ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG

690
2015

Berichte

zur Polar- und Meeresforschung

Reports on Polar and Marine Research

High latitudes and high mountains: driver of or driven by global change?

26th International Congress on Polar Research
6 - 11 September 2015, Munich, Germany

German Society for Polar Research

Edited by

Eva-Maria Pfeiffer, Heidemarie Kassens, Christoph Mayer, Mirko Scheinert, Ralf Tiedemann and Members of the DGP Advisory Board

HELMHOLTZ GEMEINSCHAFT

Die Berichte zur Polar- und Meeresforschung werden vom Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar- und Meeresforschung (AWI) in Bremerhaven, Deutschland, in Fortsetzung der vormaligen Berichte zur Polarforschung herausgegeben. Sie erscheinen in unregelmäßiger Abfolge.

Die Berichte zur Polar- und Meeresforschung enthalten Darstellungen und Ergebnisse der vom AWI selbst oder mit seiner Unterstützung durchgeführten Forschungsarbeiten in den Polargebieten und in den Meeren.

Die Publikationen umfassen Expeditionsberichte der vom AWI betriebenen Schiffe, Flugzeuge und Stationen, Forschungsergebnisse (inkl. Dissertationen) des Instituts und des Archivs für deutsche Polarforschung, sowie Abstracts und Proceedings von nationalen und internationalen Tagungen und Workshops des AWI.

Die Beiträge geben nicht notwendigerweise die Auffassung des AWI wider.

Herausgeber
Dr. Horst Bornemann

Redaktionelle Bearbeitung und Layout
Birgit Reimann

Alfred-Wegener-Institut
Helmholtz-Zentrum für Polar- und Meeresforschung
Am Handeshafen 12
27570 Bremerhaven
Germany

www.awi.de
www.reports.awi.de

Der Erstautor bzw. herausgebende Autor eines Bandes der Berichte zur Polar- und Meeresforschung versichert, dass er über alle Rechte am Werk verfügt und überträgt sämtliche Rechte auch im Namen seiner Koautoren an das AWI. Ein einfaches Nutzungsrecht verbleibt, wenn nicht anders angegeben, beim Autor (bei den Autoren). Das AWI beansprucht die Publikation der eingereichten Manuskripte über sein Repositorium ePIC (electronic Publication Information Center, s. Innenseite am Rückdeckel) mit optionalem print-on-demand.

The Reports on Polar and Marine Research are issued by the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI) in Bremerhaven, Germany, succeeding the former Reports on Polar Research. They are published at irregular intervals.

The Reports on Polar and Marine Research contain presentations and results of research activities in polar regions and in the seas either carried out by the AWI or with its support.

Publications comprise expedition reports of the ships, aircrafts, and stations operated by the AWI, research results (incl. dissertations) of the Institute and the Archiv für deutsche Polarforschung, as well as abstracts and proceedings of national and international conferences and workshops of the AWI.

The papers contained in the Reports do not necessarily reflect the opinion of the AWI.

Editor
Dr. Horst Bornemann

Editorial editing and layout
Birgit Reimann

Alfred-Wegener-Institut
Helmholtz-Zentrum für Polar- und Meeresforschung
Am Handeshafen 12
27570 Bremerhaven
Germany

www.awi.de
www.reports.awi.de

The first or editing author of an issue of Reports on Polar and Marine Research ensures that he possesses all rights of the opus, and transfers all rights to the AWI, inlcuding those associated with the co-authors. The non-exclusive right of use (einfaches Nutzungsrecht) remains with the author unless stated otherwise. The AWI reserves the right to publish the submitted articles in its repository ePIC (electronic Publication Information Center, see inside page of verso) with the option to "print-on-demand".

Titel: Föhnwolke über dem Neumayerkanal, Antarktische Halbinsel im November 2006
(Foto: Astrid Lambrecht)

Cover: Foehn cloud over Neumayer channel, Antarctic peninsula in November 2006
(Picture: Astrid Lambrecht)

26th International Congress on Polar Research

6 – 11 September 2015, Munich, Germany

High latitudes and high mountains: driver of or driven by global change?

Edited by

Eva-Maria Pfeiffer, Heidemarie Kassens, Christoph Mayer, Mirko Scheinert, Ralf Tiedemann and Members of the DGP Advisory Board

Please cite or link this publication using the identifiers

hdl:10013/epic.45858 or http://hdl.handle.net/10013/epic.45858

doi:10.2312/BzPM_0690_2015 or http://doi.org/10.2312/BzPM_0690_2015

ISSN 1866-3192

Vorwort zur 26. Internationalen Polartagung in München

In den kalten Regionen der Erde zeigen sich – verstärkt in den letzten Jahren – drastische Veränderungen: Das arktische Meereis verliert an Ausdehnung, die Schmelzregionen in Grönland vergrößern sich, die Gebirgsgletscher werden kleiner, die Lufttemperaturen im Himalaya steigen schneller als im Umland, der Eismassenverlust in der Westantarktis beschleunigt sich und die Verbreitung der Permafrostgebiete nimmt weltweit ab. Dies sind nur einige Beobachtungen, die offene Fragen aufwerfen: Sind diese Phänomene Konsequenzen globaler Umwelt- und Klimaänderungen? Welche Prozesse steuern diese Veränderungen? Wirken die kalten Regionen möglicherweise als Verstärker dieses Wandels? Wie reagieren wir Menschen darauf?

Um zur Beantwortung dieser Fragen beizutragen, hat die **Deutsche Gesellschaft für Polarforschung (DGP) zur 26. Internationalen Polartagung vom 6. - 11. September 2015 nach München** eingeladen. Dort sollen aktuelle Ergebnisse und Konsequenzen aus der **Polar- und Hochgebirgsforschung** diskutiert werden.

Die im vorliegenden Tagungsband zusammengestellten Kurzfassungen reichen von der vielfältigen Wirkung des Klimawandels auf Polar- und Hochgebirgsregionen, Meereisbedeckung und Biodiversität, bis hin zur Veränderung von Migration und Nahrungsnetzen. Es werden Aspekte der geologischen und geophysikalischen Prozesse in den Polargebieten sowie geschichtliche Themen der Polarforschung erörtert. Dazu kommen Polarlehrer zu Wort und werden von ihren Polarerfahrungen in der Schulausbildung berichten. Das Berichtskolloquium des DFG-Schwerpunktprogramms „Antarktisforschung“ (SPP 1158) ist in die Polartagung eingebettet.

Die 26. Internationale Polartagung wird in Zusammenarbeit mit der Bayerischen Akademie der Wissenschaften, der Technischen Universität München, der Ludwigs-Maximilian-Universität München, dem Deutschen Zentrum für Luft- und Raumfahrt und dem Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung organisiert. Diesen Institutionen und ebenso der DFG sowie weiteren Unterstützern sei an dieser Stelle noch einmal ganz herzlich gedankt.

Wir wünschen Ihnen nun viel Freude beim Lesen der Vortrags- und Posterkurzfassungen und freuen uns selbst auf Ihre Diskussionsbeiträge zum bunten Programm 2015, in dem Wissenschaftlerinnen und Wissenschaftler ihre aktuellen Forschungsergebnisse zu den Kältegebieten der Erde vorstellen und sie mit Polar-Interessierten in Sachen ***„Hohe Breiten und Hochgebirge: Treiber oder Getriebene im Globalen Wandel?“*** austauschen.

Eva-Maria Pfeiffer, Vorsitzende der DGP München 2015

Postadresse
Prof. Eva-Maria Pfeiffer
1. Vorsitzende – Deutsche Gesellschaft für Polarforschung e.V.
c/o Universität Hamburg,
Institut für Bodenkunde,
Allende-Platz 2
20146 Hamburg
http://www.dgp-ev.de

Deutsche Gesellschaft für Polarforschung e.V.

Programm der 26. Polartagung

„Hohe Breiten und Hochgebirge: Treiber oder Getriebene im Globalen Wandel?“

vom 6.-11. September 2015 in München

So. 06. September 2015

19:00	Willkommensabend/Icebreaker im Alpinen Museum des Deutschen Alpenvereins, Praterinsel 5 mit Registrierung

Mo. 07. September 2015

ab 8:00	Registrierung in der Bayerischen Akademie der Wissenschaften, Alfons-Goppel Str. 11
08:30	Eröffnung und Begrüßung
09:30	Die Arbeiten der Kommission für Erdmessung und Glaziologie, *C. Mayer, München*
10:15	Die internationale Polarlehrer-Vereinigung PEI (Polar Educators International), *R. Lehmann, Hannover*

10:30 – 11:00 *Kaffeepause*

11:00 – 12:30 Pioniere der Antarktisforschung

11:00	München als Ausgangspunkt für die deutsche Antarktisforschung, *C. Lüdecke, Hamburg*
11:30	Der Große Karajak-Gletscher in Westgrönland bei Drygalski im Jahre 1892 und in heutiger Zeit – ein Vergleich, *R. Dietrich, Dresden*
11:45	Friedrich Bidlingmaier (1875-1914), Physiker der Deutschen Südpolarexpedition 1901-1903, *D. Fritzsche, Potsdam*
12:00	Die russische Südpolexpedition (1819–1821) und der Wind des Kalten Krieges, *E. Tammiksaar, Tartu*

12:15 Wie gleichgültig geht die Natur über unsere Leistungen hinweg.“ Um ein institutionelles Gedächtnis für die Arktis- und Antarktisforschung. Das Archiv für deutsche Polarforschung (AdP) 2011–2013, *C. Salewski, Bremerhaven*

12:30 – 14:00 Mittagspause

14:00 – 15:30 Biodiversität, Verbreitung und Nahrungsnetze

14:00 Polar deep-sea biodiversity and the SokhoBio expedition to the Sea of Okhotsk in 2015, *A. Brandt, Hamburg*

14:30 The Scotia Arc: Highway for stepping-stone dispersal of shallow-water fauna between Patagonia and the Antarctic?, *C. Held, Bremerhaven*

14:45 Cosmopolitan, Bipolar or Endemic? – Phylogeography of three planktonic polar copepods, *A. Cornils, Bremerhaven*

15:00 Regional differentiation and extensive hybridization in the Southern Ocean giant sea spider *Colossendeis megalonyx* species complex, *F. Leese, Bochum*

15:15 A different view on penguins -multispectral mapping of penguins colonies by drones, *J. Maercker, Jena*

15:30 – 16:00 Kaffeepause

16:00 – 16:30 Biodiversität, Verbreitung und Nahrungsnetze (Fortsetzung)

16:00 The impact of unmanned aerial vehicles on the behavior of penguins, giant petrels and seals, *M.C. Rümmler, Jena*

16:15 A low-impact individual monitoring system for Adelie penguins, *S. Richter, Erlangen*

16:30 – 17:15 Periglazialräume und Permafrost 1

16:30 Spätquartäre Seesysteme und Klimaentwicklung in Ostsibirien, *B. Diekmann, Potsdam*

16:45 Holocene lake-system development in high mountain environments of the Tibetan Plateau, *A. Ramisch, Weihenstephan*

17:00 The soils of Argentine Islands: diversity of organic matter on the edge of life, *I. Kozeretska, Kyiv*

17:15 – 18:15 Postersession, Kurzvorstellung der Posterbeiträge, anschließend Posterbegehung

19:30 – 21:00 Konzert zur Internationalen Polartagung München 2015
„Der Wettlauf zum Südpol“ Multimediales Konzert - Interdisziplinäres Projekt, Ensemble CrossRoads

Di. 08. September 2015

08:3 – 10:30 Brennpunkte der Polarforschung

08:30 Future plans and strategy of IODP and other ocean drilling in Antarctica and the Arctic, *K. Gohl, Bremerhaven*

09:00 Status der beantragten Souveränitätsansprüche auf Erweiterung des Festlandsockels in antarktischen Seegebieten jenseits von 200 Seemeilen, *K. Hinz, Hannover*

09:15 PAGE21: A large-scale international and integrated project to measure the impact of permafrost degradation on the climate system, *H.W. Hubberten, Potsdam*

09:30 New Megagrant Laboratories in Russia Make Important Contributions Polar Research, *K.P. Koltermann, Moscow*

09:45 Integrating GIS, functional traits and food webs in Arctic marine research: Creating added value for science and stakeholders, *D. Piepenburg, Bremerhaven*

10:00 Mögliche Auswirkungen von Unterwasserschall auf polare marine Säugetiere, *M. Müller, Dessau*

10:15 Why the Arctic matters, *F. Ulmer, Fairbanks*

10:30 – 11:00 Kaffeepause und Posterbegehung

11:00 – 11:15 Brennpunkte der Polarforschung (Fortsetzung)

11:00 Planned interdisciplinary-geoscientific process-studies on a typical East Antarctic continental margin setting at the Ekström Ice Shelf (Dronning Maud Land): from Gondwana decay to recent deglaciation, *G. Kuhn, Bremerhaven*

11:15 – 12:30 Geodynamische Prozesse

11:15 Connecting Geology and Geophysics: the geodynamic evolution of Dronning Maud Land from Rodinia to Gondwana, *A. Läufer, Hannover*

11:45 Die mesozoische Antarktis: Der harte Kern Gondwanas?, *F. Lisker, Bremen*

12:00 Neoproterozoische bis ordovizische Sedimentation im nördlichen Victoria-Land (Antarktis) – Ergebnisse von U-Pb-Datierungen an detritischen Zirkonen, *S. Estrada, Hannover*

12:15 Antarctic Mumiyo - frozen sea food on rocks traces glacial and climatic changes in Dronning Maud Land (DML) since 40.000 years, *W.D. Hermichen, Potsdam*

12:30 – 14:00 Mittagspause

14:00 – 15:30 DFG Schwerpunktprogramm Antarktisforschung, Kolloquium
Development of the continent

14:00 A golden decade of aerogeophysical research helps unveil the Antarctic continent, *F. Ferraccioli, Cambridge*

14:30 Die langfristige Landschaftsentwicklung der Weddell Meer-Region, *N. Krohne, Bremen*

14:45 Lateral extrusion at the eastern margin of the East African-Antarctic Orogen in Dronning Maud Land, Sør Rondane, *A. Ruppel, Hannover*

15:00 Cenozoic exhumation history of the Ross province of Marie Byrd Land, West Antarctica, *M. Zundel, Bremen*

15:15 Eismassenbilanz und glazial-isostatischer Ausgleich im Gebiet des Amundsenmeeres, West-Antarktis, mit Hilfe geodätischer Beobachtungen und Modellierung, *M. Scheinert, Dresden*

15:30 – 16:00 Kaffeepause und SPP Posterbegehung

16:00 – 17:45 DFG Schwerpunktprogramm Antarktisforschung, Kolloquium, Fortsetzung
Dynamics of climate system components

16:00 Evidence for increased basal ice-shelf melting in the Weddell Sea from oceanic noble-gas observations, 1990-2013, *O. Huhn, Bremen*

16:30 Recent changes in ice dynamics of Northern Antarctic Peninsula glaciers revealed from multi-mission remote sensing data, *T. Seehaus, Erlangen*

16:45 Satellite-derived fast-ice climatology and fast-ice growth rates of Atka Bay, Antarctica, *S. Paul, Trier*

17:00 Brine channel distribution in sea ice, *K. Morawetz, Münster*

17:15 Atmosphäre- Meereis-Wechselwirkungen in der Antarktis, *J. Abalichin, Berlin*

17:30 West Antarctic glacial-isostatic adjustment in the presence of weak Earth structure, *I. Sasgen, Potsdam*

18:00 – 19:00 Sitzungen der Arbeitskreise: Polarlehrer, Geschichte, Geologie und Geophysik

19:30 Gemeinsames Konferenz-Abendessen (Ort wird bekanntgegeben)

Mi. 09. September 2015

08:30 – 10:15 DFG Schwerpunktprogramm Antarktisforschung, Kolloquium, Fortsetzung
Response to environmental change

08:30 Responses to changing sea ice conditions, *D. Thomas, Bangor*

09:00 Muster der benthischen Ökosystemfunktion an der Antarktischen Halbinsel, *H. Link, Kiel*

09:15 Speciation and adaptation in Antarctic sea spiders, *J. Dömel, Bochum*

09:30 Is the predatory amphipod *Themisto gaudichaudii* poised to displace krill in the warming region of the Southern Ocean?, *C. Havermans, Bremen*

09:45 Diversity of the sponge communities in the Bransfield Strait, the Drake Passage and the Weddell Sea, Antarctica, *D. Janussen (Erstautor: D. Kersken), Frankfurt*

10:00 Small, but powerful - benthic diatoms in polar waters, *U. Karsten, Rostock*

10:15 – 10:45 Kaffeepause und SPP Posterbegehung

10:45 – 12:30 DFG Schwerpunktprogramm Antarktisforschung, Kolloquium, Fortsetzung
Gateways to lower latitudes

10:45 Connectivity and migration in Southern Ocean food webs - a stable isotope approach, *G. Stowasser, Cambrigde*

11:15 Food selectivity as a driver of diversity in Antarctic deep-sea invertebrates, *L. Würzberg, Hamburg*

11:30 Diversity in a cold hot-spot: DNA-barcoding reveals patterns of evolution among Antarctic demosponges (Class Demospongiae, Phylum Porifera), *S. Vargas Ramirez, München*

11:45 Holocene vegetation and climate history of South Georgia, revealed by lipid biomarkers, S. *Jivcov, Köln*

12:00 The ventilation and circulation of the southern Indian Ocean on glacial / interglacial timescales, *T. Ronge, Bremerhaven*

12:15 DFG-Schwerpunktprogramm 1158: Antarktisforschung mit vergleichenden Untersuchungen in arktischen Eisgebieten, *U. Karsten, Rostock*

12:30 – 14:00 Mittagspause

14:00 – 15:30 Atmosphäre und Ozeane der hohen Breiten

14:00 Impact of removed Arctic summer sea ice on atmosphere circulation in an ensemble of coupled model simulations, *L. Stulic, Bremerhaven*

14:15 Reaktion der Atmosphäre auf eine Verringerung der arktischen Meereisdicke, *T. Semmler, Bremerhaven*

14:30 Aircraft measurements of sea ice/ocean /atmosphere interactions during the experiment LEAST near Svalbard, *G. Heinemann, Trier*

14:45 Formation of Antarctic Bottom Water on the Northwestern Weddell Sea, *M. van Caspel, Bremerhaven*

15:00 Is a warming of the Antarctic continental shelf reversible?, *H. Hellmer, Bremerhaven*

15:15 West Antarctic Ice Sheet responses to ocean warming in the Filchner Ronne Ice Shelf region, *K. Grosfeld* (Erstautor: *S. Goeller), Bremerhaven*

15:30 – 16:00 Kaffeepause und Posterbegehung

16:00 – 17:45 Meereis im Klimasystem

16:00 Satellite observation of the cryosphere - the potential of L-band satellite missions, *L. Kaleschke, Hamburg*

16:30 Sea Ice Mass Balance influenced by Ice Shelves (SIMBIS): Final Report, *S. Paul, Trier*

16:45 Pan-Arctic polynya dynamics and thermodynamic ice production estimates for 2002/2003-2014/2015 based on MODIS thermal infrared imagery and ERA-interim reanalysis, *A. Preußer, Trier*

17:00 Natural Variability of Arctic Sea-ice: Arctic peripheral seas in pre-industrial control runs, *R. Al-Janabi, Bremerhaven*

17:15 Seasonality of sea ice properties from autonomous measurements, *M. Nicolaus, Bremerhaven*

17:30 Influence of ice thickness and surface properties on light transmission through Arctic sea ice, *C. Katlein, Bremerhaven*

18:00 – 19:00 Sitzungen der Arbeitskreise: Polargeodäsie und Glaziologie, Biologie, Permafrost

19:30 Öffentlicher Abendvortrag im Plenarsaal: Eisiges Hochgebirge im Klimawandel, Prof. Dr. Wilfried Haeberli, Zürich

Do. 10. September 2015

08:30 – 10:15 Biologische Anpassung und Spezialisierung

08:30 Metabolic profile and antibacterial activity of extracts from *Himantormia lugubris*, *A. Beck, München*

08:45 Aktivitätsmuster hochalpiner und antarktischer Bodenkrusten - Physiologische Spezialisierungen als Schlüssel im Kampf ums Überleben an Extremstandorten, *C. Colesie, Kaiserslautern*

09:00 Comparative diversity of mosses and lichens in coastal and interior oases of Prydz Bay area (Antarctica), *M. Andreev, St. Petersburg*

09:15 Desiccation tolerance of Antarctic lichen photobionts: a transcriptomic approach, *A. Sadowsky, Düsseldorf*

09:30 Cytogenetic features of *Deschampsia Antarctica* desv. plants in different microclimate conditions of the Argentine Islands of maritime Antarctic, *V. Kunakh, Kyiv*

09:45 Antarctic hair grass and kelp gull interactions: comparison of two maritime Antarctic regions, *I. Parnikoza, Kyiv*

10:00 Vegetation und Vegetationsdynamik auf dem Zugspitzplatt (Bayerische Alpen) - Natur- und Kulturlandschaft im hochalpinen Raum als Produkt natürlicher, anthropogener und zoogener Einflüsse, *O. Korch, Augsburg*

10:15 Habitat changes of polar bears in summer as assessed by long-term observations in their North-East Greenland range, *B. Sittler, Freiburg*

10:30 – 11:00 Kaffeepause

11:00 – 12:30 Jahresversammlung der Deutschen Gesellschaft für Polarforschung, Plenarsaal

12:30 – 14:00 Mittagspause

14:00 – 15:30 Periglazialräume und Permafrost II

14:00 Geochemical composition of selected soils in the Yamal region, North-western Siberia, Russia*, I. Antcibor, Hamburg*

14:15 Regulation of methane production, oxidation and emission by vascular plants and bryophytes in ponds of the northeast Siberian polygonal tundra, *C. Knoblauch, Hamburg*

14:30 Partitioning small-scale net ecosystem exchange fluxes of carbon dioxide and methane in a permafrost landscape, *E.M. Pfeiffer (Erstautor: T. Eckhardt), Hamburg*

14:45 Inter-annual variability of growing season CO_2 and CH_4 fluxes at polygonal tundra of the Lena River Delta, Siberia, *L. Kutzbach, Hamburg*

15:00 Impact of temperature and labile carbon on organic matter decomposition in permafrost-affected soils of the northeastern Siberian tundra, *J. Walz, Hamburg*

15:15 Seasonal and multiannual variability of permafrost in alpine talus slopes below the timberline, *D. Schwindt, München*

15:30 – 16:00 Kaffeepause

16:00 – 18:00 Massenbilanz und Dynamik von Gletschersystemen

16:00 Investigations of mass balance on the Bellingshausen Ice Dome in 2007–2015, King George (Waterloo) Island, South Shetland Islands, Antarctica, *B. Mavlyudov, Moscow*

16:15 Vergleich von Massenbilanzen aus geodätischen GNSS-Bodenmessungen, Pegelablesungen und Satellitenaltimetrie im Swiss-Camp Gebiet (West-Grönland), *M. Stober, Stuttgart*

16:30 Subglaziales Schmelzen am Getz Gletscher – der Beitrag geothermischer Messungen, *N. Kaul, Bremen*

16:15 Radar internal layers: Synchronization with ice-core records and layer tracing, *A. Winter, Bremerhaven*

17:00 Evolution of surface velocity, ice export and mass balance of outlet glaciers to Larsen-A and -B embayments, Antarctic Peninsula, since 1995, *H. Rott, Innsbruck*

17:15 TerraSAR-X and TanDEM-X observations of the Recovery glacier system, Antarctica, *D. Floricioiu, Oberpfaffenhofen*

17:30 Characterization of cm-scale variations of crystal orientation fabric in cold Alpine ice core from Colle Gnifetti, *J. Kerch, Heidelberg*

17:45 Recent years of extreme ice-mass balance in Greenland: insights from GRACE and atmosphere models, *I. Sasgen, Potsdam*

Fr. 11. September 2015

8:30 Abfahrt der Exkursionen

Posterbeiträge

Bio-01 Do bryophytes facilitate vascular plant diversity along a bioclimatic gradient in High Arctic Svalbard?, *O. Bechberger, Reykjavik*

Bio-02 A genomic approach to the diversity and evolution of the Antarctic and sub-Antarctic nudibranch family Tritoniidae (Gastropoda, Heterobranchia) (SPP), *M. Berning, München*

Bio-03 Biogenic weathering along a chronosequence established by glacier retreat at the Fildes Peninsula, King George, in maritime Antarctica (SPP), *R. Godoy, Valdivia*

Bio-04 Biogeographic Atlas of the Southern Ocean -- New insights into Antarctic and sub-Antarctic sponge diversity and distribution, *D. Janussen (Erstautorin: R. Downey), Frankfurt*

Bio-05 Where is the richest abyssal fauna of Munnopsidae (Crustacea, Isopoda)?, *M. Malyutina*

Bio-06 A multivariate benthic regionalization of the Weddell Sea (SPP), *K. Jerosch, Bremerhaven*

Bio-07 Huddle behavior of penguins, *K. Morawetz, Münster*

Bio-08 New dynamical mechanism for Antifreeze proteins (AFP), *K. Morawetz, Münster*

Bio-09 The use of drone-based multisensor mapping in Antarctic science, *O. Mustafa, Jena*

Bio-10 Arctic and Antarctic large white-headed gull species nest materials – similarity across the globe*, I. Parnikoza, Kyiv*

Bio-11 Observing the intraseasonal dynamic of a Pygoscelis penguin colony – comparison of a multitemporal analysis of very high resolution satellite images with phenological data, *C. Pfeifer, Jena*

Bio-12 The impact of a changing environment on young macroalgal stages and communities (SPP), *K. Zacher, Bremerhaven*

Clim-01 The impact of snow specific surface area and clouds on surface albedo: Investigations made at Kohnen Station, Antarctica, during summer 2013/14 (SPP), *G. Birnbaum (Erstautorin: M. Belke-Brae), Bremerhaven*

Clim-02 Messungen der atmosphärischen Grenzschicht der Arktis mit einem Doppler Wind LIDAR, *S. Kohnemann, Trier*

Clim-03 Ground-based remote sensing of the atmospheric boundary layer in the Laptev Sea area and comparisons with regional climate simulations, *P. Schwarz, Trier*

Geo-01 The WEGAS / GEA IV Geophysical Survey in eastern and southern Dronning Maud Land, *G. Eagles, Bremerhaven*

Geo-02 ANDRILL – Wissenschaftliches Bohren in der Antarktis: Stand und Ausblick, *C. Gaedicke, Hannover*

Geo-03 Zircon Pb-Pb ages, chemistry and inclusion data of granitoids from the Wilson Terrane of northern Victoria Land (Antarctica): evidence for an immature Andean-type continental margin*, J. Giese (Erstautorin: M. Menneken), Berlin*

Geo-04 Paleoenvironmental evolution of Potter Peninsula during the Holocene, King George Island, South Shetland Islands, *P. Heredia, Cordoba*

Geo-05 Are sediments in lakes at Novolazarevskaya Station retaining earlier human impact?, *E. Kaup, Tallinn*

Geo-06 The grounding-zone wedge inventory on the Amundsen Sea Embayment shelf, West Antarctica: formation processes and significance for establishing reliable post-LGM retreat chronologies, *J.P. Klages, Bremerhaven*

Glaz-01 Ensemble Constraints on Scandinavian Glacier Mass Balance, *S. Baumann, München*

Glaz-02 Satellitengeodätische Beobachtung und Quantifizierung von Eisschild-Änderungen: Erfolge und Herausforderungen, *M. Horwath, Dresden*

Glaz-03 Search for volcanic signatures of the Toba super-eruption recorded in EDML core (Antarctica), *M. Kohno, Göttingen*

Glaz-04 Multi-mission satellite analysis of Wilkins Ice Shelf, Antarctic Peninsula: structures and dynamics , *M. Rankl, Erlangen*

Glaz-05 Firn compaction modeling for an arctic ice cap – first results, *B. Saß, Erlangen*

Glaz-06 Geodätische Messungen im Gebiet des subglazialen Lake Vostok: Implikationen für Geodynamik und Glaziologie, *M. Scheinert, Dresden*

Glaz-07 A glacier surge of Bivachny Glacier in the Pamir Mountains observed in time series of digital elevation models and velocity maps, *A. Wendt, München*

Glaz-08 Pattern of cryospheric seismic events observed at Ekström ice shelf, Antarctica (SPP), *C. Hammer, Zürich*

Perm-01 Die Geschichte der Kohlenstoff-Einlagerung in bis zu 200 Tausend Jahre alten Böden in Nordsibirien, *G. Schwamborn, Potsdam*

Perm-02 Depositional variability in a thermokarst lake basin in ice-rich permafrost of Arctic Siberia, *P. Vakhrameeva, St. Petersburg*

Perm-03 Snow microstructure and modelling in support of permafrost science, *M. Proksch, Davos*

Perm-04 Gelisols in the Lena River Delta and its hinterland – genesis and diversity, *E.M. Pfeiffer (Erstautor: S. Zubrzycki), Hamburg*

SeaIce-01 The implications of sea ice decline on ocean circulation in global coupled model simulations, *C. Campos, Bremerhaven*

SeaIce-02 Snowmelt detection on Antarctic sea ice based on passive and active microwave data, *S. Arndt, Bremerhaven*

SeaIce-03 Sensitivity of sea-ice production of Laptev Sea polynyas to the representation of subgrid-scale energy fluxes in a regional climate model, *O. Gutjahr, Trier*

SeaIce-04 Online sea ice knowledge and data platform: www.meereisportal.de, *R. Treffeisen, Bremerhaven*

SeaIce-05 Snow Covers impacts on Antarctic Sea Ice (SCASI) (SPP), *M. Nicolaus, Bremerhaven*

CONTENTS

ATMOSPHÄRE- MEEREIS-WECHSELWIRKUNGEN IN DER ANTARKTIS

Janna Abalichin[1], Ulrike Langematz[1]

[1]Institut für Meteorologie, Freie Universität Berlin, Carl-Heinrich-Becker-Weg 6-10, 12165 Berlin, Deutschland,
email: janna.abalichin@met.fu-berlin.de

Das antarktische Meereis weist in den letzten Dekaden einen positiven Trend in seiner Gesamtausdehnung auf. Während es in den Gebieten des Bellingshausen-Sees und in pazifischen Sektor zurückgeht, gibt es eine etwas stärkere Zunahme des Meereises in den Gebieten des Ross-, sowie Weddellmeeres, die flächenmäßig überwiegt.

Diese Entwicklung wird auf die Verstärkung des Southern Annular Mode (SAM) durch das Auftreten des alljährlichen Antarktischen Ozonlochs zurückgeführt, wodurch die zonale Komponente des Bodenwindes zunimmt, und somit Windschub auf die Ozeanoberfläche und der Ekman-Transport des Meereises. Gleichzeitig findet eine saisonale Verstärkung des Amundsen-Bellingshausen-Tiefdrucksystems, das zu stärkerem Nordwind (Richtung Antarktis-Küste) im Gebiet des Meereisrückgangs im Bellingshausen-Meer und verstärktem Südwind in der Region des Ross-Meeres, wo verstärkte Meereis-Ausdehnung stattfindet, führt. In dieser Studie wird mit Hilfe realitätsnaher, als auch idealisierter Simulationen mit dem gekoppelten Klima-Chemie-Ozean-Modells EMAC-O (ECHAM/MESSy gekoppelt an den MPIOM-Ozean) die Rolle der großräumigen Zirkulationsänderung auf die Meereis-Ausdehnung durch die SAM-Verstärkung dem regionalen Einfluss der Tiefdrucksysteme gegenübergestellt.

NATURAL VARIABILITY OF ARCTIC SEA-ICE: ARCTIC PERIPHERAL SEAS IN PRE-INDUSTRIAL CONTROL RUNS

Rusul Al-Janabi[1], Thomas Jung [1]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Bussestraße 24, 27570 Bremerhaven, Deutschland,
email: rusul.al-janabi@awi.de

[2]Instituto Antárctico Argentino, Universidad de Lujan, Argentina

Understanding natural variability of Arctic sea-ice is a scientific topic that has earned increasing interest in the last years. It may help explain the large negative trends in sea-ice extent and thickness that have been observed in the last 30 years. These trends have been attributed to increased greenhouse gas emissions. However, anthropogenic forcing cannot fully account for the observed trends alone, and natural variability must be taken into account. To achieve our aim of gaining further insight into sea-ice variability, we look at data from the CMIP5 models. We investigate different atmospheric and oceanic processes, that interact with sea-ice, looking at their spatial and temporal evolution, in order to depict the dynamics of the Arctic region. Time scales of atmospheric and oceanic processes interacting with sea-ice and contributing to its variability, range from weeks to decades. Taking into account this time-scale dependence is crucial for understanding any changes in the Arctic region, whether it is natural or anthropogenic. On the other hand investigating variability in the Arctic peripheral seas, could help explain the spatial variability observed. This spatial variability can in part be accounted for by interactions of both the Pacific and Atlantic oceans with the Arctic region. We have found that “reemergence” of sea ice predictability has manifested itself in many realizations of the CMIP5 pre-industrial control runs. We are going to investigate possible physical mechanisms that may be responsible for this “reemergence”.

COMPARATIVE DIVERSITY OF MOSSES AND LICHENS IN COASTAL AND INTERIOR OASES OF PRYDZ BAY AREA (ANTARCTICA)

Mikhail Andreev[1], Ljubov Kurbatova[1]

[1]Laboratory of Lichenology & Bryology, Komarov Botanical Institute, Russian Academy of Sciences, Prof. Popov Str. 2, 197376 St. Petersburg, Russia, email: andreevmp@yandex.ru

Prince Charles Mts. extends 600 km to the South along the Lambert glacier and the Amery ice shelf in Prydz Bay region, located between Mac. Robertson Land and Princess Elizabeth Land. Mainly lonely peaks, nunataks and flat top massifs with steep slopes rise over continental ice. First cryptogamic collections were gathered in the region by R. Filson in 1962 – near Mawson Station and some more south, and by R. Seppelt in 1978-1979 – in Vestfold Hills (Davis Station). Russian scientists have started to collect lichens and mosses in the region in 1989 (Andreev, 1990). In 2004-2005 the detailed study of intracontinental oases in southern parts of Prince Charles Mts. was started. As a result Landing cliff (field base Druzhnaya-4), vicinity of Radok and Beaver lakes, Clemence massif, Mts. Rymill, Potanina, Stinear and Blumfield are more or less well investigated. Some specimens were collected also on Manning and Shaw massifs and on Mt. Willing, and previously by R. Filson on Mawson Escarpment and on Fisher massif.

All explored areas could be divided on coastal oases and internal oases and nunataks. The climatic and weather conditions of two oasis groups are different, and influence very much the cryptogamic flora and vegetation, because of different adaptive ability of the different species. Environmental conditions in inner parts of the continent are significantly harsher than near the coast. Four coastal oases: Vestfold – S 68°30', alt. 0–160 m; Mawson – S 67°36'–69°05', alt. 0–1350 m; Larsemann Hills – S 69°18'–69°23', alt. 0–135 m; Landing Cliff – S 69°44', alt. 0–120 m, and three internal: Radok Lake – S 70°48'–70°54', alt. 0–350 m; Clemence – S 72°06'–72°18', alt. 100–1300 m; Glybovye Mts. (incl. Rymill, Stinear and Blumfield) – S 72°56'–73°07', alt. 340–1540 m are investigated rather intensively. There are some incomplete collections from different massifs and nunataks of the region (Shaw, Izabell, Jons, Manning, Ely, Willing) and from Rauer Islands in the sea.

At present 67 lichens and 8 bryophytes are known for the whole region. 36 lichen species – mainly most common and wide distributed taxa, were collected both in internal and in coastal oases. 19 lichens are known in internal oases only. They are saxicolous crustose species: e.g. *Acarospora macrocyclos, Lecanora mons-nivis, L. physciella, Lecidea andersonii, Rhizocarpon nidificum, Rhizoplaca macleanii* and *Sarcogyne privigna*. 12 lichen species were collected in coastal areas only – mainly terricolous and epibryophytic taxa: e.g. *Umbilicaria antarctica, Usnea antarctica* and *U. sphacelata*. Local lichen floras in the region numbers 18-42 species, depending of 3 principal factors: level of investigation, the size of oasis, and environmental conditions, first of all – the level of humidity. Well-studied local lichen floras, both internal and coastal, number normally 30-40 species, but the structure of floras is different. The salinity could be the reason of relatively poorness of flora in coastal areas. The main factors influencing flora and vegetation of internal oases are altitude and correspondently increasing

or reducing climatic hardness and environmental severity, particularly – water availability and level of wind's speed and abrasive influence.

As an example we can compare coastal oasis Larsemann Hills – 36 lichens and 7 bryophytes and 2 internal oases: Clemence massif (42 lichens and 7 bryophytes) and Glybovye Mts. (18 lichens and 1 bryophyte), both situated near Lambert and Fisher glaciers app. in 450 and 600 km from ocean coast respectively. Climate of Clemence massif, located 140 km northern than Glybovye Mts. and on lower altitude, is therefore milder. The traces of wind erosion absence and the abundance of melt water in summer is very remarkable. Because of that dense moss-lichen communities and even moss mats up to several square meters are rather common. Cryptogamic flora is relative rich and diverse. Snow petrels (*Pagodroma nivea*) nest in the massif and skuas are rather common. The climate of Glybovye Mts., situated 140 km southerly and higher are much more adverse. It is colder, with strong southerly winds, and melt water is almost absent. Birds are completely absent. The vegetation is not developed and unnoticeable. Dense cryptogamic communities and mosses were found in one single place only – in lower part of Mt. Stinear in a most protected place. Saxicolous lichens dominate but grow in cracks of rocks or under rock surface. Cryptogamic flora is very poor, without foliose and crustose lichens. Crustose saxicolous lichens dominate: *Acarospora gwynnii, Amandinea petermannii, Buellia frigida, B. pallida, Carbonea vorticosa, Lecanora fuscobrunnea, L. mons-nivis, Lecidea andersonii, L. cancriformis, Lecidella siplei, Pleopsidium chlorophanum, Rhizocarpon nidificum* and *Sarcogyne privigna*. On the ground the crustose lichens *Caloplaca citrina* and *Lepraria cacuminum* could be found. Almost all of the species were found in Clemence massif too, and one third of them are unknown in coastal oases.

The detailed investigation of more southern nunataks and massifs of Prince Charles Mts. e.g. Mawson Escarpment, Solov'yova and Growe Mts. etc. could bring very valuable results to produce a complete cryptogamic flora of continental Antarctic in the Prydz sector.

GEOCHEMICAL COMPOSITION OF SELECTED SOILS IN THE YAMAL REGION, NORTH-WESTERN SIBERIA, RUSSIA

Iuliia Antcibor[1], Evgeny Abakumov[2], Vitalii Tomashunas[2], Annette Eschenbach[1], Eva-Maria Pfeiffer[1]

[1]Institute of Soil Science, Center for Earth System Research and Sustainability, Universität Hamburg, Allende-Platz 2, 20146 Hamburg, Deutschland, email: julia.antsibor@uni-hamburg.de

[2]Institute of Earth Sciences, Saint Petersburg State University, Russia

Trace metals (TM) are a major group of pollutants present in the emissions of anthropogenic origin. The Yamal district is considered to be an important region of the northwest Siberian Arctic in terms of oil and gas exploration. Therefore, investigation of ecological functions and diversity of cryogenic soils and landscape environmental state assessment are important aspects of geoecological monitoring in north-western Siberia. The main objective of this study was to investigate soils of natural landscapes of the Yamal region in order to collect comprehensive data on TM background levels and their spatial distribution in permafrost-affected soils. Total organic carbon and nitrogen contents and soil pH were analyzed in six cryosol profiles. Contents of As, Cd, Co, Fe, Mn, Pb, and Zn were determined using atomic absorption spectrometry (AAS) and inductively coupled plasma mass spectrometry (ICP-MS).

First results showed a strong association of the majority of TM with organic matter content. We found that similar to soils in temperate regions, in permafrost-affected soils, organic matter is an important soil component which regulates immobilization of TM by organo-mineral associations and thus, prevents further leaching of those elements. Cryoturbation was determined as a second important process that governs the spatial element distribution in natural tundra landscapes of north-western Siberia. The data on TM concentrations suggested that ecological impacts at the studied sites were low. Therefore, the results of this work can be used as a reference to carry out further ecological monitoring in the Arctic on a regional scale.

SNOWMELT DETECTION ON ANTARCTIC SEA ICE BASED ON PASSIVE AND ACTIVE MICROWAVE DATA

Stefanie Arndt[1], Marcel Nicolaus[1], Wolfgang Dierking[1], Sascha Willmes[2]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Bussestr. 27-29, 27570 Bremerhaven, Deutschland,
email: stefanie.arndt@awi.de

[2]University of Trier, Environment Meteorology, Deutschland

The mass and energy budgets of sea ice differ strongly between melting and freezing seasons. The transition between these seasons may be detected by remote sensing of surface properties. As Antarctic sea ice is covered with snow during most of the year, this transition phase can be described through the timing of snow melt onset. Previous studies showed that melt-freeze-cycles of the snow surface may be detected from microwave brightness temperatures, indicating liquid water in the snow. So far, this melt onset is described through a fixed threshold in the diurnal brightness temperature variations. However, observations reveal that the strength of these diurnal variations is differing between different Antarctic sea ice regions and that they highly dependent on the age of the underlying sea ice.

Here we present three complementary approaches to improve the existing melt onset algorithms: (1) We allow for regional differences of the diurnal variations in the brightness temperature. (2) We combine different polarizations and frequencies of brightness temperatures in order to describe different stages of melt progress. (3) We include radar measurements from active microwave satellites (QuikSCAT and ASCAT) to provide similar estimates of diurnal variations in the backscatter signal. Our results are compared to autonomous measurements from snow and sea-ice mass-balance buoys, as well as ship-based observations during the Ice Station Polarstern (ISPOL) drift experiment in austral summer 2004/2005.

ENSEMBLE CONSTRAINTS ON SCANDINAVIAN GLACIER MASS BALANCE

Sabine Baumann[1], Christian Zang[2,3], Annette Menzel[2,4]

[1]Technische Universität München, Institut für Astronomische und Physikalische Geodäsie, Arcisstr. 21, München, Germany, email: sabine.baumann@bv.tum.de

[2]Technische Universität München, Chair of Ecoclimatology, Freising, Germany

[3]Biological and Environmental Sciences, School of Natural Sciences, University of Stirling, Stirling FK9 4LA, UK

[3]Institute for Advanced Study, Technische Universität München, Garching, Germany

Data basis are glacier mass balance data series separated between winter, summer, and net balance of 21 glaciers longer than 10 years and tree-ring widths from 735 trees from 7 sites distributed over Norway and Northern Sweden. First, we focused on summer mass balance data. Glacier data was clustered in continental and maritime influenced glacier types based on glacier mean elevation. Robust estimates of glacier summer mass balance were obtained by using tree-ring width as a proxy for summer temperature and thus climatic forcing on summer mass balance. The calibration ensemble of proxy (tree-ring) and target (mass balance) data was built from all possible combinations of site-specific tree-ring data and glacier mass balance data. In each step, a tree-ring composite chronology was developed as the robust mean of detrended tree-ring series. Detrending was carried out using regional curve standardization (RCS) to preserve long-term variability. Prior to detrending, the individual series were subject to power-transformation to stabilize their variance. Calibration was performed over the entire ensemble using individual linear regression models. For each step, the variance of the reconstruction has been adapted to the local variance of the respective target. The aim is to derive a robust estimate on climatic forcing on the summer mass balance of Norwegian and Northern Swedish glaciers and to extend our methodology on winter mass balance data.

DO BRYOPHYTES FACILITATE VASCULAR PLANT DIVERSITY ALONG A BIOCLIMATIC GRADIENT IN HIGH ARCTIC SVALBARD?

Oliver Bechberger[1,2,3], Ágústa Helgadóttir[1,2], Uliana Bagina[2], Pernille Bronken Eidesen[2], Ingibjörg Svala Jónsdótti[1,2]

[1]University of Iceland, Sturlugata 7, 101 Reykjavík, Island,
email: olb10@hi.is

[2]University Centre in Svalbard, Norway

[3]Staatliches Museum für Naturkunde Karlsruhe, Deutschland

Facilitation and positive interactions are widely recognized processes that shape plant communities. It is generally believed that those positive interactions increase with environmental stress and harshness. In High Arctic Svalbard, plant growth and distribution are limited by large temperature fluctuations, a short growing season, lack of nutrients and unstable substrate due to freeze–thaw cycles. Depending on the depth of the bryophyte layer, bryophytes may ameliorate those harsh growing conditions and therefore facilitate vascular plant species richness and abundance by reducing soil movement and ameliorating microclimatic fluctuations.

To examine the facilitating role on community structure we studied plant communities on six different locations within three different bioclimatic zones along the west and north coast of Svalbard. We measured abundance and richness of vascular plants, bryophyte cover and depth on each location. Furthermore we recorded temperature and humidity in bare ground and below moss. We tested the possible relationship between bryophytes and vascular plants by using linear regression models and checked for floristic similarities among all sites using ordination techniques to see if the species composition and abundance reflects the bioclimatic gradient.

We found no significant relation between bryophytes cover and depth and vascular plant species richness and abundance except for one site below a bird cliff and therefore nutrient-enriched, which was also reflected in the gradient analysis. Both vascular species richness and cover increased southwards and the bioclimatic zones were well differentiated in the ordination plots. Soil temperature was lower under a thick moss cover compared to bare ground. Moss acts as insulation when it exceeds a certain thickness and affects the active layer thickness below and therefore affects plant performance. This indicates that facilitation of vascular plants by bryophytes is rather low under low-nutrient conditions in the High Arctic, especially with a thick moss layer reducing plant growth.

METABOLIC PROFILE AND ANTIBACTERIAL ACTIVITY OF EXTRACTS FROM *HIMANTORMIA LUGUBRIS*

Andreas Beck[1], Veronika Kuhn[2], Wolfgang Eisenreich[2], Cabrera Rojas[3], Mauricio Cuellar[3], Wanda Quilhot[3], Julia Bechteler[1], Gerardo Gonzalez Rocha[4], Angélica Casanova-Katny[4]

[1]Lichenology and Bryology Department, Botanische Staatsammlung München, Menzinger Straße 67, 80638 München, Deutschland,

email: beck@bsm.mwn.de

[2]Lehrstuhl für Biochemie, TU München, Deutschland

[2]Facultad de Farmacia, Universidad de Valparaiso, Chile

[2]Laboratorio de investigaciones de agentes antibacterianos, Facultad de Ciencias Biológicas, Universidad de Concepción, Chile

Lichens form a dominant part of the vegetation in Antarctica. In order to elucidate the specific metabolic profile of a lichen species from the Antarctica, we chose the endemic lichen *Himantormia lugubris* as an example. The collected specimens were characterized by molecular methods (sequencing of the internal transcribed spacer) and their metabolic profiles were determined by non-targeted 1H-NMR and GC-MS analysis of the methanolic extract. Principle component analysis revealed the robustness of the analytical methods. 5,7-Dihydroxy-6-methyl-phthalide was identified as a key marker compound in *Himantormia lugubris* for the first time. Antibacterial activity of lichen substances was assayed upon strains of multi drug resistant bacterial species isolated from clinical specimens in Chilean hospitals.

THE IMPACT OF SNOW SPECIFIC SURFACE AREA AND CLOUDS ON SURFACE ALBEDO: INVESTIGATIONS MADE AT KOHNEN STATION, ANTARCTICA, DURING SUMMER 2013/14

Maria Belke-Brea[1], Gerit Birnbaum[2], Johannes Freitag[2], Sepp Kipfstuhl[2], Angelika Humbert[2]

[1]Faculty of Geosciences, University of Bremen, Klagenfurter Straße, 28359 Bremen, Deutschland,
email: Gerit.Birnbaum@awi.de

[2]Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Postfach 120161, 27515 Bremerhaven, Deutschland

Albedo is one of the most important factors determining near-surface energy fluxes in polar regions and is therefore a key parameter in both global and regional climate models. Albedo is, however, highly variable, and it is of great interest to incorporate albedo variability into models for reliable prognoses. Instead of assuming constant albedo values, this is achieved by incorporating complex albedo parameterizations into models.

As the albedo of snow is determined by the scattering of incoming solar radiation within the upper centimeters of snow the link between surface albedo and snow grain size is studied. During the austral summer of 2013/14 a field campaign was conducted at Kohnen Station (75° 00’ S, 0° 04’E) in which broadband albedo and Specific Surface Area (SSA), as a measure of grain size, were investigated simultaneously for the first time for December and January in Antarctica. Four data sets gained during the campaign are analyzed: 1) broadband albedo, 2) SSA, 3) synoptic observations (clouds and precipitation), 4) images of the snow surface (surface topography). It is found that the two main influencing factors on seasonal albedo development are clouds in the lowest cloud layer and variations in SSA. Overcast conditions, defined by 100 % clouds in the lowest cloud layer result in an albedo increase of around 3%. A similar albedo increase is provoked when SSA increases by 18 m2/kg. During the austral summer 2013/14 SSA increases in this order of magnitude were observed after precipitation events.

It can be concluded that the crucial factors to include into albedo parameterizations for the East Antarctic Plateau are SSA and cloud amount.

A GENOMIC APPROACH TO THE DIVERSITY AND EVOLUTION OF THE ANTARCTIC AND SUB-ANTARCTIC NUDIBRANCH FAMILY TRITONIIDAE (GASTROPODA, HETEROBRANCHIA)

Maria Berning[1,2], Katharina Jörger[1,2], Nerida Wilson[3], Michael Schrödl[1,2]

[1]Zoologische Staatssammlung München, Münchhausenstr. 21, 81247 München, Deutschland, email: gomez.berning@gmail.com

[2]Ludwig-Maximilians-Universität München, Deutschland

[3]Western Australian Museum, Perth, Australia

The nudibranch fauna in Antarctic and sub-Antarctic waters may be especially rich, yet species tend to be morphologically variable or, alternatively, species complexes or cryptic species may exist. Southern Ocean tritoniids are commonly sampled, macroscopic nudibranchs whose taxonomy has not yet been well established. Incomplete descriptions, unknown ranges of variation, apparently wide distributional ranges of currently valid species, and the lack of molecular data contribute to taxonomic uncertainty.

In this work, we explore the species level taxonomy, phylogenetic relationships and geographic distributions of the nudibranch family Tritoniidae by linking traditional morphological knowledge and available molecular data, with novel, massive nuclear ddRADseq-based data. During numerous expeditions with e.g. 'RV Polarstern', tritoniid specimens were collected and fixed for morphoanatomical and molecular analyses. DNA from muscle and mantle tissue was extracted. Probes were both Sanger sequenced for mitochondrial and nuclear markers (H3, COI, 16S, 18S, 28S) as well as ddRAD-sequenced. Species trees from each marker and marker subsets were reconstructed using maximum likelihood. The performance of several independent approaches of molecular-based species delineations were tested on the different data subsets. A ddRADseq protocol was adapted to our material, and the quality, quantity and coverage of ddRADseqs were examined. Preliminary results from our morphological and molecular data approach suggest that *Tritonia challengeriana* and *T. antarctica* form a not yet fully resolved species complex across the Polar Front, similar to what was found in the direct developing *D. kerguelenensis*. The monotypic Tritoniella is recovered as a clade in multi-locus analyses, but showing considerable morphological variation. Integrative data of the Tritoniidae, together with information on their origin and age will be tested in its abilities to reconstruct the evolutionary history of this group within paleogeographic and paleoceanographic frameworks.

POLAR DEEP-SEA BIODIVERSITY AND THE SOKHOBIO EXPEDITION TO THE SEA OF OKHOTSK IN 2015

Angelika Brandt[1], Marina Malyutina[2]

[1]Centrum für Naturkunde, Zoologisches Museum Hamburg, Universität Hamburg, Martin-Luther-King-Platz 3, 20146 Hamburg, Deutschland,

email: abrandt@uni-hamburg.de

[2]A.V. Zhirmunsky Institute of Marine Biology of the FEB RAS, Palchevskogo 17, Vladivostok, 690041, Far East Federal University, Oktiabrskaya Str. 29, Vladivostok, 690600,Russia

During the KuramBio expedition in 2012 we compared the biodiversity of the non-isolated abyssal plain of Kuril-Kamchatka Trench (KKT) area with the abyssal of the geographically 'relatively' isolated Sea of Japan. The abyssal KKT fauna was much more diverse than that of the Sea of Japan. As the Sea of Okhotsk is connected to both, the Sea of Japan and the KKT abyssal area, we hypothesize that we might find an intermediate state of biodiversity in the bathyal deep Kurile Basin of the Sea of Okhotsk which biogeographically links these two studied areas of the Northwest Pacific. Like the Sea of Japan the Sea of Okhotsk is also a marginal, semi-enclosed sea. Its Kurile Basin has a similar depth (3372 m) like the Japan Basin of the Sea of Japan, but it is less isolated, as it has deep-sea straits to the Pacific Ocean and the KKT area: the Bussol Strait (2318 m) and the Krusenstern Strait (1920 m).

We now have the opportunity to join the expedition SokhoBio (Sea of Okhotsk Biodiversity Studies) in 2015 with the Russian RV *A.K. Larentjev* to the Sea of Okhotsk. During SokhoBio we aim to test the following hypotheses:

Hypothesis 1: The Sea of Okhotsk is characterized by a higher number of species than the Sea of Japan, but lower species richness than the abyssal Northwest Pacific.

Hypothesis 2: The hadal depths of the Kuril-Kamchatka Trench will isolate species of the Sea of Okhotsk from species of the abyssal Northwest Pacific.

A test of these hypotheses will allow us to understand the biogeographic relationships of the KKT area (KuramBio expedition) with the Sea of Japan and Sea of Okhotsk.

THE IMPLICATIONS OF SEA ICE DECLINE ON OCEAN CIRCULATION IN GLOBAL COUPLED MODEL SIMULATIONS

Camila Campos[1], Tido Semmler[1], Thomas Jung[1]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Bussestr. 24, 27570 Bremerhaven, Deutschland,
email: ccampos@awi.de

Observations of Arctic sea ice over the last 30 years indicate a substantial retraction. In order to improve the understanding of both triggers and consequences of Arctic sea ice decline, the specific role of climate system components and their interactions must be better understood. To address the sole influence of sea ice decline on the ocean circulation this study presents results from the atmosphere-ocean-sea ice global coupled model ECHAM6 - FESOM. We compare three 150-year idealized sensitivity experiments, (I) reduced albedo (II) reduced lead closing parameter (III) added longwave, in which declining Arctic sea ice is simulated with a control run. Even though sea ice retraction differs between each experiment, patterns and magnitudes of changes in oceanic parameters establish comparably.

AKTIVITÄTSMUSTER HOCHALPINER UND ANTARKTISCHER BODENKRUSTEN - PHYSIOLOGISCHE SPEZIALISIERUNGEN ALS SCHLÜSSEL IM KAMPF UMS ÜBERLEBEN AN EXTREMSTANDORTEN

Claudia Colesie[1], Burkhard Büdel[1], Jose Raggio[2], Allan T.G. Green[2,3]

[1]Abteilung Pflanzenökologie und Systematik, FB Biologie, TU Kaiserslautern, Erwin Schrödinger Straße 13, 67663 Kaiserslautern, Deutschland, email: claudia.colesie@googlemail.com

[2]Departamento de Biologia Vegetal II, Universidad Complutense, 28040 Madrid, Spain

[3]Department of Biological Sciences, University of Waikato, Private Bag 3105, 3240 Hamilton, New Zealand

Biologische Bodenkrusten sind Vergesellschaftungen von poikilohydren Flechten, Moosen, Algen und Cyanobakterien, die an Standorten, wo vaskuläres Pflanzenwachstum physiologisch limitiert ist, bis zu 70% der offenliegenden Bodenoberfläche besiedeln. Solche Gebiete sind unter anderen auch polare und hochalpine Flächen, die durchaus ähnliche makroklimatische Charakteristika aufweisen, nämlich kalte Temperaturen und heftige Schneefälle im Winter. Obwohl sie geographisch weit voneinander entfernt liegen, beherbergen beide eine natürliche Bodenkruste, die sich allerdings in Ihrer Zusammensetzung zwischen den beiden Habitaten unterscheidet. Als mögliche Selektionsparameter dabei könnten die Dauer der Aktivitätsphase und spezielle Wassernutzungseigenschaften greifen, da sich beide Habitate bezüglich Ihrer Wasserverfügbarkeit unterscheiden. Vergleichende Studien zur in situ Wassernutzungseffizienz zwischen hochalpinen und antarktischen Bodenkrusten wurden bislang noch nicht durchgeführt. In der hier vorgestellten Studie möchten wir zum einen mögliche Wasserquellen für poikilohydre Organismen in diesen Habitaten beschreiben, zum anderen Aktivitätsmuster und damit verbundene Fixierungsraten charakterisieren. Dazu werden in situ Aktivitätsmuster jeweils während der Vegetationsperiode von antarktischen Bodenkrusten mit solchen aus hochalpinen Standorten verglichen. Während Bodenkrusten in der Kontinentalantarktis vornehmlich während und nach Schneefallereignissen aktiv sind, können am hochalpinen Standort am Großglockner zusätzlich Regen, Nebel, Tau und Bodenwasser als mögliche Wasserquellen genutzt werden. Somit sind die Organismen am hochalpinen Standort nahezu über den kompletten Untersuchungszeitraum aktiv, während in der Kontinentalantarktis nur an 10 Tagen in 2 Monaten eine Aktivität gemessen werden konnte. Offensichtlich bedingen spezielle Wassernutzungseigenschaften das Überleben am jeweiligen Standort. Eine Identifizierung und Beschreibung dieser Eigenschaften kann ein erster Schritt zum besseren Verständnis der Populationsdynamiken innerhalb biologischer Bodenkrusten sein und gleichzeitig physiologische Eingrenzungen offenbaren, die unter dem aktuellen Druck in Zuge des Klimawandels kritisch für das Überleben der Arten am Standort sein können.

COSMOPOLITAN, BIPOLAR OR ENDEMIC? – PHYLOGEOGRAPHY OF THREE PLANKTONIC POLAR COPEPODS

Astrid Cornils[1], Christoph Held[1]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Am Handelshafen 12, 27570 Bremerhaven, Deutschland,

email: astrid.cornils@awi.de

Small pelagic copepods (≤ 1 mm) play an important role in the trophic network as intermediators between the microbial loop and higher trophic levels in the Southern Ocean, and also the Arctic Ocean. Traditionally, many small-sized copepod species are considered to be widespread, bipolar or cosmopolitan. However, these large-scale distribution patterns need to be re-examined in view of increasing evidence of cryptic and pseudo-cryptic speciation in pelagic copepods. For the present study three abundant polar copepod species-groups with a circumglobal distribution, but with a different vertical distribution, were chosen (*Oithona similis* s.l. (epipelagic), *Microcalanus* spp. (mesopelagic), *Spinocalanus abyssalis/longicornis* (meso-bathypelagic)). Phylogeographic analyses were carried out based on various nuclear and mitochondrial markers (e.g. 18S, 28S, ITS1, COI) including samples from both polar regions, temperate and tropical regions. By performing a non-destructive DNA extraction that preserves the copepod exoskeleton we were able to carry out complementary morphological analyses on the same specimens used for sequencing. Results show that in epi- and mesopelagic species polar endemic cryptic or pseudo-cryptic species occur, while bathypelagic species may have a wider distribution.

SPÄTQUARTÄRE SEESYSTEME UND KLIMAENTWICKLUNG IN OSTSIBIRIEN

Bernhard Diekmann[1]

[1]Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar- und Meeresforschung, Telegrafenberg A43, 14473 Potsdam, Deutschland,

email: bernhard.diekmann@awi.de

Im Gesamtverständnis der spätquartären Klima- und Umweltgeschichte sind die ostsibirischen Periglazialräume noch unterrepräsentiert. Am Kältepol der Nordhemisphäre gelegen, reagiert diese Region der Extreme sensitiv auf Umweltschwankungen, wie die heutigen Änderungen der Permafrostdynamik und Geoökologie belegen. Im Rahmen des mehrjährigen russisch-deutschen SibLake-Programms werden fossile Ablagerungen aus verschiedenen Seesystemen Ostsibiriens untersucht, um die Umweltgeschichte der letzten 50-Tausend Jahre zu rekonstruieren. Die untersuchten Seen decken arktische und subarktische Standorte sowie den hochkontinentalen Raum Jakutiens bis zum maritim beeinflussten Gebiet der Kamtschatka-Halbinsel ab. Die Auswertung der Sedimente mit einem "Multi-Proxy"-Ansatz berücksichtigt sedimentologische, geochemische und mikropaläontologische Analysen. Die ältesten Seen des Untersuchungsgebietes befinden sich in ehemaligen proglazialen Becken im Werchojansker Gebirge und im Vorland des Stanovoy-Gebirges. Die sedimentäre Überlieferung deutet auf wiederholte Klimasprünge während der mittleren Weichsel-Eiszeit (50-30 ka v.h., russisch Karginsk) hin, wie sie in ähnlicher Weise in den Stadialen und Interstadialen der grönländischen Eiskerne dokumentiert sind. Das Spätweichsel (30 bis 15 ka v.h., russisch Sartan) war durch maximale Kälte und Trockenheit gekennzeichnet. Hochauflösende Aufzeichnungen der holozänen Klimavariabilität sind in den Sedimenten der weit verbreiteten Thermokarstseen Jakutiens und in jungen Seen auf der Halbinsel Kamtschatka überliefert. Sie dokumentieren ein regionales Klima-Optimum zwischen 7,0 und 4,5 ka v.h. Überlagert wird dieser langfristige klimatische Trend von kurzfristigeren Klimasprüngen auf hundertjährigen Zeitskalen, die sich insbesondere in zyklischen Schwankungen der Wasserführung zeigen. Verantwortlich dafür sind wahrscheinlich atmosphärische Schwingungsmuster, die auf interne Klimavariablität zurückzuführen sind. Zahlreiche Thermokarstseen zeigen allerdings Veränderungen in Reaktion auf komplexe Permafrostdynamik, die sich nur mittelbar als Klimasignale deuten lassen.

DER GROSSE KARAJAK-GLETSCHER IN WESTGRÖNLAND BEI DRYGALSKI IM JAHRE 1892 UND IN HEUTIGER ZEIT – EIN VERGLEICH

Reinhard Dietrich[1], Ralf Rosenau[1],

[1]TU Dresden, Eggerstorf 65, 23968 Zierow, Deutschland,
email: reinhard.dietrich@tu-dresden.de

Der Große Karajak-Gletscher im Umanak-Fjord in Westgrönland stand im Mittelpunkt der glaziologischen Arbeiten von Erich von Drygalski auf seiner Expedition im Jahre 1892/93. Das schließt unter anderem eine sehr präzise Kartierung des Gletschers und seiner Frontlage wie auch genaue Geschwindigkeitsmessungen in ausgewählten Profilen über den Gletscher ein. Für die letzten Jahrzehnte konnten signifikante Änderungen von Frontlagen und Geschwindigkeitsfeldern für eine Reihe von Gletschern in Westgrönland nachgewiesen werden. Über Zeiträume, die mehr als 50 Jahre zurückreichen, ist in dieser Hinsicht sehr wenig bekannt. Insbesondere unter Nutzung von Satellitendaten der Landsat-Mission können Vergleiche mit den Messungen von Drygalski angestellt werden, die einen Zeitraum von mehr als 100 Jahren abdecken. Diese Vergleiche bestätigen die Qualität der Messungen, die Drygalski seinerzeit durchführte. Im Ergebnis kann der Gletscher in seinem Langzeitverhalten beschrieben und in das Ensemble der anderen westgrönländischen Gletscher eingeordnet werden.

SPECIATION AND ADAPTATION IN ANTARCTIC SEA SPIDERS: ASSESSING THE RELATIVE IMPORTANCE OF GENETIC DRIFT AND SELECTION USING COMPARATIVE POPULATION GENOMIC AND MORPHOLOGICAL APPROACHES

Jana S. Dömel[1], Roland R. Melzer[2], Florian Leese[1]

[1]Lehrstuhl für Evolutionsökologie und Biodiversität der Tiere, Ruhr Universität Bochum, Universitätsstraße 150, 44801 Bochum, Deutschland, email: jana.doemel@rub.de

[2]Zoologische Staatssammlung München, Deutschland

Frequent *in situ* speciation events in the Southern Ocean benthos are often interpreted as examples of allopatric speciation. During glacial maxima in the Antarctic past ice sheet expansion possibly covering a majority of the continental shelf must have influenced that habitat drastically. Geographic isolation seems plausible, however alternative models such as ecological speciation have been largely neglected.

This study aims to determine the relative importance of random genetic drift and natural selection in speciation using two Southern Ocean sea spider species as test cases. Our previous studies detected that the nominal species *Colossendeis megalonyx* Hoek, 1881 and *Pallenopsis patagonica* (Hoek, 1881) actually consist of several genetically distinct clades and represent species flocks rather than single species. Another interesting research aspect of those sea spiders is that they can be found inside and outside of Antarctica.

By combining population genomic and morphological approaches, we aim at identifying evolutionary trajectories at genotype and phenotype level in order to understand the generation of the great biodiversity of this key group of Southern Ocean benthic taxa.

The first approach is to identify genetically distinct clades, especially those occurring in sympatry are of interest. The majority of samples of *Colossendeis megalonyx* have already been analyzed in previous studies. Currently samples of *Pallenopsis patagonica* are analyzed genetically using mitochondrial and nuclear markers (COI and ITS). Based on the known phylogenetic structure of each species flock, suitable candidates for genomic analyses can be selected. The aim of the analyses is to detect genomic regions under selection. Furthermore phenotypic variation between clades is investigated using morphological approaches (e.g., SEM and µct scans). Here we focus on characters that are indicative of ecological differentiation between clades (e.g., proboscis micromorphology, leg characteristics).

BIOGEOGRAPHIC ATLAS OF THE SOUTHERN OCEAN -- NEW INSIGHTS INTO ANTARCTIC AND SUB-ANTARCTIC SPONGE DIVERSITY AND DISTRIBUTION

Rachel Downey[1], Huw Griffiths[2], Dorte Janussen[1]

[1]Research Institute and Nature Museum Senckenberg, Senckenberganlage 25, 60325 Frankfurt am Main, Germany,
email: Rachel.downey@senckenberg.de

[1]British Antarctic Survey, Cambridge, UK

The new Biogeographic Atlas of the Southern Ocean significantly updates our knowledge and understanding of Antarctic and sub-Antarctic sponge biodiversity; as well as providing exact location information of these crucial habitat-forming species for conservation programmes. Within this Atlas, all Southern Ocean sponge ecological research is reviewed, key aspects of sponge biogeography are revised, and future sponge research directions are proposed.

The ecological importance of sponges in the Southern Ocean is re-examined, with new research indicating the significant role of sponges in providing permanent habitats, nurseries, and substrate for numerous marine organisms. Developments in Southern Ocean sponge taxonomy and systematics research are assessed. Highlights include the significant impact of recent Southern Ocean research expeditions on our understanding of sponge diversity. Major scientific initiatives and legacy projects (e.g. CAML, SCAR-MarBIN, and the TOTAL Foundation Southern Ocean Bioconstructor database) have enhanced biological data access and revolutionised our ability to visualise and analyse spatio-temporal patterns and processes in Southern Ocean sponge biogeography.

Utilising this new and more comprehensive biological database, the Southern Ocean sponge biogeographic region is re-assessed. New analyses re-define the boundaries of this distinct region and the level of connectivity, both within this region and with adjacent biogeographic regions, are explored. New sponge research findings discussed include a re-examination of the complex nature of circumpolar and eurybathic ranges in Southern Ocean sponges; an updated assessment of Southern Ocean sponge endemism and taxonomic diversity; and recognition that the Antarctic shelf, sub-Antarctic islands, and abyssal regions are all potential centres of sponge genera evolution and speciation in the Southern Ocean.

Future directions to enhance Southern Ocean sponge biogeographic research are discussed and include: increased taxonomic research effort, improved morphological investigation methods and increased utilisation of molecular techniques to enhance sponge systematics; additional research to better comprehend sponge reproduction and dispersal capabilities; and the development of research programmes that both improve sampling across all Southern Ocean regions and devise new methodological approaches to resolve specific biogeographic questions.

THE WEGAS / GEA IV GEOPHYSICAL SURVEY IN EASTERN AND SOUTHERN DRONNING MAUD LAND

Graeme Eagles[1] Antonia Ruppel[2], Daniel Steinhage[1], Wilfried Jokat[1], Andreas Läufer[2], Joachim Jacobs[3]

[1]Alfred Wegener Institut, Helmholtz Zentrum für Polar und Meeresforschung, Am Handelshafen 26, 27570 Bremerhaven, Deutschland,
email: geagles@awi.de

[2]BGR, Hannover, Deutschland

[3]Norwegian Polar Institute, Bergen, Norway

The Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI) and the Federal Institute for Geosciences and Natural Resources (BGR) collected around 150 hours of new gravity, magnetic and ice-penetrating radar data from east and south of Princess Elisabeth station in Dronning Maud Land between 2013 and 2015. Survey lines were spaced 10 km apart. The 2013/2014 and 2014/2015 used different gravimeters; a LaCoste and Romberg AirSea gravimeter (LCR) at constant barometric altitude and a Gravimetric Technologies GT2A gravimeter at constant ground separation. Both surveys used a Scintrex Cs-3 caesium vapour magnetometer mounted in a tail boom with compensation for the airframe calculated using a fuselage-mounted three-component fluxgate magnetometer. The GT2A gravity data reflect the effects of short-wavelength density contrasts between basement rocks and the ice sheet more reliably than the LCR data. Cross-over analysis suggests the repeatability of data collection with the GT2A lies at the sub-milliGal level. A broad subglacial channel that separates eastern Sør Rondane from the Yamato Belgica Mountains is evident in the gravity data. In the south of the survey region, the data reveal a dendritic pattern of subglacial valleys that converge towards the SW.

Strong NS-trending magnetic anomalies coincide with the Yamato-Belgica Mountains. Further west, subtler ESE-trending anomalies confirm proposals that the SE Dronning Maud Land province continues into the region south of eastern Sør Rondane. An unexpected feature of both data sets is the apparent termination of the anomaly patterns associated with the province at a NNW-trending anomaly running south of Princess Elisabeth.

PARTITIONING SMALL-SCALE NET ECOSYSTEM EXCHANGE FLUXES OF CARBON DIOXIDE AND METHANE IN A PERMAFROST LANDSCAPE

Tim Eckhardt[1] ,Christian Knoblauch[1], Lars Kutzbach[1], Eva-Maria Pfeiffer[1]

[1]Institute of Soil Science, Center for Earth System Research and Sustainability, Universität Hamburg, Allende-Platz 2, 20146 Hamburg, Germany,
email: Tim.Eckhardt@uni-hamburg.de

Warming of the Arctic will cause longer and deeper thawing of permafrost-affected soils. However, it still remains unclear if arctic warming will turn permafrost-affected landscapes from a sink to a source for atmospheric carbon in the future. To estimate the effect of arctic warming on the CO_2 and CH_4 fluxes it is essential to gain a quantitative understanding about the underlying processes of net ecosystem exchange (NEE) fluxes on different time scales. Furthermore, a better understanding of the environmental controls on these processes is needed to improve simulations of future developments. Therefore, chamber flux measurements of CO_2 and CH_4 have been made in summer 2014 in two polygonal tundra microsites in the Lena River Delta, Northern Siberia. One site is characterized by water-saturated soils, densely vegetated by vascular plants in the center of a polygon. The second site was situated at a dryer polygonal rim, with vegetation dominated by mosses. A combination of light and dark chamber measurements was used to separate NEE into photosynthesis and total ecosystem respiration. Additionally, to partition total ecosystem respiration into autotrophic and heterotrophic components, photosynthetically active biomass was removed from some sampling plots. Considerable differences in CO_2 and CH_4 fluxes between the microsites have been observed. CO_2 uptake and CH_4 emissions were sharply higher on the polygonal center than on the polygonal rim. The main environmental controls of CH_4 fluxes were hydrological conditions and soil temperature. Measurements on sampling plots where photosynthetically active biomass was removed showed high spatial variability: heterotrophic respiration has a higher proportion to total ecosystem respiration on the polygonal rim (>80%) than on the polygonal center (~40%), which might be explained by lower plant/root density on the polygonal rim.

NEOPROTEROZOISCHE BIS ORDOVIZISCHE SEDIMENTATION IM NÖRDLICHEN VICTORIA-LAND (ANTARKTIS) – ERGEBNISSE VON U-PB-DATIERUNGEN AN DETRITISCHEN ZIRKONEN

Solveig Estrada[1], Andreas Läufer[1], Katja Eckelmann[2], Mandy Hofmann[2], Andreas Gärtner[2], Ulf Linnemann[2]

[1]BGR, Stilleweg 2, 30655 Hannover, Deutschland, email: solveig.estrada@bgr.de

[2]Senckenberg Naturhistorische Sammlungen, Dresden, Deutschland

Die Ost-Antarktis bildete gemeinsam mit Australien das Herzstück zweier Superkontinente: Rodinia vor ca. 1000 Mill. Jahren und Gondwana vor ca. 500 Mill. Jahren. Mit dem Zerfall Rodinias öffnete sich der Paläo-Pazifische Ozean, und der angrenzende Küstenbereich von Ost-Gondwana (die kratonalen Bereiche der heutigen Ost-Antarktis und Australiens) wurde zum passiven Kontinentalrand. Nachdem im frühen Kambrium, evtl. schon am Ende des Neoproterozoikums, die ozeanische Platte unter den Kontinent abzutauchen begann, also subduziert wurde, entwickelte sich entlang des nun aktiven Kontinentalrandes ein Faltengebirgsgürtel ähnlich den heutigen Anden: das Ross-Orogen in der Antarktis und das Delamerische Orogen in Australien. Reste des Ross-Orogens finden wir heute im Transantarktischen Gebirge, so auch im nördlichen Victoria-Land. Das metamorphe Grundgebirge besteht hier aus drei litho-tektonischen Einheiten, traditionell als Terranes bezeichnet: das Wilson-Terrane (niedrig- bis hochgradig metamorphe Sedimentgesteine und Ross-orogene Granitoide), das Bowers-Terrane (niedriggradig metamorphe Inselbogen-Vulkanite und Sedimentgesteine) und das Robertson-Bay-Terrane (niedriggradig metamorphe Turbidite). Nach klassischen geotektonischen Modellvorstellungen (Kleinschmidt & Tessensohn 1987) wurden die Terranes im Zuge von Subduktionsvorgängen nacheinander an Ost-Gondwana angelagert.

Um Aussagen über Herkunft und Alter der metamorphen Sedimentgesteine von den drei Terranes zu erhalten, wurden aus diesen detritische Zirkone isoliert und ihr U-Pb-Alter mit Hilfe der LA-ICP-MS-Methode gemessen. Die Proben stammen aus der Priestley-Formation des Wilson-Terranes (4 Proben), der mit Inselbogen-Vulkaniten vergesellschafteten Molar-Formation des Bowers-Terranes (5 Proben), dem Millen-Schiefer im Grenzbereich von Bowers- und Robertson-Bay-Terrane (2 Proben) und der Robertson-Bay-Gruppe (3 Proben).

Alle Proben enthalten sehr ähnliche Zirkon-Altersspektren mit dominanten Gruppierungen um 550 bis 470 Mill. Jahren (aus dem Ross-Orogen; außer in der Priestley-Formation), 700 bis 550 Mill. Jahren ("Panafrikanische" Alter, möglicherweise aus magmatischer Aktivität während des Aufbruchs von Rodinia), 1300–900 Mill. Jahren ("Grenville"-Alter aus der Zeit der Rodinia-Bildung) und in geringerem Umfang Alter zwischen 3600 und 1600 Mill. Jahren (Zirkone, die von den archaisch-paläoproterozoischen Kraton-Bereichen stammen). Diese Ergebnisse sprechen für ein einheitliches Liefergebiet für alle untersuchten Sedimentgesteine aus dem Bereich der Ost-Antarktis.

Einen Hinweis auf das Maximalalter der Sedimentation liefern die jeweils jüngsten konkordanten Zirkonalter. Die Maximalalter in den Proben der Priestley-Formation variieren stark und sprechen für eine Ablagerung über einen langen Zeitraum im späten Neoproterozoikum. Bereits Ross-orogene Maximalalter wurden für die anderen Formationen ermittelt: 495 Mill. Jahre (spätes Kambrium) für die Molar-Formation und 485 Mill. Jahre (frühes Ordovizium) für den Millen-Schiefer und die Robertson-Bay-Gruppe.

Die Priestley-Formation wurde am passiven Kontinentalrand vor dem Einsetzen der Subduktion abgelagert und während der Ross-Orogenese von syn- bis postorogenen Graniten (\"Granite Harbour Intrusives\") intrudiert. Die Molar-Formation ist eine Turbiditfolge, die in einem Akkretions-Milieu am aktiven Kontinentalrand während und nach dem Andocken eines intra-ozeanisch gebildeten Inselbogens (Glasgow-Vulkanite) abgelagert wurde. Der Glasgow-Inselbogen entstand durch intra-ozeanische Subduktion und kollidierte während der fortdauernden Subduktion noch vor 495 Ma mit dem ostantarktischen Kontinent. Die Robertson-Bay-Turbidite wurden im frühen Ordovizium am äußersten aktiven Kontinentalrand im Bereich des Akkretionskeils abgelagert, in Übereinstimmung mit dem Modell von Roland et al. (2004).

A GOLDEN DECADE OF AEROGEOPHYSICAL RESEARCH HELPS UNVEIL THE ANTARCTIC CONTINENT

Fausto Ferraccioli[1]

[1]British Antarctic Survey, High Cross, Madingley Road, Cambridge CB3 0ET, UK,
email: ffe@bas.ac.uk

The Antarctic continent plays a pivotal role in the global Earth System. Not only do its blanketing ice sheets form a key component inthe global climate system (and are a key influence on past, present and future global sea-level rise) but also its geology is an integral part of the Gondwana, Rodinia and Columbia supercontinents.

While we have learnt a lot about the Antarctic continent from geological, geochemical and geochronological studies the meager exposures that portray the evolution of Antarctica provide only tantalising but still relatively difficult to decipher clues regarding the evolution of the continent's interior and its larger- scale geodynamic linkages. Additionally, when compared to other continents little is still known about the deeper crustal architecture of the continent.

A decade of extensive aerogeophysical research is however helping to transform our knowledge of Antarctica's crustal architecture and tectonic evolution, as shown by several case studies in the Gamburtsev Province, the Aurora and Wilkes basin in East Antarctica and the Amundsen, Bellingshausen and Weddell Sea embayment in West Antarctica.

Here I will review some of the results of these studies and also highlight some of the emerging questions that may provide a springbord for future interdisciplinary geological and geophysical research.

Aeromagnetic and satellite magnetic data combined with crustal thickness and lithospheric strength models derived from gravity now delineate a mosaic of Precambrian crustal provinces in interior East Antarctica. A major suture separates the Archean/Paleoproterozoic Ruker Province from an inferred Grenvillian-age(?) Gamburtsev Province. Suturing likely occurred during Rodinia assembly, perhaps followed by transpressional reactivation during Gondwana assembly. The basement architecture likely influenced the much later Permian to Cretaceous(?) East Antarctic Rift System, which is inferred to extend for 3,500 km from India to the South Pole, making it one of the largest narrow-mode paleorift systems on Earth. Rifting and intraplate strike-slip faulting may also have triggered Gamburtsev Mountains uplift, although the effects of other processes such as intraplate compression and dynamic topography as well as isostatic responses to erosion require further studies.

In Wilkes Land, aeromagnetic and gravity data compilations reveal the architecture of the Mawson Craton and the Antarctic counterpart of the Albany Fraser Orogen, including their overlying sedimentary basins. Aeromagnetic imaging of the Wilkes Subglacial Basin, suggest that its margins are controlled by major Precambrian and Paleozoic fault systems and that it is imposed on a Neoproterozoic rifted margin and Cambrian back-arc region. Magnetic anomaly

studies are expanding our knowledge of subglacial magmatic and tectonic patterns associated with the West Antarctic Rift System in the Amundsen and Bellingshausen Sea sectors. New constraints on the Jurassic Weddell Sea Rift and a composite Haag-Ellsworth-Whitmore microplate that flanks it are also emerging with significant implications for our understanding of the geological processes that heralded Gondwana break-up.

Overall, we are learning more and more about the fundamental geological processes responsible for the 4D evolution of the Antarctic continent, including subduction, accretion, continental rifting and intraplate mountain building and basin formation. Additionally, there are major ongoing strands of research focussed on trying to better constrain the influence of such geological processes on the spatial and temporal varions in basal conditions that are capable of influencing subglacial topography development, basal roughness and subglacial hydrology, and consequently ice flow dynamics, including in particualar trying to constrain one of the largest unknowns for Antarctica, geothermal heat flux variations- that also has implications for ongoing international efforts to seek for the oldest ice for drilling aimed at paleoclimate research.

TERRASAR-X AND TANDEM-X OBSERVATIONS OF THE RECOVERY GLACIER SYSTEM, ANTARCTICA

Dana Floricioiu[1], Michael Baessler[1], Wael Abdel Jaber[1]

[1]Deutsches Zentrum für Luft- und Raumfahrt (DLR), Institut für Methodik der Fernerkundung (IMF), Münchenerstr. 20, 82234 Wessling, Deutschland, email: dana.floricioiu@dlr.de

The Recovery Glacier system in Coates Land Antarctica is of considerable scientific interest because of its role in discharging East Antarctic ice to the sea and because it has been subsequently learned that the flow of the glacier is likely controlled by the presence of subglacial lakes near the onset of faster glacier flow. The area was completely imaged for the first time in 1997 during the Radarsat Antarctic Mapping Project. Starting in 2008 and continuing until late 2013 TerraSAR-X acquisitions covered the Recovery area in interferometric mode. These high resolution data were acquired in the left looking mode of the SAR instrument in order to extend the observations to high southerly latitudes. We compiled a high resolution velocity mosaic to investigate the rate of ice discharge into the Filchner Ice Shelf as well as the flow mechanisms of the main trunk and its tributaries. Our velocity map extends from the grounding zone upwards to areas of slower motion in the vicinity of the subglacial lakes.Surface elevations are measured from bistatic TanDEM-X data acquired in 2013 and 2014 during dedicated campaigns for Antarctica. We have processed bistatic interferometric TanDEM-X data into calibrated DEMs on selected regions of the Recovery glacier. The expected absolute vertical accuracy (90% linear point-to-point error) of the TanDEM-X DEMs is below 3 m, while their horizontal grid spacing of 0.2 arcsec in latitude and 1.0 arcsec in longitude (corresponding to distances of 6.2 m and 2.7 to 5.4 m, respectively). The interferometric elevations are compared to measurements of the Airborne Topographic Mapper (ATM) optical sensor during the Operation IceBridge in 2011 and 2012 in order to assess the penetration depth of the X-band signal in the ice. Other critical parameter needed for calculations of the ice sheet mass budget is the location of the transition where the ice resting on bedrock detaches and becomes a floating ice shelf. The InSAR double differencing method (DInSAR) has been identified to be one of the most accurate techniques for locating the vertical tidal deformation of the ice sheet. We will investigate the capabilities of the DInSAR method for mapping the tidal deformation using time series of TerraSAR-X Stripmap data acquired at the grounding line of Recovery and Slessor glaciers which are both feeding the Filchner Ice Shelf. Due to their location far in the interior of the ice sheet they may offer particular conditions compared to the coastal zones which have been more frequently imaged with other SAR sensors. With surface velocity, surface elevation and grounding line location we expect a comprehensive picture of the ice dynamics in the remote region of the Recovery glacier system.

FRIEDRICH BIDLINGMAIER (1875-1914), PHYSIKER DER DEUTSCHEN SÜDPOLAREXPEDITION 1901-1903

Diedrich Fritzsche[1], Conrad Kopsch[1]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Forschungsstelle Potsdam, Telegrafenberg A 43, 14473 Potsdam, Deutschland, email: Diedrich.Fritzsche@awi.de

Dr. Friedrich Bidlingmaier war der jüngste Wissenschaftler der unter der Leitung von Erich von Drygalski stehenden Deutschen Südpolarexpedition (1901-1903). Als Physiker der Expedition war er an Bord des Expeditionsschiffes „*Gauß*“ in erster Linie für das erdmagnetische Programm zuständig. Zur Vorbereitung auf diese Aufgabe kam Bidlingmaier nach seiner Promotion 1900 an das Potsdamer Observatorium für erdmagnetische Messungen. Bidlingmaier erwies sich als erstklassiger Theoretiker der zugleich in der Lage war, für bestimmte Aufgaben spezielle Instrumente zu entwickeln und unter den Expeditionsbedingungen auch anzufertigen. Bekanntestes Beispiel dafür ist der Doppelkompass, der Messungen auf bewegten Plattformen dient und 1903 im Antarktischen Packeis speziell für die Rückreise des „Gauß“ von Bidlingmaier konstruiert und gebaut wurde. Ein funktionstüchtiges Exemplar dieses später von den Askaniawerken Berlin in Serie gefertigten Instrumentes befindet sich noch heute im Geomagnetischen Observatorium Niemegk des Deutschen GeoForschungsZentrums Potsdam. Der Doppelkompass wurde mit Erfolg auch auf Zeppelinfahrten in der Arktis eingesetzt.

In den Jahren 1903 bis 1909 koordinierte Bidlingmaier die Gesamtauswertung der Expedition und bearbeitete seine eigenen magnetischen Beobachtungen. Sie füllen zusammen mit denen von Karl Lyken (Kerguelenstation) 2 Bände und einen Atlas der insgesamt 20 Bände und 2 Atlanten umfassenden Expeditionsergebnisse. Den Abschluss und die Herausgabe seiner Arbeiten mussten zum Teil Paul Nelle sowie Fritz und Julius Bartels übernehmen, da Friedrich Bidlingmaier im September 1914 in Avocourt (Argonnen) unweit Verdun schwer verwundet wurde und daran verstarb.

Eine Akte mit Briefen und Unterlagen zur Expeditionsauswertung hat sich in Potsdam erhalten. Sie wurde 2013 dem Archiv für deutsche Polarforschung in Bremerhaven übergeben. Der Vortrag stellt erstmals öffentlich darin enthaltene Dokumente aus der Arbeit Bidlingmaiers vor. Diese zeugen von seinen Ideen und Auswerteansätzen aber auch vom teilweise harten Widerstand etablierter älterer Kollegen.

ANDRILL – WISSENSCHAFTLICHES BOHREN IN DER ANTARKTIS: STAND UND AUSBLICK

Christoph Gaedicke[1,2]

[1]Bundesanstalt für Geowissenschaften und Rohstoffe, Stilleweg 2, 30655 Hannover, Deutschland,
email: christoph.gaedicke@bgr.de

[2]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, 27568 Bremerhaven, Deutschland

ANDRILL (Antarctic Geological Drilling Program) ist ein langfristig ausgelegtes internationales Forschungsprogramm, in seiner Struktur ähnlich organisiert wie IODP oder ICDP, unter bisheriger Federführung der National Science Foundation (NSF) der USA. ANDRILL untersucht die bedeutende Rolle der Antarktis bei den während der jüngeren Erdgeschichte.

BIOGENIC WEATHERING ALONG TEMPORAL GRADIENTS OF SOIL DEVELOPMENT INDUCED BY GLACIER RETREAT AT FILDES PENINSULA, KING GEORGE (MARITIME ANTARCTICA)

Roberto Godoy[1], Boy, J.[2], Shibistova, O.[2], Boy D.[2], Aguirre-Morales, M.[2], Mikutta, R.[2], Mc Culloch, R.[3], Guggenberger, G.[2]

[1]Universidad Austral de, Instituto de Ciencias Ambientales y Evolutivas, Isla Teja, Casilla 567, Valdivia, Chile,
email: rgodoy@uach.cl

[2]Institute of Soil Science, Leibniz Universität Hannover, Germany

Recent evidence points towards biogenic weathering, as a major contributor to weathering, thus turning weathering into an partly active process fueled by photosynthesis. This project aims to determine the contribution of biota to weathering processes during soil formation and organism succession along temporal gradients in soil development induced by glacier retreat at the Fildes Peninsula, King George Island, Maritime Antarctica. Selected unweathered minerals were introduced in situ at each developmental stage of the biogeosystem. After an exposure time of 1 and 2 years weathering rates of biota were be analyzed by confocal laser scanning microscopy and scanning electron microscopy and related to functional groups of organisms present, as well C and N content in soil. Results pointed towards an active and directed process, including nutrient selectiveness by weathering organisms in later successional stages. Bacterial weathering always was found an order of magnitude lower than fungal weathering Both groups of organisms rose constantly in their abundance along the phototrophic succession gradient. Biogenic weathering organisms in Antarctica seem not to use soil organic carbon stocks as a substrate, indicating an already established partitioning between recycling-oriented and weathering-oriented organisms.

Acknowledgements: INACH T-28-11, DFG BO 374/3-1.

WEST ANTARCTIC ICE SHEET RESPONSES TO OCEAN WARMING IN THE FILCHNER RONNE ICE SHELF REGION

Sebastian Goeller[1], Ralph Timmermann[1], Malte Thoma[1], Klaus Grosfeld[1]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar und Meeresforschung, Bussestraße 24, 27570 Bremerhaven, Deutschland,

email: Sebastian.Goeller@awi.de

The ice flow at the margins of the West Antarctic Ice Sheet (WAIS) is moderated by large ice shelves. Their buttressing effect substantially controls the mass balance of the WAIS and thus its contribution to sea level rise. The stability of these ice shelves results from the balance of mass gain by accumulation and ice flow from the adjacent ice sheet and from mass loss by calving and basal melting due to the ocean heat flux. Recent results of ocean circulation models indicate that warm circumpolar water of the Southern Ocean may override the submarine slope front of the Antarctic Continent and boost basal ice shelf melting. In particular, ocean simulations for several of the IPCC's future climate scenarios demonstrate the redirection of a warm coastal current into the Filchner Trough and underneath the Filchner-Ronne Ice Shelf (FRIS) within the next decades.

In this study, we couple the finite elements ocean circulation model FESOM and the three-dimensional thermomechanical ice flow model RIMBAY to investigate the sensitivity of the ice dynamics within the entire FRIS catchment to simulated future basal shelf melt rates. Our simulations indicate a high sensitivity of the ice dynamics for the Möller and the Institute Ice Stream but only very little response of other ice streams like Rutford, Foundation and Recovery Ice Stream to enhanced basal shelf melting. The grounding line between the Möller and Institute Ice Streams is located on a submarine ridge in front of a deep trough further inland. In this area, basal shelf melting causes a local thinning of the FRIS. The consequent initial retreat of the grounding line continues once it reaches the adjacent reverse-sloped bedrock. We state, that a possible 'point of no return' for a vast grounding line retreat along this steep reverse bedrock slope might have been crossed already even f

or simulated present-day melt rates, indicating that the WAIS is currently not in equilibrium. Furthermore, our simulations show an accelerated grounding line retreat in this sector of the FRIS as an answer to modeled future cavity warming scenarios leading to an additional mass loss of the WAIS.

FUTURE PLANS AND STRATEGY OF IODP AND OTHER OCEAN DRILLING IN ANTARCTICA AND THE ARCTIC

Karsten Gohl[1]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Am Alten Hafen 26, 27568 Bremerhaven, Deutschland,
email: karsten.gohl@awi.de

The International Ocean Discovery Program (IODP) states in its current IODP Science Plan for 2013-2023 that the polar regions are one of the primary target areas for scientific drilling using the drill vessels Joides Resolution and Chikyu as well as various drilling options in so-called Mission-Specific Platforms. In particular this is expressed in the Science Plan's Key Theme "Climate and Ocean Change" and its Challenge 1 "How does Earth's climate system respond to elevated levels of atmospheric CO_2" and Challenge 2 "How do ice sheets and sea level respond to a warming climate": The response of ice sheets to a warmer climate can be reconstructed from sedimentary records of relatively recent interglacial episodes when ice extent was similar, or slightly less than at present, and from much earlier times (34 - 3 Ma) when climate was several degrees warmer than today. Analysis of recently recovered ocean sediment cores suggests that, for instance, the West Antarctic Ice Sheet (WAIS), with a potential of 4 m sea level rise, is particularly sensitive to climate change and may have collapsed many times over the last 5 million years. Estimates of sea level rise during warm intervals about 3 million years ago suggest the possibility of even larger changes. The Greenland Ice Sheet and WAIS together account for only about 12 m of potential sea level, so estimates greater than 12 m imply a significant loss of ice from the much larger East Antarctic Ice Sheet, containing the equivalent of about 52 m of sea level. Some of the major questions to be urgently addressed are: Did large sections of the Greenland, West and East Antarctic Ice Sheets collapse the last time when atmospheric CO_2 levels reached 400 ppm? What are the time spans over which past ice sheet collapses occurred, and how much warming was required to push them past their "tipping points"? To answer these questions, sediment cores are needed from the Antarctic and Arctic shelves and slopes where sediment accumulates rapidly. This information is needed, along with land-based records, to constrain numerical ice sheet models that attempt to predict how ice sheets melt under warmer conditions. Drilling of continental rise and deep-sea sediments at sites close to past ice sheets will provide more direct information regarding regional ice melt history and the timing of ice advance and retreat. Ultimately, the combination of these ice-proximal and ice-distal data with modelling techniques can be used to work out the relative contributions of different ice sheets to past sea level change, providing more realistic scenarios for testing predictive models and a better understanding of ice sheet behaviour in climate change situations.

The general drilling strategy in IODP is to target locations ranging from polar seas to low-latitude upwelling zones to explain the behaviour of the climate system during past episodes of global warmth. This is well in line with the SCAR-PAIS approach to development of "ice-to-abyss" data transects, extending from the ice sheet interior to the deep sea in order to link ice

core, ice sheet-proximal, offshore, and far-field records of past ice sheet behaviour and sea level, yielding an unprecedented view of past changes in ice sheet geometry, volume, and ice sheet-ocean interactions.

About 16 drilling proposals for Antarctica and the Arctic Ocean, at various stages from pre-proposals to revised and mature full proposals, are currently in the IODP evaluation and implementation system. Some have been forwarded to the Facility Boards for scheduling, and two proposals are already scheduled for drilling. This presentation will give an overview of these proposals and their progress stages, also with regard to the future perspectives and challenges of IODP, and will discuss strategies that may help successful proposals to be considered for drilling.

SENSITIVITY OF SEA-ICE PRODUCTION OF LAPTEV SEA POLYNYAS TO THE REPRESENTATION OF SUBGRID-SCALE ENERGY FLUXES IN A REGIONAL CLIMATE MODEL

Oliver Gutjahr[1], Günther Heinemann[1]

[1]FB VI Umweltmeteorologie, Universität Trier, Behringstraße 21, 54286 Trier, Deutschland,
email: gutjahr@uni-trier.de

Sea-ice production is strongly depending on the energy budget of sea ice. In this case study we analyse and quantify the sensitivity of sea-ice production rates in the Laptev Sea to the representation of subgrid-scale energy and turbulent fluxes in the regional climate model COSMO-CLM. The calculation of the energy and turbulent fluxes differ with respect to the representation of subgrid-scale open water areas. In a reference run we neglect these subscale areas, and in two sensitivity runs we either assume them to be ice-free or covered with 1cm thin ice. COSMO-CLM is forced by ERA-Interim and downscaled in a double-nesting to a horizontal resolution of 5km. Sea-ice conditions are updated on a daily basis from AMSRE-E and PIOMAS data.

Preliminary results for January 2008 show that the surface temperatures within polynyas become 5-14°C (ice-free) and 4-12°C (1cm) warmer, if subgrid-scale energy fluxes are considered. A warmer surface causes stronger heat-loss via longwave radiation and, in particular, by sensible heat flux because of an intensified vertical temperature gradient. This strong release of heat causes a convective boundary layer to develop over polynyas and relatively warm air is transported up to ~600 km away from its source. As this heat-loss is compensated by formation of new ice, ice production increases by +48% (ice-free) and +30% (1cm) compared to the reference run. Furthermore, not only heat but also moisture is released to the atmosphere causing an intensification of the development of low clouds.

PATTERN OF CRYOSPHERIC SEISMIC EVENTS OBSERVED AT EKSTRÖM ICE SHELF, ANTARCTICA

Conny Hammer[1], Matthias Ohrnberger[2], Vera Schlindwein[3]

[1]Schweizerischer Erdbebendienst, ETH Zürich
Sonneggstrasse 5, 8092 Zürich, Schweiz,
email: conny.hammer@sed.ethz.ch
[2]Universität Potsdam, Deutschland
[3]AWI Bremerhaven, Deutschland

Mobility of glaciers such as rapid retreat or disintegration of large ice volumes produces a large variety of different seismic signals. Thus, evaluating cryospheric seismic events (e.g. changes of their occurrence in space and time) allows to monitor glacier dynamics. We analyze a one year data span recorded at the Neumayer seismic network in Antarctica. Events are automatically recognized using hidden Markov models. In this study we focused on a specific event type occurring close to the grounding line of the Ekström Ice Shelf. Observed waveform characteristics are consistent with an initial fracturing followed by the resonance of a water filled cavity resulting in a so-called hybrid event. The number of events detected strongly correlates with dominant tide periods. We assume the cracking to be driven by existing glacier stresses trough bending. Voids are then filled by sea water, exciting the observed resonance. In agreement with this model, events occur almost exclusively during rising tides where cavities are opened at the bottom of the glacier, i.e. at the sea/ice interface.

IS THE PREDATORY AMPHIPOD *THEMISTO GAUDICHAUDII* POISED TO DISPLACE KRILL IN THE WARMING REGION OF THE SOUTHERN OCEAN?

Charlotte Havermans[1]

[1]Universität Bremen, Marine Ecology (BreMarE), Marine Zoology Leobener Str. im NW2, 28359 Bremen, Deutschland,

email: Charlotte.Havermans@awi.de

The swarm-forming, predatory amphipod *Themisto gaudichaudii* is a so far neglected, but key component of Southern Ocean pelagic ecosystems. Its distribution extends from waters around the Antarctic continent to as far north as the sub-Tropical front and hence, encompasses a large environmental gradient with temperature differences of almost 20°C. Also called “krill of the North”, it forms - similar to krill - the mainstay of several food webs on which many top consumers rely, several of which being commercially exploited. *T. gaudichaudii* is believed to be an opportunistic and voracious predator, controlling several groups of mesozooplankton. Its abundance is predicted to significantly increase southwards in the warming SW Atlantic sector of the Southern Ocean. Distributional and ecological shifts have already been reported for this region between two pelagic players, Antarctic krill and salps, explained by bottom-up processes such as alterations in phytoplankton blooms and sea ice extent. However, the importance of cascading top-down effects, such as predation, remain largely unexplored due to a lack of knowledge on the interactions between Themisto, salps and krill. In this study, the invading potential of *T. gaudichaudii* will be tackled by evaluating its genetic connectivity and its potential to outcompete the cold-adapted Antarctic krill. Phylogeographic results will be presented, together with future research directions on how to better understand the genetic and trophic connectivity of this key pelagic player and likely climate-change winner in the Southern Ocean.

AIRCRAFT MEASUREMENTS OF SEA ICE/OCEAN /ATMOSPHERE INTERACTIONS DURING THE EXPERIMENT LEAST NEAR SVALBARD

Günther Heinemann[1], Clemens Drüe[1], Andreas Preußer[1], Irina Govorina[2]

[1]Umweltmeteorologie, Universität Trier, Behringstraße 21, 54286 Trier, Deutschland,

email: heinemann@uni-trier.de

[2]Institute for Arctic and Antarctic research (AARI), Sankt Petersburg, Russia

In March 2014, we conducted the aircraft-based experiment LEAST (Lead and ABL Study in the Transpolar System) around Svalbard. The investigations comprised studies of atmosphere/sea-ice/ocean exchange processes over the Storfjorden polynya and in the marginal ice zone north of Svalbard, detailed studies over large leads and high-resolution thermal mapping for verification of remote sensing algorithms. LEAST is mainly based on measurements with the research aircraft POLAR 5 of Alfred Wegener Institute (AWI, Bremerhaven, Germany). Besides navigational and basic meteorological instrumentation, the aircraft was equipped with radiation and surface temperature sensors, two laser altimeters, a thermal infrared scanner, a laser scanner, a dropsonde system, and video and digital cameras. In order to determine turbulent heat and momentum fluxes, POLAR 5 was instrumented with a turbulence measurement system collecting data on a nose boom with a sampling rate of 100 Hz.

Apart from one calibration flight and one IR scanner test flight, a total of six research flights have been performed, three of them were boundary layer flights. Because of an unusual warm winter in the Svalbard region (temperatures 15K above normal conditions in February 2014) a huge zone of open water extended north of Svalbard. We probed the ABL in this zone during off-ice flow with dropsondes in two cases. Due to the long fetch, the height of the internal thermal boundary layer was as high as 1000m. The ABL over the Storfjorden polynya was studied by a series of low-level legs and profile by the aircraft. The ABL flights were combined with studies of leads. The lead studies were flown in order to investigate single large leads. High-resolution infrared scans (3m) and visible scans (1m) were obtained for an area of about 15km x 15km, the boundary layer over the leads was studied by low-level aircraft legs. Air and surface temperatures were quite low (down to -40°C), and intensive atmosphere/ocean interaction was observed. Low-level flights over leads showed warm plumes extending about 2km downstream of the lead.

The data of LEAST are valuable for the verification of satellite remote sensing algorithms for the quantification of sea ice production and lead detection as well as for the validation of numerical models in simulations of the ABL.

THE SCOTIA ARC: HIGHWAY FOR STEPPING-STONE DISPERSAL OF SHALLOW-WATER FAUNA BETWEEN PATAGONIA AND THE ANTARCTIC?

Christoph Held[1], Shobhit Agrawal[1] und Florian Leese[1,2]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Am Handelshafen 26, 27570 Bremerhaven, Deutschland,
email: Christoph.Held@awi.de
[2]Universität Duisburg-Essen, Deutschland

The shallow-water fauna in the Southern Ocean is very distinct from that of lower latitudes with on average 50% of the species being endemic, i.e. not occurring anywhere else. Of the three continental landmasses (S.-America, Africa, Australia) outside the Southern Ocean, South America has the highest proportion of species shared with the Antarctic and it is commonly assumed that this circumstance is caused by (1) South America departing more recently from Gondwana than Africa and Australia and (2) the islands of the Scotia Arc providing intermediary shallow-water habitats permitting opportunities for faunal exchange in a stepping-stone fashion.

Here, we provide molecular evidence from *Glyptonotus sp.*, a giant Antarctic crustacean, collected from Rothera in the South all along the hypothesized Scotia Arc dispersal pathway up until South Georgia in the North and test predictions of the stepping stone dispersal hypothesis in a statistical framework. Our results indicate that the stepping-stone hypothesis is an oversimplified view and that the evolutionary past of Glyptonotus and likely other shallow-water fauna can be reconstructed as a complex mixture of small and large-scale dispersal events at various temporal scales.

IS A WARMING OF THE ANTARCTIC CONTINENTAL SHELF REVERSIBLE?

Hartmut Hellmer[1], Frank Kauker[1], Ralph Timmermann[1]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Sektion Physikalische Ozeanographie der Polarmeere, Bussestraße 24, 27570 Bremerhaven, Deutschland,

email: Hartmut.Hellmer@awi.de

Antarctic ice sheet mass loss and thus part of global sea-level rise is related to enhanced ice stream discharge to the fringing ice shelves. The transfer of ice into the ocean occurs via iceberg calving and ice shelf basal melting. For decades the balance of both terms was assumed to be in favor of the calving, but recent results, based on remote sensing, revealed that basal melting seems to be at least of similar importance. A recent model study indicates that future atmospheric conditions in the southern Weddell Sea may switch the continental shelf, formerly dominated by the formation of cold saline waters, to one influenced by warm open ocean waters with consequences for the basal mass flux and ice shelf/ice sheet dynamics. Here, we continue the simulations showing a warming of the Filchner-Ronne Ice Shelf cavity, applying 20th-century atmospheric and basal mass flux forcing at different future points in time. Our numerical study indicates that once the system reaches the 'warm phase', a positive meltwater feedback stabilizes the shelf circulation such that only a reduction to 20th century basal mass flux can stop warm water from penetrating onto the continental shelf and into the sub-ice cavity. This has implications for the future of the Antarctic Ice Sheet, since a major decrease of basal melting only can be achieved by a significant disintegration of the floating portion of the ice sheet.

PALEOENVIRONMENTAL EVOLUTION OF POTTER PENINSULA DURING THE HOLOCENE, KING GEORGE ISLAND, SOUTH SHETLAND ISLANDS

Pablo Heredia Barion[1], Jorge Strelin[2], Gerhard Kuhn[3]

[1]Centro de Investigaciones en Ciencias de la Tierra (CICTERRA)-Univesidad Nacional de Córdoba (UNC), Av. Vélez Sársfield 1611, Ciudad Universitaria, X5016GCA Cordoba, Argentina,

email: pablo.heredia@awi.de

[2]Instituto Antártico Argentino (IAA)-Centro de Investigaciones en Ciencias de la Tierra (CICTERRA), Cordoba, Argentina

[3]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Bremerhaven, Deutschland

The first Holocene marine transgression reached the inner fiords of King George Island approximately at 9.5 ka BP according to Sugden and John (1973). This age marks today the minimum age of the end of the last glacial period obtained on land and the start of the Holocene in this Antarctic sector. Following the first Holocene marine transgression, Watcham et al. (2011) reconstructed a relative sea level curve for the South Shetland Islands with a relative sea level rise of 15.5 m amsl for Fildes Peninsula between 8 and 7 ka BP. The curve shows that a delay occurred in the isostatic uplift after 7.2 ka BP related to a glacier still-stand resulting in a relative sea level rise. This is followed by a drop of the relative sea level after 7 ka BP due to the rate of glacial unloading and isostatic rebound exceeding the rate of eustatic sea level rise. The aim of this presentation is to show new evidence, which will help to understand the post-glacial paleoenvironmental changes on King George Island. Our chrono-stratigraphical and geomorphological studies in Potter Peninsula suggest, that the Holocene post-glacial marine transgression was not just initiated before 7.7 ka BP but also reached 14 m amsl, and was locally interrupted by a glacier advance after 7.3 ka BP. This glacier advance can be correlated to Watcham´s et al (2011) curve, showing a drop of relative sea level between 7.2 and 7 ka BP. In conclusion, we consider that a glacier readvance took place between 7.2 and 7 ka BP in the Southern sector of King George Island. Additionally our findings show that the age of 9.5 ka BP as a minimum age of the onset of the Holocene transgression in the South Shetland Islands has to be reconsidered.

References

Sugden, D. and John, B., 1973. The age of glacier fluctuations in the South Shetland Islands,Antarctica. In: van Zinderen Bakker, E.M. (Ed.), Palaeoecology of Africa, the Surrounding Islands, and Antarctica. A.A. Balkema, 139-159 p., Cape Town.

Watcham, E. P., Bentley, M. J., Hodgson, D. A., Roberts, S. J., Fretwell, P. T., Lloyd, J. M., Larter, R. D., Whitehouse, P. L., Leng, M. J., Monien, P. and Moreton, S. G., 2011. A new Holocene relative sea level curve for the South Shetland Islands, Antarctica. Quaternary Science Reviews 30, 3152–3170.

ANTARCTIC MUMIYO - FROZEN SEA FOOD ON ROCKS TRACES GLACIAL AND CLIMATIC CHANGES IN DRONNING MAUD LAND (DML) SINCE 40.000 YEARS

Wolf-Dieter Hermichen[1]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Deutschland, now retired,
email: wolf-dieter.hermichen@awi.de

Als „Antarktisches Mumiyo“ wird gefrier-getrocknetes Magenöl von Schneesturmvögeln (SSV) bezeichnet, das die Vögel aus Bruthöhlen gegen Rivalen spritzen. Tausende Schneestumvögel leben und brüten gegenwärtig im Südsommer in den Gebirgen des DML - in Küstenentfernungen von 200km und mehr. Schneesturmvögel ernähren sich von marinen Kleinkrebsen. Im Laufe von Jahrtausenden können vor den Bruthöhlen mehrere Dezimeter dicke Mumiyo-Akkumulationen entstehen. Auf mehreren deutschen geowissenschaftlichen Expeditionen sind in den 1990er Jahren 25 Mumiyo-Blöcke geborgen und das 14C-Alter ihrer Basisschicht ermittelt worden. Zusätzliche Datierungen der Oberflächenschicht belegen, dass Mumiyo-Vorkommen im DML/Wohlthatmassiv, die oberhalb des spätpleistozänen maximalen Eisrand-Niveaus liegen, den Zeitbereich von ca. 40.000 BP bis rezent überdecken und damit als natürliche Archive für Untersuchungen der vermutlich klimagesteuerten Dynamik der SSV-Population und ihrer Diät geeignet sind.

STATUS DER BEANTRAGTEN SOUVERÄNITÄTSANSPRÜCHE AUF ERWEITERUNG DES FESTLANDSOCKELS IN ANTARKTISCHEN SEEGEBIETEN JENSEITS VON 200 SEEMEILEN

Karl Hinz[1]

[1]c/o Verwaltungsunion GmbH, Podbielskistraße 74, 30177 Hannover, Deutschland,
email: geohinzhannover@aol.com

Siebenundsiebzig Souveränitätsansprüche (Submissions) von Küstenstaaten auf Erweiterung des Festlandsockels jenseits von 200 Seemeilen sind bisher bei der Kommission zur Begrenzung des Festlandsockels der Vereinten Nationen eingereicht worden. Davon entfallen zehn Submissions auf antarktische Seegebiete.

Für die antarktischen Seegebiete sind zwei Vertragswerke zuständig: (1) Das Internationale Seerechtsübereinkommen (Convention on the Law of the Sea) von 1982, das eine Rechtsordnung für die Meere und Ozeane schafft und die Grenzen des Festlandsockels definiert über den der Küstenstaat souveräne Rechte ausführt und (2) der Antarktisvertrag (Antarctic Treaty System ATS) von 1959, der für alle Land- und Eisflächen südlich vom 60. Breitengrad südlicher Breite gilt. Das ATS, das die Basis für friedliche Zusammenarbeit bildet und den Schutz und Erhalt der polaren Umwelt fördert gilt nicht für die antarktischen Inseln um den 60. südlichen Breitengrad, da diese eine eigene politische Zugehörigkeit haben.

Von den ersten zwölf Unterzeichnerstaaten des ATS haben acht Staaten Gebietsansprüche erhoben, und von diesen acht Staaten haben drei Staaten (Australien, Argentinien und Norwegen) unter Berufung auf Artikel 76 des Internationalen Seerechtübereinkommens Gebietsansprüche jenseits von 200 Seemeilen gestellt. Obwohl die Festlandsockelbegrenzungskommission auf absehbare Zeit keine Bewertung dieser drei Anträge vornehmen wird, werden offene wissenschaftliche Interpretationen die Delineation des Festlandsockels betreffend in diesem Beitrag angesprochen.

Von den verbleibenden sieben Souveränitätsansprüchen auf antarktische Seegebiete, die eigene politische Zugehörigkeiten haben, betreffen drei Proclaims Inseln, die mittelozeanischen Rücken aufsitzen. Nämlich, (1) die Bouvet Insel (Norwegen), die auf dem südlichsten Teil des Mittelatlantischen Rückens liegt, (2) die Saint Paul und Amsterdam Inseln (Frankreich), die auf dem Südost Indischen Rücken liegen, und (3) das iim Gebiet des Südwest Indischen Rückens gelegene Crozet Archipel und die Prince Edward Inseln (Frankreich gemeinsam mit Südafrika).

Bei Souveränitätsansprüchen in Seegebieten jenseits von 200 M sind Ausnahmeregeln für die unterseeischen Rücken zu beachten: Artikel 76 des Internationalen Seerechtübereikommens unterscheidet drei Kategorien von unterseeischen Rücken: Für den Tiefseeboden mit seinen Unterseeischen Rücken (Oceanic ridges of the deep ocean floor) gilt 200 Seemeilen von der Basislinie äls maximale äüßere Grenze. Für die Kategorie Unterseeischer Bergrücken (Submarine ridges) darf die äußere Grenze des Festlandsockels 350 M nicht überschreiten. Für die Kategorie Unterseeische Erhebungen (Submarine elevations) gelten als maximale

Begrenzung bis zu 100 M von der 2500 m Isobathe und/oder 350 M von der Basislinien. Obwohl die relevanten Staaten das südliche Ende des Mittelatlantischen Rückens mit der Bouvet Insel , den Südost Indischen Rücken mit den Inseln Saint Peter und Amsterdam und den Südwest Indischen Rücken mit dem Crozet Archipel und den Prince Edward Inseln als Submarine Erhebung (Submarine elevation) im Sinne des Seerechtsübereinkommens eingestuft haben, wäre nach jetzigem Wissensstand eine konservative Klassifizierung als “oceanic ridge of the deep ocean floor“ d.h. eine Beschränkung auf 200 M konform mit Artikel 76 des Seerechtsübereinkommens.

Angesprochen werden auch die Submission von Frankreich für das Nord Kerguelen Plateau mit dem Kerguelen Archipel, und die Submissionen von Australien für die Gebiete des Macquarie Rückens und dem geologisch komplexen Kerguelen Plateau mit den sehr jungen vulkanischen Inseln Heard und McDonald. Diese drei Submissionen sind bereits von der dritten Festlandsockelbegrenzungskommission evaluiert worden. Schwer nachvollziehbar bleibt, warum die dritte Festlandsockelbegrenzungskommission die von Australien beantragte Festlandsockelerweiterung von 1,185,038 km² jenseits von 200 M im Gebiet des Kerguelen Plateaus akzeptiert und damit einen Präzedenzfall geschaffen hat. Die Frage, wer kontrolliert die Festlandsockelbegrenzungskommission wird auch angesprochen.

SATELLITENGEODÄTISCHE BEOBACHTUNG UND QUANTIFIZIERUNG VON EISSCHILD-ÄNDERUNGEN: ERFOLGE UND HERAUSFORDERUNGEN

Martin Horwath[1], Mirko Scheinert[1], Lutz Eberlein[1], Andreas Groh[1], Christoph Knöfel[1], Ralf Rosenau[1], Ludwig Schröder[1]

[1]TU Dresden, Institut für Planetare Geodäsie, Helmholtzstr. 10, 01062 Dresden, Deutschland, email: martin.horwath@tu-dresden.de

Satellitengeodätische Messungen liefern Informationen über Änderungsprozesse von Eisschilden und deren Massenbilanz-Effekt, die durch glaziologische Modellierung derzeit nicht erbracht werden können. Satellitenaltimetrie-Missionen beobachten Änderungen der Eisoberflächenhöhen und erlauben Rückschlüsse auf Eismassenänderungen. Die Satellitengravimetrie-Mission GRACE (Gravity Recovery and Climate Experiment) beobachtet Änderungen des Gravitationsfeldes und damit mittelbar Eismassenänderungen. Satellitenfernerkundung (optisch und Radar) beobachtet Eis-Fließgeschwindigkeiten und deren zeitliche Änderungen, die im Zusammenhang mit Schnee-Akkumulationsdaten wiederum Massenbilanz-Schätzungen zulassen.

Diese drei Grundansätze sind in den letzten Jahren zu einer akzeptablen Übereinstimmung ihrer Ergebnisse gekommen, weisen aber ihre spezifischen Schwächen. So ist zum Beispiel die gegenwärtige Massenbilanz des Ostantarktischen Eisschilds immer noch selbst im Vorzeichen ungewiss. Insbesondere wirken sich kleine systematische Fehler oder geophysikalische Störeffekte in ihrem Gesamteffekt über die Größe des Antarktischen Eisschilds empfindlich auf Massenbilanzschätzungen aus. Eine Kombination der Ansätze verspricht eine Überwindung der Schwächen der jeweiligen Einzelverfahren, bietet jedoch zusätzliche Herausforderungen. Feldarbeiten, wie z.B. GPS-Messungen auf der Eisoberfläche und auf Fels, können helfen, Satellitenverfahren zu kalibrieren und die Natur von Änderungsprozessen weiter einzugrenzen.

Der Vortrag stellt den Entwicklungsstand der geodätischen Beobachtung und Quantifizierung von Eisschild-Änderungsprozessen vor, illustriert durch Beispiele aus den Forschungsarbeiten des Instituts für Planetare Geodäsie der TU Dresden. Er diskutiert die entscheidenden Herausforderungen gibt einen Ausblick auf mögliche zukünftige Entwicklungen.

PAGE21: A LARGE-SCALE INTERNATIONAL AND INTEGRATED PROJECT TO MEASURE THE IMPACT OF PERMAFROST DEGRADATION ON THE CLIMATE SYSTEM

Hans-Wolfgang Hubberten[1], J. Boike[1], H. Lantuit[1], L.-K. Viitanen [1]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Forschungsstelle Potsdam, Telegrafenberg A 43, 14473 Potsdam, Deutschland, email: hans-wolfgang.hubberten@awi.de

Project Objectives

The key objectives of PAGE21 are:

- to improve our understanding of the processes affecting the size of the arctic permafrost carbon and nitrogen pools through detailed field studies and monitoring, in order to quantify their size and their vulnerability to climate change,
- to produce, assemble and assess high-quality datasets in order to develop and evaluate representations of permafrost and related processes in global models,
- to improve these models accordingly,
- to use these models to reduce the uncertainties in feedbacks from arctic permafrost to global change, thereby providing the means to assess the feasibility of stabilization scenarios, and
- to ensure widespread dissemination of our results in order to provide direct input into the ongoing debate on climate-change mitigation.

Methodology

The concept of PAGE21 is to directly address these questions through a close interaction between monitoring activities, process studies and modeling on the pertinent temporal and spatial scales. Field sites have been selected to cover a wide range of environmental conditions for the validation of large scale models, the development of permafrost monitoring capabilities, the study of permafrost processes, and for overlap with existing monitoring programs. PAGE21 will contribute to upgrading the project sites with the objective of providing a measurement baseline, both for process studies and for modeling programs. PAGE21 is determined to break down the traditional barriers in permafrost sciences between observational and model-supported site studies and large-scale climate modeling. Our concept for the interaction between site-scale studies and large-scale modeling is to establish and maintain a direct link between these two areas for developing and evaluating, on all spatial scales, the land-surface modules of leading European global climate models taking part in the Coupled Model Intercomparison Project Phase 5 (CMIP5), designed to inform the IPCC process.

Expected Results

The PAGE21 is designed to leave a legacy that will endure beyond the lifetime of the projections that it produces. This legacy will comprise

- an improved understanding of the key processes and parameters that determine the vulnerability of arctic permafrost to climate change,
- the production of a suite of major European coupled climate models including detailed and validated representations of permafrost-related processes, that will reduce uncertainties in future climate projections produced well beyond the lifetime of PAGE21, and
- the training of a new generation of permafrost scientists who will bridge the long-standing gap between permafrost field science and global climate modeling, for the long-term benefit of science and society.

EVIDENCE FOR INCREASED BASAL ICE-SHELF MELTING IN THE WEDDELL SEA FROM OCEANIC NOBLE-GAS OBSERVATIONS, 1990-2013

Oliver Huhn[1], Monika Rhein[1], Michael Schröder[2]

[1]Institut für Umweltphysik (IUP), Universität Bremen, 28359 Bremen, Deutschland,

email: ohuhn@uni-bremen.de

[2]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, 27568 Bremerhaven, Deutschland

We use oceanic noble-gas observations from the Weddell Sea from the period 1990 to 2013 to infer basal ice-shelf melting and the spatial distribution and temporal variability of the melt water input into the ocean. This helium and neon data were used to compute glacial melt water fractions and their contribution to Antarctic Bottom Water formation, a substantial water mass in the global ocean and important driver of the Meridional Overturning Circulation.

Oceanic measurement of low-solubility and stable noble-gases helium and neon provide a useful tool to quantify glacial melt water. Atmospheric air with a constant composition of these noble gases is trapped in the ice matrix during formation of the meteoric ice. Due to the enhanced hydrostatic pressure at the base of the floating ice, these gases are completely dissolved, when the ice is melting from below. This leads to an substantial excess of helium and neon in pure glacial melt water.

From that 23 year long time series of noble-gas observations we find an increasing trend in helium, neon, and, hence, in the glacial melt water content in the deep Weddell Sea. Melt water fractions along a repeated section in the north-western Weddell Sea are almost doubling from 1990 to 2013, indicating substantial increase of glacial melting in the Weddell Sea.

A MULTIVARIATE BENTHIC REGIONALIZATION OF THE WEDDELL SEA

Kerstin Jerosch[1], Frauke Scharf[1], Hendrik Pehlke[1]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Sektion Funktionale Ökologie, Am Handelshafen 12, 27570 Bremerhaven, Deutschland,

email: kerstin.jerosch@awi.de

This poster aims to model spatially benthos influencing physical environmental parameters such as bathymetry, geomorphology, current speed, nutrients, sediments, particulate organic carbon, biogenic silica and other environmental parameters, that mimic the geochemical situation as proxies combining in situ measurements, experiments and multivariate models. The resulting provinces will indicate areas of defined oxygen and carbon fluxes and are also needed to quantify potential species occurrence and biomass. The spatial distribution and the dimensions of the Southern Ocean provinces will support the understanding and the quantification of global geochemical cycles.

HOLOCENE VEGETATION AND CLIMATE HISTORY OF SOUTH GEORGIA, REVEALED BY LIPID BIOMARKERS

Sandra Jivcov[1], Sonja Berg[1], Finn Viehberg[1], Janet Rethemeyer[1], Martin Melles[1]

[1]Universität Köln, Institut für Geologie und Mineralogie , Zülpicher Straße 49a, 50674 Köln, Deutschland,
email: sjivcov@uni-koeln.de

To date the environmental history of South Georgia has been reconstructed on the basis of lake sediments (e.g. Rosqvist et al. 2003), terrestrial and marine geomorphological observations (e.g. Bentley et al. 2007, Hodgson et al. 2014) and peat records (e.g. van der Putten et al. 2009). All this data suggests a postglacial ice retreat in the early Holocene. The mid- to late Holocene paleoenvironmental reconstructions, in contrast, show a more diverse picture, potentially as a result of local effects. The results presented here complement the picture of the postglacial environmental evolution of South Georgia. We analysed lipid biomarker in a 11 m long sedimentary record that was recovered in a marine inlet of Cumberland West Bay and spans the entire Holocene. Coring was conducted during the ANT XXIX/4 expedition of RV „Polarstern“ in spring 2013. The biomarker stratigraphy of the sedimentary record, and comparison with lipid biomarkers extracted from plants collected in the catchment of the inlet, reveals important features of the vegetation history, productivity and source organisms as well as sedimentary processes. The extracted biomarkers include a wide range of n-alkanes (C15-C35) and n-alcohols (C16-C28) with a dominance of high molecular weight (HMW) compounds. These HMW compounds typically derive from land plants (grasses and mosses). Their abundance in the marine sediments provides information on vegetation coverage of the catchment and sedimentary input into the inlet. Low molecular weight (LMW) compounds like C17 n-alkanes and C16 n-alcohols, in contrast, smostly derive from aquatic organisms. These compounds, found in varying concentrations in the sediments, reflect variations in marine productivity through time. The results obtained provide an important link between paleoenvironmental reconstructions derived from marine and terrestrial archives in this region.

SATELLITE OBSERVATION OF THE CRYOSPHERE - THE POTENTIAL OF L-BAND SATELLITE MISSIONS

Lars Kaleschke[1]

[1]Institut für Meereskunde, Universität Hamburg, Bundesstraße 53, 20146 Hamburg, Deutschland, email: lars.kaleschke@uni-hamburg.de

The launch of the European Space Agency's (ESA) Soil Moisture and Ocean Salinity (SMOS) in November 2009 marked a new era of satellite radiometry for studies of the Earth\'s cryosphere. The SMOS payload is the Microwave Imaging Radiometer using Aperture Synthesis (MIRAS) measuring for the first time globally the L-band (wavelengths about 21~cm) brightness temperature at a range of incidence angles and at different polarizations. SMOS was followed by the NASA L-band missions Aquarius (2011) and SMAP (2015). Electromagnetic radiation at L-band emerge from deep inside the ice. The attenuation varies for the different components of the cryosphere and depends on the temperature and electrical conductivity of the media. The penetration depth of the electromagnetic waves range from about a meter for frozen soil and sea ice to the order of kilometers for cold pure ice. The availability of the new kind of observational data offers the potential for various new applications for the observation of sea ice, land ice, ice shelves and the frozen soil.

SMALL, BUT POWERFUL - BENTHIC DIATOMS IN POLAR WATERS

Ulf Karsten[1], Iris Schaub[1], Carolin Schlie[1]

[1]Institut für Biowissenschaften, Universität Rostock, Albert-Einstein-Straße 3, 18059 Rostock, Deutschland,
email: ulf.karsten@uni-rostock.de

Polar shallow water regions exhibit high abundances of unicellular benthic diatoms, forming a community known as microphytobenthos. Microphytobenthic biofilms cover extensive sediment areas. They are responsible for high rates of primary production and the stabilization of sediment surfaces against erodibility under hydrodynamic forces, and affect the exchange of oxygen and nutrients across the sediment-water interface. This phototrophic community represents a key component in the functioning of many trophic webs in the polar regions, particularly as a major food source for benthic suspension- or deposit-feeders.

Microphytobenthos in Antarctica and the Arctic is confronted with pronounced seasonal variations of solar radiation, low temperatures, hyposaline (meltwater) conditions in summer, as well as long periods of ice and snow cover in winter. From the few data available, it seems that these organisms can easily cope with such environmental extremes. The underlying physiological mechanisms will be addressed in this contribution, with an emphasis on recent climate change scenarios.

DFG-SCHWERPUNKTPROGRAMM 1158: ANTARKTISFORSCHUNG MIT VERGLEICHENDEN UNTERSUCHUNGEN IN ARKTISCHEN EISGEBIETEN

Ulf Karsten[1], Julia Regnery[1], Martin Melles[2]

[1]Universität Rostock, Institut für Biowissenschaften, Lehrstuhl für Angewandte Ökologie und Phykologie, Koordination SPP Antarktisforschung, Albert-Einstein-Str. 3, 18059 Rostock, Deutschland email: ulf.karsten@uni-rostock.de

[2]Universität Köln, Institut für Geologie und Mineralogie, Deutschland

Die Antarktis spielt eine besondere Rolle im Klimasystem der Erde, da sie durch ihre physikalischen und chemischen Eigenschaften die globale atmosphärische und ozeanische Zirkulation beeinflusst.

Seit 1981 besteht in Deutschland eine koordinierte Förderung der Antarktisforschung durch die Deutsche Forschungsgemeinschaft (DFG). Das DFG-Schwerpunktprogramm „Antarktisforschung“ ist seit Anbeginn multidisziplinär angelegt und kommt deutschen Polarforschern, vor allem an Universitäten, zu Gute. Über das Schwerpunktprogramm werden sowohl die für die Forschung benötigten Finanzmittel zur Verfügung gestellt als auch der Rahmen für eine koordinierte interdisziplinäre Forschung und deren internationale Einbindung bereitet.

Ein tiefgreifendes Verständnis der Rolle der Polargebiete im System Erde kann nur mit einer koordinierten Forschung aller naturwissenschaftlichen Disziplinen erlangt werden. Dieses soll insbesondere durch die vier übergreifenden, interdisziplinären Themen "Development of the Continent", "Gateways to Lower Latitudes", "Dynamics of Climate System Components" und "Response to Environmental Change" erreicht werden.

Due to its special physical and chemical properties, Antarctica plays a major role in the climate system of the earth and influences the global atmospheric and oceanic circulation.

Since 1981 the German Research Foundation (DFG) provides the funds required for a coordinated research programme. The DFG-Priority Programme 1158 on Antarctic research with comparative investigations in Arctic ice areas is a multi-disciplinary approach dedicated to polar researchers, especially from German universities. It provides the funds required for the research and furthermore defines the frame for the coordinated interdisciplinary research and its international integration.

The understanding of the roles that the polar regions play in the Earth system can only be fully attained with multi-disciplinary coordinated research. This shall be achieved by focusing on four overarching, interdisciplinary major research topics: "Development of the Continent", "Gateways to Lower Latitudes", "Dynamics of Climate System Components", and "Response to Environmental Change“.

INFLUENCE OF ICE THICKNESS AND SURFACE PROPERTIES ON LIGHT TRANSMISSION THROUGH ARCTIC SEA ICE

Christian Katlein[1], Stefanie Arndt[1], Marcel Nicolaus[1], Donald K. Perovich[2], Michael V. Jakuba[3], Stefano Suman[3], Stephen Elliott[3], Louis L. Whitcomb[3,4], Christopher J. McFarland[4], Rüdiger Gerdes[1], Antje Boetius[1,5], Christopher R. German[3]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Meereisphysik, Bussestr. 27-29, 27570 Bremerhaven, Deutschland,

email: ckatlein@awi.de

[2]Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, USA

[3]Woods Hole Oceanographic Institution, Woods Hole, Massachusetts, USA

[4]Johns Hopkins University, Baltimore, Maryland, USA

[5]Max Planck Institute for Marine Microbiology, Bremen, Germany

The changes in physical properties of sea ice such as decreased thickness and increased melt pond cover observed over the last decades severely impact the energy budget of Arctic sea ice. Increased light transmission leads to increased deposition of solar energy in the upper ocean and thus plays a crucial role in the amount and timing of sea-ice-melt and under-ice primary production. Recent developments in underwater technology provide new opportunities to undertake challenging research at the largely inaccessible underside of sea ice. We measured spectral under-ice radiance and irradiance onboard the new Nereid Under-Ice (NUI) underwater robotic vehicle, during a cruise of the R/V *Polarstern* to 83°N 6°W in the Arctic Ocean in July 2014. NUI is a next generation hybrid remotely operated vehicle (H-ROV) designed for both remotely-piloted and autonomous surveys underneath land-fast and moving sea ice. Here we present results from one of the first comprehensive scientific dives of NUI employing its interdisciplinary sensor suite. We combine under-ice optical measurements with three-dimensional under-ice topography and aerial images of the surface conditions. We investigate the influence of spatially varying ice-thickness and surface properties during summer on the spatial variability of light transmittance. Results show that surface properties dominate the spatial distribution of the under-ice light field on small scales.

SUBGLAZIALES SCHMELZEN AM GETZ GLETSCHER – DER BEITRAG GEOTHERMISCHER MESSUNGEN

Norbert Kaul[1], Karsten Gohl[2]

[1]FB Geowissenschaften, Universität Bremen, Klagenfurter Str., 28359 Bremen, Deutschland, email: nkaul@uni-bremen.de

[2]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Am Alten Hafen 26, 27568 Bremerhaven, Deutschland

Auf der Polarsternreise ANT XXVI/3 ins Amundsen Meer gelang es, eine große Anzahl von CTD Messungen in Verbindung mit geothermischen Wärmestrommessungen durchzuführen. Hier soll ein recht spektakuläres Detailergebnis von Messungen im Wrigley Golf vor dem Getz Gletscher der West Antarktis vorgestellt werden.

Temperaturmessungen in der Wassersäule beobachten einen Momentanwert des Zustandes, Temperaturgradientenmessungen im Untergrund zeigen zusätzliche eine Historie der jüngeren Vergangenheit. Im Wrigley Golf beobachten wir das Überschwappen des „warmen“ Zirkumantarktischen Tiefenwassers in die küstennahe Depression und gewinnen einen Eindruck von der Dynamik des Prozesses. Eine Abschätzung der Energiebilanz aus geothermisch zugeführter Wärme und advektiv mit dem Meerwasser herein transportierter Energie kann daraus versucht werden. Insbesondere die Zeitkonstanten dieses Einfließens von wärmerem Wasser sind dabei überraschend.

ARE SEDIMENTS IN LAKES AT NOVOLAZAREVSKAYA STATION RETAINING EARLIER HUMAN IMPACT?

Enn Kaup[1], Genki I. Matsumoto [2], Bhupesh Sharma [3]

[1]Institute of Geology, Tallinn University of Technology, Ehitajate tee 5, 19086 Tallinn, Estland, email: Enn.Kaup@ttu.ee

[2]Otsuma Women's University, Japan

[3]Shriram Institute for Industrial Research, India

Upper (down to 30 cm) sediment samples were taken from several lakes in March 2009 and analyzed for total nitrogen (TN), total organic carbon (TOC) and hydrocarbons. Increase of TOC was observed in upper 3 cm sediments of two lakes but these were not confirmed as the results of eutrophication. In Lake Stancionnoye sediments showed remarkable diesel oil pollution. These data are presented and discussed.

CHARACTERIZATION OF CM-SCALE VARIATIONS OF CRYSTAL ORIENTATION FABRIC IN COLD ALPINE ICE CORE FROM COLLE GNIFETTI

Johanna Kerch[1], Olaf Eisen[2,3], Ilka Weikusat[2,4], Pascal Bohleber[1,6], Nicole Spaulding[6], Tobias Erhardt[5], Johannes Freitag[2], Dietmar Wagenbach[1,†]

[1]Institute for Environmental Physics, Heidelberg University, Im Neuenheimer Feld 229,
69120 Heidelberg, Germany,
email: jkerch@iup.uni-heidelberg.de

[2]Alfred-Wegener-Institute Helmholtz-Zentrum for Polar and Marine Research, Bremerhaven, Germany

[3]Department of Geosciences, Bremen University, Germany

[4]Department of Geosciences, Tübingen University, Germany

[5]Oeschger Center for Climate Change Research and Institute for Climate and Environmental Physics, University of Bern, Switzerland

[6]Climate Change Institute, University of Maine, Orono, USA

Crystal orientation fabric – i.e. the spatial distribution of crystal c-axes in a defined depth interval – and its evolution with depth contain information on deformation processes in the ice column. Recent pilot studies on Alpine and polar ice indicate that fabric evolution provides more information than just on deformation if examined on the sub-meter scale, where the interaction between climate-related impurities and fabric evolution, i.e. their mutual influence, comes into focus and needs to be investigated. We studied crystal orientation fabric from an Alpine ice core from Colle Gnifetti (4450 m asl, Monte Rosa, Switzerland), a small glacier saddle with low net accumulation which is uniquely suited as a test site for studies under polar conditions. We calculated orientation tensor eigenvalues as measure for fabric strength in cm-resolution for several depth ranges of about 1 m between the firn-ice-transition and bed rock of the 73 m long ice core drilled in 2013. We found significant variations of fabric strength occurring within only 10 cm in all assessed depth ranges, revealing a complex anisotropic ice structure. In order to understand the mechanisms that lead to the observed short-scale variability we evaluated impurity data in cm-resolution from continuous flow analysis of the ice core. As a new approach we collected sub-mm impurity data from several features of the ice microstructure, where fabric changes occur, by means of a new laser ablation-inductively coupled plasma-mass spectrometry technique to explore the direct comparison of sub-mm impurity data and ice microstructure.

DIVERSITY OF THE SPONGE COMMUNITIES IN THE BRANSFIELD STRAIT, THE DRAKE PASSAGE AND THE WEDDELL SEA, ANTARCTICA

Daniel Kersken[1], Dorte Janussen[1]

[1]Forschungsinstitut und Naturmuseum Senckenberg, Senckenberganlage 25, 60325 Frankfurt am Main, Deutschland,

email: dorte.janussen@senckenberg.de

Effects of Global warming are observed in the Antarctic particularly at the Antarctic Peninsula, and caused in 1995 and 2002 the collaps of the Larsen AB ice shelves. The ecological impact of this event are monitored by multidisciplinary scientific teams during several consecutive expeditions (2007, 2011. 2013, so far) and compared with reference areas in the Weddell Sea (PS 96, 2015/16, upcoming). All sponge classes occur in the Southern Ocean and sponge communities on the Antarctic continental shelf currently represent the most extensive sponge grounds in the world, and. From the PS81 (2003) expedition, we collected and compare sponge communities around the Antarctic Peninsula. The studied material from 25 AGT catches was collected in three large-scale areas in the vicinity of the Antarctic Peninsula: Bransfield Strait, Drake Passage and Weddell Sea. Within this study common sponge species were described taxonomically and a community analysis conducted. Our study revealed five significantly different sponge communities dominated by species of the following genera: Haliclona/Rossella (C1), Iophon/Tetilla (C2), Tedania/Iophon (C3), Anoxycalyx (C4) and Rossella/Isodictya (C5). Community composition was driven rather by spatial scales and occurrence of character species than by abiotic factors. Sea ice coverage was the main abiotic factor distinctly shaping sponge communities, probably due to iceberg-scouring. Results of this study are of crucial importance for development, performance and assessment of future protection strategies in case of ongoing climate-induced environmental changes.

THE GROUNDING-ZONE WEDGE INVENTORY ON THE AMUNDSEN SEA EMBAYMENT SHELF, WEST ANTARCTICA: FORMATION PROCESSES AND SIGNIFICANCE FOR ESTABLISHING RELIABLE POST-LGM RETREAT CHRONOLOGIES

Johann Philipp Klages[1], Kuhn, G.[1], Hillenbrand, C.-D.[2], Smith, J.A.[2], Graham, A.G.C.,[2,3], Gohl, K.[1], Wacker, L.[4]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Am Handelshafen 26, 27570 Bremerhaven, Deutschland,
email: Johann.Klages@awi.de

[2]British Antarctic Survey, Cambridge, UK

[3]University of Exeter, UK

[4]ETH Zürich, Schweiz

Grounding-zone wedges have been mapped on many of the formerly glaciated continental shelves around Antarctica. These wedges record periods of grounding-line stillstand during general ice-sheet retreat following the Last Glacial Maximum (~26-19 ka BP; kiloyears before present). The presence of grounding-zone wedges along the axis of a palaeo-ice stream trough therefore indicates a style of episodic grounding-line retreat during the migration from its initial position at the LGM to its modern position. However, precise chronological constraints for both the onset and duration of these stillstands are still lacking. Consequently, the role of grounding-zone wedge formation in modulating post-LGM ice-sheet retreat, and therefore ice sheet stability cannot be reliably quantified. Additionally, this information is also vital for calculating reliable retreat rates during the past, which are essential for evaluating and understanding the significance of modern, locally very high retreat rates. Here we present the currently known inventory of grounding-zone wedges on the Amundsen Sea Embayment shelf. We will discuss formation processes and possible relations between grounding-zone wedges in neighbouring palaeo-ice stream troughs that are separated by an inter-ice stream ridge. Furthermore, we will present our approach on how i) to reliably date the onset of stabilization periods, and ii) to constrain their actual duration. This knowledge will help refine available post-LGM retreat chronologies, which, in turn, serve as a basis for validating and improving ice-sheet models.

REGULATION OF METHANE PRODUCTION, OXIDATION AND EMISSION BY VASCULAR PLANTS AND BRYOPHYTES IN PONDS OF THE NORTHEAST SIBERIAN POLYGONAL TUNDRA

Christian Knoblauch[1], Oliver Spott[2], Svetlana Evgrafova[3], Lars Kutzbach[1], Eva-Maria Pfeiffer[1]

[1]Institute of Soil Science, Center for Earth System Research and Sustainability, Universität Hamburg, , Germany,

email: Christian.Knoblauch@uni-hamburg.de

[2]Institute of Geography, Faculty of Physics and Earth Science, Leipzig University, Germany

[3]Sukachev Institute of Forest, Siberian Branch of the Russian Academy of Science Krasnoyarsk

Methane production, oxidation and emission were studied in ponds of the permafrost-affected polygonal tundra in northeast Siberia. Microbial degradation of organic matter in water-saturated soils is the most important source for the climate relevant trace gas methane. Although ponds and lakes cover a substantial fraction of the land surface in northern Siberia, currently no data on methane fluxes from these water bodies are available. Methane fluxes were measured with closed chambers during one summer season at the margins of ponds vegetated by vascular plants and in their centers without vascular plants. Furthermore, methane and oxygen concentration gradients, stable carbon isotope signatures of dissolved and emitted methane as well as microbial methane production and methane oxidation were determined. Mean summer methane fluxes were significantly higher at the margins of the ponds (45.1 ± 7.0 mg CH4 m^{-2} d^{-1}) than at the centers (6.8 ± 3.4 mg CH4 m^{-2} d^{-1}), and plant-mediated transport accounted for 70 to 90 % of total methane fluxes above emerged vegetation. In the absence of vascular plants, up to 99% of the methane produced in the anoxic bottom soil was consumed in a layer of the submerged moss *Scorpidium scorpioides*, which covered the bottoms of the ponds. The fraction of methane oxidized was lower at sites with vascular plants since methane was predominantly transported through the plant tissue, thereby bypassing the methane oxidation zone in the moss layer. These results emphasize the importance of moss-associated methane oxidation causing low methane fluxes from the studied Siberian ponds.

MESSUNGEN DER ATMOSPHÄRISCHEN GRENZSCHICHT DER ARKTIS MIT EINEM DOPPLER WIND LIDAR

Svenja Kohnemann[1], Günther Heinemann[1]

[1]Umweltmeteorologie, Universität Trier, Behringstraße 21, 54286 Trier, Deutschland,
email: kohnemann@uni-trier.de

Die Simulation der atmosphärischen Grenzschicht in der Arktis ist eine große Herausforderung für numerische Wettervorhersage- und Klimamodelle. Referenzdaten sind selten, vor allem über dem Ozean und Meereis. Im Rahmen des Projekts TRANSDRIFT wurden während der Polarsternfahrt ARKXXVIII/II im Juni und Juli 2014 vertikale Profile und Querschnitte des Windes (3D und Turbulenz) sowie von Aerosol in der Fram-Straße mit Hilfe eines Doppler Wind-LIDARs gemessen. In dieser Region ist der Wind von besonderem Interesse, da er hier den windinduzierten Meereisexport der Arktis mit steuert.

Das ‚Halo-Photonics Streamline' Wind LIDAR ist ein Scanner und kann mit einer Reichweite von bis zu 10km messen. Das Messprinzip basiert auf der Reflektion eines Lasers an Wolken- und Aerosolpartikeln. Es benutzt eine Wellenlänge von 1.5µm und eine Pulsrate von 20kHz. Es wurde während der Polarsternfahrt ARKXXVIII/II zum ersten Mal auf einem Schiff in der Arktis betrieben und mit Radiosondenmessungen verglichen. Erste Ergebnisse zeigen, dass Wolken und Grenzschichthöhe gut wiedergegeben werden. Windgeschwindigkeiten und Windrichtungen sind realistisch und bieten somit gute Verifikationsmöglichkeiten für atmosphärische Modelle.

SEARCH FOR VOLCANIC SIGNATURES OF THE TOBA SUPER-ERUPTION RECORDED IN EDML CORE (ANTARCTICA)

Mika Kohno[1], S. Kipfstuhl[2], K. Krüger[3], G.Wörner[1]

[1]Geowissenschaftliches Zentrum, Georg-August-Universität Göttingen, Goldschmidtstr. 1, 37033 Göttingen, Deutschland,

email: mkohno@uni-goettingen.de

[2]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Bremerhaven, Deutschland

[3]Department of Geosciences, University of Oslo, Norway

Sulfuric acid aerosols formed by the volcanic SO2 in the stratosphere transport to the polar region. The aerosols released by the volcanic eruption in the equatorial region can be preserved in both polar ice sheets. They disperse solar radiation and lead a significant cooling effect on global climate. The latest super-eruption of Toba Caldera in Indonesia (2°45' N, 98°45' E) is the largest volcanic event in the Quaternary period. The eruption yielded 2800 km3 of magma (the Youngest Toba Tuff: YTT) and covered an area up to 20,000 km2. Radiometric ages (40Ar/39Ar) of the YTT are determined to be 73.88 ± 0.32 ka (1σ) and 75.0 ± 0.9 ka (1σ) by using sanidine (Storey et al., 2012) and biotite (Mark et al., 2013). At a layer of 74-76 ka B.P. between ice cores from EDML in Antarctica and NGRIP in Greenland, 9 common signals of SO42- are found. However, no evidence is reported from field study that the YTT eruption intermittently occurred during this period. A large caldera that created by a super-eruption is generally formed by the roof of a magma chamber collapsed, erupting enormous magma at once. These suggest that one of the 9 signals is likely due to the YTT eruption.Of the nine signals, we determined sulfur isotopes of high 3 signals to ascertain a transportation process from the source volcano to Antarctica. Only the highest signal contained the anomalous sulfur isotope that is created during photochemical oxidation by the UV light in the stratosphere. This indicates SO2 related to the signal was released into the stratosphere by an explosive eruption of an equatorial volcano and transported to Antarctica. So far, this signal is the most likely to originate from the YTT eruption. However, we furher need to verify the presence of the Toba signal on the basis of searching for volcanic glass shards in the 9 signals. An amount of the H2SO4 aerosols that was glaciologically estimated for the 9 signals (120-1660 Mt H2SO4) exceeds that of 1815 eruption of Tambora in Indonesia (109 Mt H2SO4) which lowered surface temperature up to 0.7 °C and triggered famine and starvation. Possible temperature decrease is estimated to be 0.9-3.8 °C based on the relationship between global temperature decrease and the global H2SO4 loading following the historic major eruptions.

NEW MEGAGRANT LABORATORIES IN RUSSIA MAKE IMPORTANT CONTRIBUTIONS TO POLAR RESEARCH

Klaus Peter Koltermann[1], Jörn Thiede[2],

[1]Natural Risk Assessment Laboratory NRAL, Faculty of Geography, Lomonossov Moscow State University, Leninskye Goy 1, GSP-1, Moscow 119991, Russia, email: peter.koltermann@gmail.com

[2]Köppen Laboratory, Institute of Earth Sciences, Saint Petersburg State University, V. O. Sredniy pr. 41, Saint Petersburg 199178, Russia

In 2010 the Russian Federal Government started a megagrant program to provide major funding to the universities, for the first time in many years. Many of the projects were lead by foreign scientists; they resulted in vast improvements of the scientific infractrures and research profiles of the universities involved. Two of the granted projects are of particular relevance for polar research:

The new Natural Risk Assessment Laboratory NRAL (www.nral.org) concentrated until 2014 on the identification, description, quantification and risk probabilities of natural hazards in the coastal areas of Arctic NW Russia. In addition risks have been investigated in the context of their causal frameworks and their long-term variability. Beside extreme events like flooding, precipitation, droughts, storms the occurrence/probabilities of avalanches and land slides have been studied. In the next project phase the studies will concentrate around the applications of the gained insights with the goal to define special dangers and risks in the Russian Arctic, in particular in relation to the ongoing and expected climate change. The applied aspects of these studies concentrate upon the long-term impact of these phenomena on economic planning and the usage of these regions. NRAL has contributed substantially to improve interdisciplinary research in Russia and the close cooperation between the university and other government entities.

SPbSU funded based on its own means the renovation of modern laboratory space in the building of the Faculty of Geography and Geoecology on Srednyi pr. V. O. in St. Petersburg (now part of the Institute of Earth Sciences), while the grant itself was used for 3 purposes:

1) to found a new laboratory (now renamed to be the Köppen Laboratory; cf. http://geolab.spbu.ru/about-our-laboratory/) “Palaeogeography and geomorphology of Polar Countries and the World Ocean“, with the specific tasks of publishing Geomorphologic Atlases of Antarctica (Russian version 2012, English version 2013) and Geomorphologic maps of the Arctic (in progress), of organizing international conferences (2012 and 2013);

2) to improve the geochronologic facilities of the faculty with the aim to establish a first rate dating laboratory of international standards (hopefully to upgraded to a national facility in the near future); a substantial number of new instruments have been acquired through the megagrant which are now installed in the renovated rooms;

3) to expand multidisciplinary marine research with funding for a substantial number of junior Russian scientists and students. A particular interesting part of the field work conducted under the umbrella of the Köppen-Laboratory aims at identifying the history of the Lena River in Eastern Siberia, which with its important fresh water drainage into the Arctic Ocean has an enormous impact on the fate of the Arctic sea ice cover.

VEGETATION UND VEGETATIONSDYNAMIK AUF DEM ZUGSPITZPLATT (BAYERISCHE ALPEN) - NATUR- UND KULTURLANDSCHAFT IM HOCHALPINEN RAUM ALS PRODUKT NATÜRLICHER, ANTHROPOGENER UND ZOOGENER EINFLÜSSE

O. Korch[1], Arne Friedmann[1]

[1]Institut für Geographie, Universität Augsburg, Alter Postweg 118, 86159 Augsburg, Deutschland,
email: oliver.korch@geo.uni-augsburg.de

Seit 2009 erforscht die Arbeitsgruppe Biogeographie der Universität Augsburg im Rahmen der vom Bayerischen Staatsministerium für Umwelt und Verbraucherschutz (bis 2014 Staatsministerium für Umwelt und Gesundheit) finanzierten Forschungsvorhaben KLIMAGRAD sowie KLIMAGRAD II die Flora, Vegetation und Vegetationsdynamik auf dem Zugspitzplatt. Hierbei wurden bisher eine detaillierte Vegetationskarte des Untersuchungsgebiets erstellt, vergangene Schwankungen der Krummholzgrenze rekonstruiert, geländeklimatologische Parameter erfasst sowie ein langfristiges Monitoring der Vegetation auf Dauerbeobachtungsflächen initiiert.

Die bisherigen Ergebnisse zeichnen das Bild des weitgehenden Vorherrschens einer artenreichen, heterogenen Kulturlandschaft, die jedoch in stark unterschiedlichem Maße anthropogen bzw. anthropo-zoogen überprägt ist. Während manche Pflanzengesellschaften direkt an das Vorhandensein dieser Einflussgrößen gebunden sind, werden andere dadurch lediglich mit lokal stark wechselnder Intensität beeinflusst. Ungestörte bzw. naturnahe Standorte sind dagegen auf die unwegsamsten Bereiche beschränkt.

Unter den natürlichen Einflussfaktoren sind das stark reliefierte Gelände und die dadurch bedingten vielfältigen kleinklimatischen Einflüsse sowie die mechanische Belastung als Ergebnis geomorphologischer Prozesse prägend für die Verteilung von Arten bzw. Pflanzengesellschaften. Das bisherige Monitoring liefert hinsichtlich der Auswirkungen eines sich seit Jahrzehnten wandelnden Klimas auf die Verbreitung und Zusammensetzung der Plattvegetation erste Indizien, die jedoch erst künftig zu statistisch belastbaren Aussagen zusammengefasst werden können.

THE SOILS OF ARGENTINE ISLANDS: DIVERSITY OF ORGANIC MATTER ON THE EDGE OF LIFE

Iryna Kozeretska[1], Parnikoza I.[2], Abakumov E.[3], Shvydun P.[1], Korsun S.[4]

[1]Taras Shevchenko National University of Kyiv, Str. Vladimirska 60, 01601, Kyiv, Ukraine,

email: iryna.kozeretska@gmail.com

[2]Institute of Molecular Biology and Genetics of National Academy of Sciences of Ukraine, Ukraine

[3]Saint-Petersburg State University, Saint-Petersburg, Russia

[4]National Scientific Centre "Institute of Agriculture of NAAS", Ukraine

The study of soil cover on the Argentine Islands as the central part of the maritime Antarctic has a number of outstanding issues. The local diversity and classification of soils appear to be one of the main questions. On this basis, in the season of 2013/14, we have collected 20 soil samples in different ecological and topographical conditions of the Galindez Island.

The main specificity of soil in the region is the low depth of friable gravel textured soil profile. In general, the thickness of the weathering debris on the Argentine Islands is relatively low. Weathering products and organic material can be concentrated only in a relatively superficial cracks and crevices on the slopes and tops of the Islands ridges. At the same time, the vegetation and soil development on lowlands are blocked by snow even during the essential part of astral summer. In contrast to the oases of King George Island, there are no differentiated catena formation of soils and vegetation in the direction: the edge of the ocean - glacier. Meanwhile, there is a gradient appears, which mainly depends on the slope and the exposure position above the summer snow.

Taking into account the specificity of the Argentine Islands, primary stage of the pedogenesis performed by the formation of rocky soil humus Leptosols (soils with poorly differentiated profile with total thickness of profile less than 10 cm) on the slopes and tops of rocky ridges. This soil type is most common on the Galindez Island.

In the locations of the additional input of organic matter from more developed vegetation and bird's guano, more developed soils – Lithosols can form. Those of it that are formed under the guano layers post-ornithogenic Lithosols. At the same time on the area of Deschampsia antarctica Desv. spread Histic and Humic Lithosols are formed. Their thickness reaches 19 cm with base rock above the level of permafrost occurrence. The upper border of permafrost is located at the average depth of about 30 cm. Humus accumulation occurs in the local Lithosols in form of single organic horizon. Depending on the content of the organic substance these soils have a pH in the range of 5-7.

In the coastal areas of the Island the Ornitosols formed instead of Lithosols. These Ornitosols forms as guano-rich Lithosols which have upper horizon - fresh organic matter with relatively large for ornithogenic soil C/N ratio, and the lower horizon – with a lower C/N ratio. In addition

to the soils mentioned above Organic Littoral soils can be formed in confined littoral zones. Gradual decomposition and transformation of organic remains of sea algae take place in such soils.

In general, all soils identified on the Argentine Islands have a high content of organic matter, due to its accumulation in weak surface horizons with low fine earth content.

However, accumulation of typical peat occurs in the areas where fields of moss Polytrichum strictum Bridel are spread. Peat depressions in such places may reach up to 50 cm, with a common range 15-40 cm. So such deep peat corresponds to Histosols in WRB soil classification.

By now it is difficult to estimate the influence of primary soils on Antarctic biodiversity and the population of vascular plants. The local soil and peat deposits make strong contribution to the accumulation of organic matter as a result of slow decomposition in a short period of biological activity and the presence of permafrost. At the same time thin soils are very vulnerable because of the high concentrations of toxicants.

The work was supported by the Ukrainian Antarctic research center under the State target scientific and technical program of research in Antarctica for 2011-2020; and RFBR grant № 15-04-06118-a – SFFR - №Ф53.4/010. We also thank NSF (USA) for logistical support.

DIE LANGFRISTIGE LANDSCHAFTSENTWICKLUNG DER WEDDELL MEER-REGION

Nicole Krohne[1], Frank Lisker[1], Andreas Läufer[2], Georg Kleinschmidt[3], Cornelia Spiegel[1]

[1]FB 5 Geowissenschaften, Universität Bremen, Klagenfurter Str, 28359 Bremen, Deutschland,
email: nicole.krohne@uni-bremen.de

[2]Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), Hannover, Deutschland

[3]Goethe Universiät Frankfurt, Deutschland

In Coats Land und Dronning Maud Land (Ostantarktis) ragen durch Steilstufen begrenzte großflächige topographische Erhebungen aus dem Eis hervor. Diese bis 3200 m hohen und bis zu 200 km von der Küste des Weddell-Meeres aufgeschlossenen Berge sind hauptsächlich aus verebnetem metamorphem Grundgebirge aufgebaut. Die letzte metamorphe Überprägung des Grundgebirges resultiert aus der Kollision mehrerer Kontinente, die sich im Kambrium zum Superkontinent Gondwana zusammengeschlossen haben. Jüngere Gesteine, und somit der Zugang zur geologischen Entwicklung der obersten Krusten-bereiche und der Oberfläche, fehlen jedoch im Umfeld des Weddell Meers weitgehend. Mit Hilfe thermochronologischer Methoden, insbesondere der Apatit-Spaltspuranalytik, kann aber die Abkühlung der heute aufgeschlossenen Gesteine auf Temperaturen unter ~100°C datiert und damit die Freilegung und Hebung der Region rekonstruiert werden. Publizierte thermochrono-logische Daten aus Coats Land sowie dem westlichen und zentralen Dronning Maud Land liefern ein gemeinsames Altersspektrum von ~80 bis ~315 Ma. Die Alter und assoziierte Proxies wurden in der Vergangenheit als monotone und schrittweise Abkühlung bzw. Exhumierung interpretiert. Dieses traditionelle Konzept steht jedoch nicht mit dem geologischen und geomorphologischen Hintergrund, insbesondere der Ausbildung ausgedehnter Erosionsoberflächen, in Einklang.

So wurden auf dem verebnetem, Grundgebirge der Shackleton Range (Coats Land) Vulkaniklastika abgelagert, die eine Exposition des Grundgebirges um ~180 Ma markieren. Weitere Relikte verebneter Oberflächen befinden sich im gesamten Dronning Maud Land, und im westlichen Dronning Maud Land markieren jurassische Lavaströme die Exposition des verebneten Grundgebirges. Diese Faktenlage verlangt eine neue Interpretation der regionalen Exhumierungs- und Hebungsgeschichte. Neue Apatit-Spaltspurdaten aus Coats Land und dem westlichen Dronning Maud Land reichen von 94 bis 220 Ma bzw. 126 bis 267 Ma. Die gemeinsame Modellierung dieser Spaltspuralter mit diversen Proxies und Daten komplementärer thermochronologischer Methoden ((U-Th-Sm)/He) unter Berücksichtigung der geologischen Marker erlaubt eine detaillierte Rekonstruktion der Zeit-Temperatur Geschichte im Umfeld des Weddell Meers. Die Zeit-Temperatur-Modelle zeigen eine komplexe Entwicklungsgeschichte einschließlich mehrerer Versenkungsphasen und anschließender Exhumierung. Dabei kam es zur Anlage sedimentärer Becken mit bis zu 6 km Sedimentfüllung während der Permo-Trias, vom Späten Jura bis in die Frühe Kreide und vermutlich während des frühen Känozoikums. In diesen Phasen waren weite Bereiche Dronning Maud Lands und Coats Lands vermutlich Bestandteil eines ausgedehnten Beckensystems im Inneren

Gondwanas. Die letzte Exhumierungsphase, die auch mit einer Hebung des Grundgebirges einherging, erfolgte einheitlich seit dem Oligozän im Zusammenhang mit der flächenhaften Vereisung der Antarktis und den damit verbundenen isostatischen Ausgleichsbewegungen. Dies bedeutet, dass das Landschaftsbild Coats Lands und Dronning Maud Lands für lange Zeit von flachen Ebenen geprägt war und die heutige topographische Ausbildung erst seit dem Oligozän erfolgte.

PLANNED INTERDISCIPLINARY-GEOSCIENTIFIC PROCESS-STUDIES ON A TYPICAL EAST ANTARCTIC CONTINENTAL MARGIN SETTING AT THE ECKSTRÖM ICE SHELF (DRONNING MAUD LAND): FROM GONDWANA DECAY TO RECENT DEGLACIATION

Gerhard Kuhn[1], Christoph Gaedicke[2],

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Am Handelshafen 26, 27570 Bremerhaven, Deutschland,

email: gerhard.kuhn@awi.de

[2]Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), Hannover, Deutschland

Recent findings of outcrops of the so-called "Explora Wedge" and overlying younger sediments below the Eckström Ice Shelf initiated discussion about discovering this area in more detail.

The Eckström Ice Shelf is a characteristic ice shelf and one out of numerous small to medium scale ice shelves around East Antarctica. It is bordered by ice rises and ridges, has only a small catchment area and a slow flowing central ice stream. Nevertheless, this region is of critical importance to water-mass preconditioning in the Weddell Sea, and like other ice shelves in that area particularly susceptible to future environmental changes.

We have learned about sub-ice-shelf melting and freezing processes as well as the formation of supercool water and ice platelets mostly through modelling. Observations from land-fast sea ice are still very rare. Ikaite and related inorganic carbonate precipitation, processes probably observed in the ANDRILL sediment cores, may be associated with freezing processes and brine formation in this type of environment. Hardly any measurements exist regarding oceanographic and glaciological seasonal cycles and associated processes below an ice shelf, close to its calving, or at the grounding zones. Observations and detailed spatial mapping of seafloor morphology and composition are difficult and can only be done with the aid of AUVs or ROVs diving below the ice shelf. "Deep SCINI", a ROV that can be lowered through an ice hole, discovered a school of fish hidden under 740 m of ice and 850 km away from the coast and light, living at the grounding zone of the Ross Ice Shelf (WISSARD project). It also discovered a community of sea anemones (*Edwardsiella andrillae*), a new species, which lives in high densities upside down on the underside of the ice shelf and is part of an unknown system of biogeochemical processes. These are two more examples for living at the edge on Planet Earth.

Evidence of these biological, oceanographic and glaciological processes could have been archived in sedimentary deposits. With detailed seafloor mapping and high-resolution reflection seismic we hope to find postglacial and Holocene sediments. A sequence of more than 1000 m thick sediments has been detected lying on top of the "Explora Wedge" in an area between the ice shelf calving line and about 40 km inland below the Eckström Ice Shelf. Up to now, its age is relatively unknown but could range from Cretaceous to Pleistocene. Therefore, this area would be predestined for exploring East Antarctica\'s development from a greenhouse

environment after the Gondwana breakup to a Cenozoic icehouse environment, thus enabling us to possibly reconstruct the history and variability of the East Antarctic Ice Sheet. We will present various sites for drill holes and would like to raise awareness and interest within the community of polar researchers. Due to the proximity to the Neumayer III Station, the logistics of possible future investigations will be easier and will have less of an environmental impact than if started elsewhere in Antarctica.

CYTOGENETIC FEATURES OF *DESCHAMPSIA ANTARCTICA* DESV. PLANTS IN DIFFERENT MICROCLIMATE CONDITION OF THE ARGENTINE ISLANDS OF MARITIME ANTARCTIC

Viktor Kunakh[1], Navrotska D.[1], Twardovska M.[1], Hasterok R.[2], Betekhtin A.[2], Andreev I.[1], Parnikoza I.[1]

[1]Institute of Molecular Biology and Genetics, National Academy of Science of Ukraine, Akademica Zabolotnogo Str. 150, 03143 Kyiv, Ukraine,

email: kunakh@imbg.org.ua

[2]Department of Plant Anatomy and Cytology, Faculty of Biology and Environmental Protection, University of Silesia, 40-032 Katowice, Jagiellonska Str. 28, Poland

Antarctic is a region with the most severe climatic conditions on Earth. Only two species of vascular plants (*Deschampsia antarctica* Desv. and *Colobanthus quitensis* (Kunth) Bartl.) survive in this area at the edge of their capabilities demonstrating adaptation to local unfavorable environment conditions. A low angle of insolation along with terrain roughness creates a set of microclimates in Antarctic tundra habitats, thus resulting in a specific adaptation of individual plants. The classical geobotanical methods and population studies do not always enable identification of adaptive alterations. Molecular genetic analysis also can not reveal the features of the adaptation, because for genetic differences to occur more time and certain isolation of populations are needed. However, clear evidence of individual adaptation to specific environmental micro-conditions may be provided by karyotype studies.

The study of individual plants of D. antarctica cultured in vitro, which were obtained from seeds collected in the Argentine Islands region, revealed the interesting phenomena. Cytogenetic analysis revealed that most of plants from this region (Galindez, Skua, Yalur, and Darboux Islands, and Rasmussen Cape) have 13 pairs of chromosomes (2n = 26). At the same time, the plants from the Darboux Island were found to be mixoploid (2n = 13-27) and one of them demonstrated the presence of metaphases containing a supernumerary B chromosome (26 + 1B). Moreover, analysis of plants from the Great Yalour Island revealed mixoploidy with an even higher range of variation in chromosome number (2n = 13-39) that correspond to the haploid and triploid chromosome sets of this species. It is assumed that mixoploidy is mainly a manifestation of an organism's reaction to adverse environmental conditions.

Existence of different forms of chromosomal polymorphism in the Argentine Islands region was confirmed by FISH analysis of rRNA genes. For samples from Darboux, Skua, Galindez Islands and Cape Rasmussen ten sites of 5S rDNA and four sites of 25S rDNA were identified. Whereas, greater number of rDNA loci (twelve of 5S rDNA and six of 25S rDNA loci) were identified in the karyotype of D. antarctica from Great Yalour Island.

The still open question is the prevalence of different chromosomal forms of D. antarctica in the Argentine Islands region. There is no doubt that the determination of possible reasons for the occurrence of various cytogenetic races of D. antarctica in the natural environment requires more detailed studies using molecular-cytogenetic approach.

INTER-ANNUAL VARIABILITY OF GROWING SEASON CO_2 AND CH_4 FLUXES AT POLYGONAL TUNDRA OF THE LENA RIVER DELTA, SIBERIA

Lars Kutzbach[1], Christian Wille[1], Benjamin R. K. Runkle[1,4], Peter Schreiber[1], Torsten Sachs[3], Moritz Langer[2], Julia Boike[2], Eva-Maria Pfeiffer[1]

[1]Institute of Soil Science, Center for Earth System Research and Sustainability, Universität Hamburg, Germany,
email: lars.kutzbach@uni-hamburg.de

[2]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Telegrafenberg A43, 14473 Potsdam, Germany

[3]Helmholtz Centre Potsdam, GFZ German Research Centre for Geosciences, Germany

[4]University of Arkansas, USA

Due to the logistic and technical difficulties associated with experimental work in high latitudes, long-term measurements of CO_2 and CH_4 fluxes from arctic ecosystems are still rare, and published trace gas balances often rely on measurements from one or few growing seasons. The inter-annual variability of environmental conditions such as temperature, precipitation, snow cover, and timing of snow melt can be high in the Arctic, especially for regions which are influenced by both continental and maritime climates, such as the Siberian arctic lowlands. For these ecosystems, we must also expect a great inter-annual variability of trace gas balance. Here we present multi-annual late summer CO_2 and CH_4 flux data from the Lena River Delta in the Siberian Arctic (72°N, 126°E). The study site Samoylov Island is characterized by polygonal lowland tundra, a vegetation dominated by mosses and sedges, a soil complex of Glacic, Turbic and Histic Cryosols, and an active layer depth of on average 0.5 m. Seasonal flux measurements were carried out with the eddy covariance technique during the 13-year period 2002 - 2014. Within this period, CO_2 flux data overlaps during 37 days (20 July - 25 August) for 12 years, and CH_4 flux data overlaps during 25 days (28 July - 21 August) for 9 years.

Cumulative net ecosystem CO_2 exchange (NEE) during the late summer overlap period is fairly consistent for 9 out of 12 years with a CO_2 uptake of of 1.9 ± 0.1 mol m^{-2}. Three years show a clearly smaller uptake of <1.5 mol m^{-2}. Regression analyses reveal a quadratic relationship between air temperature and NEE which suggests the existence of a temperature optimum where the balance of photosynthesis and ecosystem respiration leads to maximum NEE. Both photosynthesis and ecosystem respiration probably benefit initially from higher temperatures, however, in the highest temperature range ecosystem respiration outbalances photosynthesis. Cumulative CH_4 fluxes during the overlap period were found to be positively linearly correlated to the date of thaw and the temperature of the top 10 cm soil layer in wet polygon centers. This suggests that

(i) higher soil temperatures enhance CH_4 production more than CH_4 oxidation, and

(ii) a long thaw period may allow a stronger accumulation of CH_4 in soil pore space by methanogens and thus enhance transport processes which bypass oxidation (ebullition, plant-mediated transport).

The obtained results indicate that the Siberian polygonal tundra will emit more greenhouse gases in a warming climate - at least on the short term. On the longer term, however, an adaptation of the vegetation or effects of higher evapotranspiration on the hydrology may counteract these effects. The findings can be used to evaluate and train deterministic climate-carbon cycle models for the circumpolar permafrost regions.

CONNECTING GEOLOGY AND GEOPHYSICS: THE GEODYNAMIC EVOLUTION OF DRONNING MAUD LAND FROM RODINIA TO GONDWANA

Andreas Läufer[1], Joachim Jacobs[2,3], Marlina Elburg[4], Antonia Ruppel[1], Ilka Kleinhanns[5], Matthias Mieth[6], Wilfried Jokat[6], Solveig Estrada[1], Friedhelm Henjes-Kunst[1], Graham Eagles[6], Nicole Krohne[7], Detlef Damaske[1], Chris Clark[8], Tom Andersen[9], Frank Lisker[7]

[1]Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), Stilleweg 2, 30655 Hannover, Deutschland, email: andreas.laeufer@bgr.de

[2]Department of Earth Science, University of Bergen, Norway

[3]Norwegian Polar Institute, Fram Centre, Tromsø, Norway

[4]University of Johannesburg, Department of Geology, Johannesburg, South Africa

[5]FB Geowissenschaften, Universität Tübingen, Deutschland

[6]Alfred Wegener Institut, Helmholtz Zentrum für Polar und Meeresforschung (AWI) , Bremerhaven, Deutschland

[7]FB Geowissenschaften, Universität Bremen, Deutschland

[8]Curtin University, Perth, Australia

[9]University of Oslo, Department of Earth Science, Norway

East Antarctica consists of a number of cratonic fragments that amalgamated along distinct orogenic belts in late Neoproterozoic to early Palaeozoic times. These mobile belts include the c. 640 to 500 Ma old East African-Antarctic Orogen (EAAO) and the Kuunga Orogen, which seem to converge in Dronning Maud Land in the Atlantic sector of Antarctica. The polymetamorphic basement of Dronning Maud Land is characterized by rocks with Grenville-age protolith ages of c. 1130 to 1000 Ma in the west and rocks with early Neoproterozoic protolith ages of c. 1000 to 900 Ma in the east. These two provinces are separated by the prominent Forster Magnetic Anomaly, which is therefore interpreted to represent a suture zone.

Four joint AWI-BGR international expeditions within the WEGAS (West-East Gondwana Amalgamation and Separation) and GEA (Geodynamic Evolution of East Antarctica) programmes between 2010 and 2015 have provided new combined geological and geophysical data that reveal a complex crustal architecture between central Dronning Maud Land and Lützow-Holm-Bay. The magnetic anomaly pattern changes significantly east of the Forster Magnetic Anomaly with apparently no indication of Maud-type crust. Particularly, the GEA II campaign (2011-12) targeted a series of previously unvisited nunataks in the largely ice-covered Borchgrevink-Isen between central Dronning Maud Land and Sør Rondane from Urna and Sørsteinen in the west to Blåklettane and Bergekongen in the east. This region is characterized by NW-SE trending distinct linear magnetic anomalies. This pattern is referred to as the SE Dronning Maud Land Province and was previously interpreted as a fragment

of potentially older cratonic crust south of an Ediacaran to Cambrian mobile belt that crops out in Sør Rondane. New SHRIMP/SIMS U-Pb zircon ages and geochemical analyses, however, indicate that this region consists of Rayner-age (c. 1000 to 900 Ma) juvenile arc and metasedimentary cover rocks, which were intensely reworked by medium- to high-grade metamorphism and felsic melt injections between c. 630 and 520 Ma. The juvenile rocks are very similar to a gabbro-tonalite-trondhjemite-granodiorite (GTTG) suite in the southern SW Terrane of Sør Rondane, which yield crystallization ages of c. 1000 to 920 Ma based on U-Pb zircon geochronology. The juvenile character of this suite suggests a long-lived accretionary setting in early Neoproterozoic times. While the rocks in the Borchgrevink-Isen further west were intensely reworked in Pan-African times, the GTTG complex in Sør Rondane shows evidence of Pan-African up to lower amphibolite-facies thermal overprint, but still contains large domains with apparently only weak deformation. An exception is the northern margin of the GTTG complex where high-strain dextral shear is related to the prominent Main Shear Zone that is estimated to be of latest Ediacaran to early Cambrian age (c. 560 to 530 Ma). This structure, which we interpret as part of a fault system related to NE-directed lateral extrusion of the EAAO, separates the Rayner-age GTTG complex from a series of greenschist- to granulite-facies metasupracrustal rocks of mainly volcano-sedimentary origin. They in turn are separated from the amphibolite- to granulite-facies NE Terrane in the north and north-east by the Main Tectonic Boundary that is postulated by researches of the Japanese National Antarctic Programme. Available literature and our own new geochronological data indicate that peak and retrograde metamorphism in the NE and SW terranes was at c. 640 to 530 Ma. Both terranes were intruded by several granitoid magmatic pulses between c. 650 and 500 Ma. In contrast to “Indo-Antarctic” affinities of the GTTG complex south of the Main Shear Zone and the similar rocks of the SE Dronning Maud Land Province to the west, these units thus appear to have rather “East African” affinities. Furthermore, grey heterogeneous gneisses and augen-gneisses of the aforementioned meta-volcanosedimentary supracrustal rocks of the SW Terrane close to the Main Shear Zone gave zircon crystallization ages of c. 750 Ma. Such ages are unknown from the EAAO in central and western Dronning Maud Land west of the Forster Magnetic Anomaly.

Taking all evidence together, we propose that the Forster Magnetic Anomaly separates distinctly different parts of the EAAO. These are (i) a reworked, mainly Grenville-age crust of the Maud Belt to the west representing the overprinted margin of the Kalahari Craton, and (ii) a part of the orogen dominated by early Neoproterozoic accretionary tectonics to the east, which we refer to as Tonian Ocean Arc Super Terrane (TOAST). The contrast between these two crustal units is also reflected in the geochemistry of voluminous late-tectonic granitoids across the whole belt. Based on our new geological and aerogeophysical evidence, the regional crustal structure of eastern Dronning Maud Land as a whole may tentatively be interpreted as reflecting large-scale lateral extrusion of the EAAO post-dating continental collision in the late Neoproterozoic and early Cambrian.

REGIONAL DIFFERENTIATION AND EXTENSIVE HYBRIDIZATION IN THE SOUTHERN OCEAN GIANT SEA SPIDER *COLOSSENDEIS MEGALONYX* SPECIES COMPLEX

Florian Leese[1], Lars Dietz[1]

[1]Ruhr-Universität Bochum, Evolutionsökologie und Biodiversität der Tiere, Universitätsstraße 150, 44801 Bochum, Deutschland,
email: florian.leese@rub.de

Assessing the enormous diversity of Southern Ocean benthic species and their evolutionary histories is a central task in the era global climate change. Based on mitochondrial markers it was recently suggested that the circumpolar giant sea spider *C. megalonyx* comprises a complex of at least six cryptic species with mostly small and non-overlapping distribution ranges. Here we expand the sampling to include over 500 mitochondrial COI sequences of specimens from around the Antarctic. Additionally, we present sequences from the nuclear ITS region for a subset of these specimens. Using different species delimitation approaches, the number of distinct mitochondrial OTUs increased from six to 15-20 with our larger data set. In contrast to earlier studies, many of these clades show a circumpolar distribution. Our results suggest survival during Pleistocene glaciations in multiple refugia, some of them probably located on the Antarctic shelf. The nuclear data are incongruent with the mitochondrial results in that some specimens from different COI OTUs group together in the ITS data. These mito-nuclear discordances suggest that divergent mitochondrial lineages can hybridize and should not be interpreted as cryptic species. Our results confirm that the presence of cryptic species should not be inferred based on mitochondrial data alone.

DIE INTERNATIONALE POLARLEHRER-VEREINIGUNG PEI (POLAR EDUCATORS INTERNATIONAL)

Rainer Lehmann[1],Inga Beck[2]

[1]FWS Hannover-Bothfeld , AK Polarlehrer der DGP, Zum Weidegut 1, 31634 Steimbke, Deutschland, email: rainer.lehmann@gmx.net

[2]AWI Potsdam, Deutschland

MUSTER DER BENTHISCHEN ÖKOSYSTEMFUNKTION AN DER ANTARKTISCHEN HALBINSEL

Heike Link[1], Freija Hauqier[2], Dieter Piepenburg[3]

[1]Christian-Albrechts-Universität Kiel, Institut für Ökosystemforschung, c/o GEOMAR, Düsternbrooker Weg 20, 24105, Kiel, Deutschland,

email: hlink@ecology.uni-kiel.de

[2]Senckenberg am Meer, Wilhelmshaven, Deutschland

[4]Alfred-Wegener-Institut, Bremerhaven, Bremerhaven, Deutschland

Wie wirken sich Veränderungen im Nahrungsexport und der Zusammensetzung benthischen Gemeinschaften des Südlichen Ozean sich auf die Ökosystemfunktion aus? Ein wichtiger Aspekt der Ökosystemfunktion ist der Abbau organischen Materials und die damit verbundene Remineralisation von Kohlenstoff und inorganischen Nährstoffen. Hier stellen wir Projektergebnisse zu einer ersten Quantifizierung benthischer Stoffflüsse um die Antarktische Halbinsel vor. Der Zusammenhang zwischen benthischen Gemeinschaften, Umweltbedingungen und den Ökosystemfunktionen wird dabei genutzt, um die Ergebnisse mit anderen polaren Lebensräumen zu vergleichen.

DIE MESOZOISCHE ANTARKTIS: DER HARTE KERN GONDWANAS?

Frank Lisker[1], Andreas Läufer[2],

[1]FB 5 Geowissenschaften, Universität Bremen, PF 330440, 28334 Bremen, Deutschland,

email: flisker@uni-bremen.de

[2]Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), Hannover, Deutschland

Die Geschichte des Superkontinents Gondwana ist charakterisiert durch die Entwicklung großer sedimentärer Becken. Einige von ihnen gehören zu den größten geologischen Beckenstrukturen, die in Afrika, Indien, Australien und Südamerika erhalten sind (z.B., Cape–Karoo-, Indian Master, Innamincka- oder Paraná Becken). Trotz seiner zentralen Position innerhalb Gondwanas besteht die heutige Antarktis dagegen nahezu ausschließlich aus Festgesteinen, während Belege mesozoischer und frühkänozoischer Abtragungs- und Ablagerungsprozesse weitgehend fehlen. So finden sich um Ross Meer and Prydz Bay sowie in der Westantarktis in geringem Umfang Relikte triassischer und/ oder jurassischer terrestrischer Schichten, aber kretazische oder paläogene Sedimente sind jenseits der Antarktischen Halbinsel auf dem Kontinent nicht anzutreffen. Dies kann auf zwei Ursachen zurückzuführen sein: entweder bildete das Zentrum Gondwanas eine stabile Hochlage, auf der keine Sedimente abgelagert wurden, oder die Antarktis enthielt mesozoische Sedimentbecken, die in jüngerer Zeit abgetragen wurden bzw. unter der heutigen Eisdecke liegen. Somit kann die mesozoische Geschichte der Antarktis nicht mittels traditioneller sedimentologischer und stratigraphischer Methoden rekonstruiert, sondern muss über die Verknüpfung thermochronologischer, geophysikalischer und strukturgeologischer Daten, thermischer Indikatoren und geomorphologischer Beobachtungen erschlossen werden. Dieser multidisziplinäre Ansatz sowie der Abgleich mit Informationen angrenzender Gebiete enthüllt die Existenz eines ausgedehnten intra-gondwanischen Beckensystems. Einige der mesozoischen Sedimentbecken sind nicht mehr erhalten, z.B. entlang des gesamten Transantarktischen Gebirges, entlang der Pennell – Terre Adélie Küste, in Dronning Maud Land, in der Shackleton Range oder in Marie Byrd Land. Ablagerungen anderer Senken hingegen sind reliktisch erhalten (Prydz Bay/ Lambert Graben) oder geophysikalisch belegt (Ross Meer, Wilkes Becken und Aurora Trog). Die Entwicklung eines mesozoischen antarktischen Depozentrums steht offensichtlich im Zusammenhang mit langanhaltender Krustendehnung im Vorfeld der Fragmentierung Gondwanas. Die antarktischen Becken erstrecken sich nahezu ausschließlich senkrecht zum Kontinentalrand und korrelieren durchgehend mit äquivalenten Strukturen auf den ehemals angrenzenden Gondwana-Fragmenten.

MÜNCHEN ALS AUSGANGSPUNKT FÜR DIE DEUTSCHE ANTARKTISFORSCHUNG

Cornelia Lüdecke[1]

[1]Universität Hamburg, Fernpaßstraße 3, 81373 München, Deutschland,
email: C.Luedecke@lrz.uni-muenchen.de

1845 wurde der Pfälzer Georg von Neumayer (1826-1909) in der kgl. Polytechnischen und der Bau- und Ingenieurschule in München auf den Staatsdienst als Bauingenieur vorbereitet. Als jedoch auch in Bayern 1848 die Märzrevolution ausbrach, musste Neumayer auf Weisung seines Vaters das Studium unterbrechen und in Tirol ruhigere Zeiten abwarten. Dort wandte er sich dem neuen Forschungsgebiet des Erdmagnetismus zu. Carl Friedrich Gauss (1777-1855) hatte 1836-1841 den Göttinger Magnetischen Verein mit 50 weltweit verteilten Messstationen organisiert und aufgrund der Messungen das Magnetfeld der Erde theoretisch berechnet. Daraufhin richtete James Clark Ross (1800-1862) während des sogenannten magnetischen Kreuzzuges 1840 in Hobart (Tasmanien) das Rossbank Observatorium ein, das bis 1848 in Funktion war, und entdeckte 1841 den Magnetpol der Südhemisphäre in der Nähe des von Gauss festgelegten Ortes. Sicherlich verschlang Neumayer auch Ross' 1847 publizierten Reisebericht über seine Expedition in die Südpolarregion. Weil Neumayer der Erdmagnetismus zunehmend interessierte, trat er nach seinem Staatsexamen im Jahr 1849 eine Assistentenstelle bei dem Physiker Karl Joseph Reindl (1806–1853) an, der 1834 ein Buch über die *Identität der Elektrizität und des Magnetismus* publiziert hatte. Als jedoch Johann von Lamont (1805-1879), Direktor der Sternwarte in Bogenhausen bei München, 1849 ein *Handbuch des Erdmagnetismus* veröffentlichte, begann Neumayer gleichzeitig ein Praktikum bei Lamont. Im Vortrag wird gezeigt, dass Lamont als Mentor Neumayers späteres wissenschaftliches Interesse und Arbeitsgebiete bis ins Detail prägte. Neumayers Lebensziel war einerseits, die Schifffahrt durch Sammeln von magnetischen und meteorologischen Informationen zu sichern und andererseits vor allem, selbst an einer Antarktisexpedition teilzunehmen, denn die Südpolarregion war das letzte noch völlig unerforschte Gebiet auf der Erdkugel. Nach einem Aufenthalt in Melbourne, wo er 1858 mit kgl bayerischen Geldern das Flagstaff Observatory gründete und bis 1863 leitete, wurde er Hydrograph der Admiralität in Berlin und konnte es bei der Planung der wissenschaftlichen Aufgaben der Weltreise der „S.M.S Gazelle“ einrichten, dass bei einem Aufenthalt auf den Kerguelen im Südindischen Ozean am 9.12.1874 der Venustransit beobachtet wurde. Seit 1879 engagierte sich Neumayer, inzwischen Direktor der Deutschen Seewarte in Hamburg, in der Organisation des ersten internationalen Polarjahres in der Arktis (1882-1883) und schaffte es mit der Argumentation, am 6.12.1883 den Venustransit auf Südgeorgien beobachten zu können, eine deutsche Expedition auf diese subantarktische Insel auszusenden. Schließlich wurde Neumayers Motto „Auf in den Süden“ um die Jahrhundertwende realisiert, als im Rahmen einer internationalen Kooperation 1901-1903 nach dem Vorbild des Polarjahres die deutsche Expedition unter der Leitung des Königsberger Grönlandforschers Erich von Drygalski (1865-1949) auf der „Gauss“, die britische unter Robert Falcon Scott (1868-1912), die schwedische unter Otto Nordensjköld (1869-1928) und die Schottische unter William Speirs Bruce (1867-1921) die

Natur der Antarktis erstmals erkundeten. Nach seiner Rückkehr wechselte Drygalski 1906 von Berlin auf den neugeschaffenen Lehrstuhl für Geographie an die Ludwig-Maximilians-Universität nach München, wo er bis 1931 die Ergebnisse der Südpolarexpedition herausgab. Als Überwinterer in Grönland und der Antarktis war er *die* Polarautorität in Deutschland und international sehr gut eingebunden. Gerne teilte er seine umfangreichen Erfahrungen nachfolgenden Expeditionen mit. Nachdem der bayerische Offizier Wilhelm Filchner (1877-1957) von München zur trigonometrischen Abteilung der Preußischen Landesaufnahme nach Berlin gewechselt hatte, entwarf er 1910 einen Expeditionsplan, um den Zusammenhang der Westantarktis mit der Ostantarktis zu untersuchen. Seine Expedition an Bord der „Deutschland“ (1911-1912) geriet in die Drift des Weddell-Meeres und kam erst nach neun Monaten wieder frei. Währenddessen schlug der Norweger Roald Amundsen (1872-1928) den Briten Robert Falcon Scott (1868-1912) im Wettlauf.

A DIFFERENT VIEW ON PENGUINS -MULTISPECTRAL MAPPING OF PENGUIN COLONIES BY DRONES

Jakob Maercker[1], Jan Esefeld[2], Hans-Ulrich Peter[2], Christian Pfeifer[1], Fritz Hertel[3], Osama Mustafa[1]

[1]ThINK - Thüringer Institut für Nachhaltigkeit und Klimaschutz, Leutragraben 1, 07743 Jena, Deutschland,
email: jakob.maercker@think-jena.de

[2]Polar & Bird Ecology Group, Institute of Ecology, Friedrich Schiller University Jena, Germany

[3]Umweltbundesamt/Federal Environment Agency, Dessau-Rosslau, Germany

Antarctic penguin populations of different species underwent considerable changes during the last decades. This information is based on the monitoring of only a limited number of accessible colonies regularly surveyed by scientists. A significant number of colonies remain unmonitored today due to inaccessibility or their sheer size. Modern satellite remote sensing techniques allow surveying those colonies on a continental scale. However, before an extensive monitoring by satellite can be conducted, mature ground truthing methods have to be developed. The use of Unmanned Aerial Vehicles (UAV or drones) can help to extend the database for ground truthing. In order to develop a methodology for obtaining precise census data from drone imagery the suitability of different sensors was tested.

For this ongoing study three penguin colonies of the South Shetland Islands in the maritime Antarctic were surveyed by drone overflights using different sensors during the seasons 2013/14 and 2014/15. The colony on Withem Island hosts a so far unknown number of chinstrap penguins (*Pygoscelis antarctica*). Chinstrap and Gentoo penguins (*Pygoscelis papua*) breed at Narębski Point and Adélie penguins (*Pygoscelis adeliae*) additionally occur on Ardley Island. For the latter two colonies a ground-based GPS mapping was conducted to compare the results with those of the drone mapping.

During drone flights images of the penguins were taken with three different sensors: visual images (RGB), near-infrared (NIR), ultraviolet (UV) and thermal images. Respective individual images were merged together and the so originated mosaics were compared with the ground mapping results.

RGB images were used for manual counting of both nests and total penguin numbers. Results revealed only limited deviations from ground-based mapping. Further, the ability of species differentiation was tested. Thermal images offer the potential to easily distinguish between incubating individuals and those standing off a nest. NIR and UV images will be investigated for their potential to detect the extent of guano and thus enabling comparisons to satellite images.

WHERE IS THE RICHEST ABYSSAL FAUNA OF MUNNOPSIDAE (CRUSTACEA, ISOPODA)?

Marina V. Malyutina[1], Angelika Brandt[2]

[1]A.V. Zhirmunsky Institute of Marine Biology of the FEB RAS, Palchevskogo 17, Vladivostok, 690041, Far East Federal University, Oktiabrskaya Str. 29, Vladivostok, 690600,Russia
email: m_malyutina@mail.ru

[2]Centre of Natural History (CeNak), Zoological Museum Hamburg, University of Hamburg, Germany

The ANDEEP expeditions (2002, 2005) to the Atlantic sector of the Southern ocean revealed the high diversity and richness of the isopod family Munnopsidae: 219 species of 31 genera and 8 subfamilies, but from these only 58 species of 25 genera occur at 14 abyssal stations deeper than 4000 m. This result was compared with the data of the recent expeditions KuramBio (2012) to the Kuril-Kamchatka Trench (KKT) abyssal area and Vema-TRANSITE (2015) to the Vema Transform Zone of the tropical Atlantic on the both sides of the MAR, as during these expeditions samples have been collected with the same type of C-EBS and treated by same manner. Munnopsidae from 12 stations at the KKT area (4830-5780 m depths) was the most specious and the richest with 80 species of 28 genera and 8 subfamilies. The number of the collected Munnopsidae species from the Vema-TRANSITE samples (4986 - 5735 m) is less than in Antarctic abyssal area of ANDEEP: 43 species of 18 genera and 8 subfamilies. Similarities and differences in the ratios of subfamilies and genera and some morphologically similar species of all studied areas have been found. Everywhere the most numerous and frequent was subfamily Eurycopinae (about third of all species). Most of the species are rare, 50-80% of species are new to science. Some of the species sampled at Vema-TRANSITE stations in the western side of the MAR seem to be the same or close to the ANDEEP species. The widest distributed species: *Betamorpha fusiformis*, *Syneurycope parallela* and *Acanthocope galatheae* have been collected in the all sampled areas. The further genetic analyses of the species are planned.

INVESTIGATIONS OF MASS BALANCE ON THE BELLINGSHAUSEN ICE DOME IN 2007–2015, KING GEORGE (WATERLOO) ISLAND, SOUTH SHETLAND ISLANDS, ANTARCTICA

Bulat Mavlyudov[1]

[1]Department of Glaciology, Institute of Geography, Russian Academy of Sciences, Staromonetny 29, Moscow, Russia, email: bulatrm@bk.ru

The Bellingshausen Ice Dome is a small ice cap that is situated at the northern part of Fildes Peninsular at the south-west part of King George (Waterloo) Island, Southern Shetland Islands archipelago, Antarctica. Dimension of ice cap is about 3x4 km and elevation is equal 250 m a.s.l. Ice reach sea level at eastern part of ice cap and at one point of its southern part but at other parts ice located at elevations 30-50 m a.s.l. The Bellingshausen Ice Dome is situated closely to Uruguayan Antarctic station “Artigas” and in about 4 km from Russian Bellingshausen scientific Antarctic station. The situation with ice dynamic on King George Island mainly reflect situation of ice dynamic at the Antarctic Peninsula.

Net of our 16 ablation stakes was placed on ice cap in November 2007. We also use net of 13 ablation stakes that was placed by previous investigators (Mathias Brawn). Ablation stakes are situated on all slopes of ice cap. Only at the northern part they are absent as at this place the Bellingshausen Ice Dome is connected with mail ice caps of island.

Mass balance researches on the Bellingshausen Ice Dome were spent during six summer seasons in 2007–1012 and 2014-2015 and in one winter in 2011 as the parts of Russian Antarctic Expeditions (RAE 53, 54, 55, 56, 57, 60). Each summer mission was prolongated during 3-4 months and included areal snow survey at the end of winter at period of maximum snow accumulation and every week stakes measurements accompanied by snow density measurements in snow pits in some points. Snow survey at 180-200 points is shown that the results of areal measurements of snow thickness and measurements of snow thickness at 29 ablation stakes situated on ice cap almost equal. It allows us to use data of snow thickness measurements on stakes for calculation of ice mass balance on all Bellingshausen Ice Dome.

After snow survey we receive accumulation of snow at ice cap and can calculate average value of snow thickness. Snow survey gives us possibility to make map of snow thickness on all area of ice cap. Now we have possibility to compare such maps for different years. After snow survey we make 7-8 snow pits in different parts of ice cap to receive average snow density. It gives us possibility to calculate winter snow balance b_w.

During melt season on net of stakes we receive information about snow melt intensity, quantity of growing superimposed ice and also about quantity of melting superimposed ice and glacier ice. As we know density of snow (from snow pits – it change during time), density of superimposed ice (0.82 g/cm^3 – average from 100 measurements) and glacier ice we can calculate melting intensity for each point of stakes net. Average melting intensity from all stakes give us summer balance b_s. Comparison of winter and summer balance give us net balance $b_n=b_w+b_s$. The analysis of received data has shown next values of ice mass balance on the Bellingshausen

Ice Dome: in 2007/08 – -9,4 cm we, 2008/09 – -72,4 cm we, in 2009/10 – +34,7 cm we, in 2010/11 – +9,9 cm we, in 2011/12 – -42,9 cm we, in 2012/13 – +30,5 cm we, in 2013/14 – +64,1 cm we and in 2014/15 – +26 cm we. From 8 years of investigations we can see that ice mass balance of the Bellingshausen Ice Dome change irregular during time and there are only 3 years with negative mass balance.

ELA in 2007/08 and 2008/09 was situated a little below top of the Bellingshausen Ice Dome (about 225 m a.s.l.), in 2009/10, 2012/13, 2013/14 and in 2014/2015 ELA has lowered practically up to sea level, in 2010/11 it was equal 180 m a.s.l., in 2011/12 – 220 m a.s.l. Last years we observe increasing of snow, firn and superimposed ice accumulation on all area of the Bellingshausen Ice Dom but especially at its upper part. For example, at the point R8 thickness of snow at the end of ablation season at March 30th rich 3.6 m with density 0.58g/cm³.

Good correlation between snow and ice melting and mean summer air temperature for 4 months (December-March) give possibility to renew ice melting conditions for all period of observations at the Bellingshausen weather station (from 1969). We receive such connection air temperature and ablation intensity: A = 47.49t + 39.69, where A – average melting intensity of the Bellingshausen Ice Dome, cm we, t – mean summer temperature for 4 months (December-March) at the Bellingshausen weather station, °C. Using data of air temperature on the Bellingshausen weather station from data archive (www.aari.nw.ru) we draw graph of snow and ice melting on Bellingshausen Ice Dome from 1969.

Snow accumulation at the Bellingshausen weather station from 1969 to now give zero trend. But data of different authors give us possibility to say that there is small increasing of snow accumulation during time. For showing this accumulation increasing we used formula:

K = 0.375x − 679.58, where K – snow accumulation at the Bellingshausen Ice Dome, cm we, x – year from 1969. If we know accumulation and ablation for every year it is possible to calculate ice mass balance for each year bn. such way ice mass balance for Bellingshausen Ice Dome was also renewed from 1969 to 2006 and for period of absence of direct investigations on ice cap (2012/2013 and 2013/2014).

Analysis of received data allows us to see that last years positive mass balance on the Bellingshausen Ice Dome is begin to prevail. As it is the longest period of positive ice mass balance on the Bellingshausen Ice Dome since 1969, it suppose that we can say that climate cooling in this area is outlined in last years. If we consider historical data of air temperature at the Bellingshausen weather station from 1969 up to now, we will see positive trends for mean air temperature, average summer and average winter temperature. It can't explain positive mass balance on the Bellingshausen Ice Dome in last years. But more careful analysis will show that last almost 10 years average winter air temperature almost not change but average summer temperature decreased. For example, summer 2013/14 was the first summer with negative average air temperature. Summer temperature decreasing at Fildes Peninsular was connected with more often east and south-east winds in summer. Low summer air temperature permits summer snowfalls and decreasing of melting intensity of snow and ice. But what will happen in future we can say if investigations of ice mass balance on the Bellingshausen Ice Dome will be continued.

Comparison of received results of ice mass balance changing in last years on the Bellingshausen Ice Dome in Antarctica with our ice mass balance investigations on Spitsbergen glaciers show some kind of similarity in them. On Spitsbergen glaciers we also see big lowering of ELA after 2006. In both cases we see lowering of ELA approximately on 200 m at the Bellingshausen Ice Dome and on 300 m at Spitsbergen glaciers that is equivalent to air temperature decreasing on about 1.2 and 1.8°C, respectively, at standard temperature elevation step that equal 0.6°C

on 100 m. In reality cooling at elevations can have more significant values as now temperature elevation step is increased. We see some similarity in glacier dynamics in two areas that situated in different Polar Regions. What it means for global climate change we will see in future.

Investigations were spent in the network of scientific programs of Institute of geography RAS and Russian Academy of Sciences and in last season in connection with interregional technical cooperation project of IAEA INT5153 «Assessing the Impact of Climate Change and its Effects on Soil and Water Resources in Polar and Mountainous Regions» and at financial support of Russian Antarctic Expedition.

ZIRCON PB-PB AGES, CHEMISTRY AND INCLUSION DATA OF GRANITOIDS FROM THE WILSON TERRANE OF NORTHERN VICTORIA LAND (ANTARCTICA): EVIDENCE FOR AN IMMATURE ANDEAN-TYPE CONTINENTAL MARGIN

Martina Menneken[1], Timm John[1]; Andreas Läufer[2], Jasper Berndt[3], Jörg Giese[1]

[1]Freie Universität Berlin, Institut für Geologische Wissenschaften, Malteserstr. 74-100, 12249 Berlin, Deutschland,
email: martina.menneken@fu-berlin.de

[2]Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), Hannover, Deutschland

[3]WWU Münster, Institut für Mineralogie, Münster, Deutschland

We analyzed zircons from 15 granitoid samples of the Granite Harbour Intrusives (GHI) in northern Victoria Land, Antarctica. The samples were taken during the BGR-expeditions GANOVEX VII (1992/93) and GANOVEX VIII (1999/2000). They cover a region of about 400 km along what has been interpreted as a typical continental margin arc magmatic system associated with west-dipping subduction beneath the continental crust of East Gondwana. Samples were taken at Lanterman Range (n=4), in the Terra Nova Bay region (Inexpressible island (n=5), Cape Russel (n=2), and close to the Italian station), Anderson Ridge, Black Ridge, Szanto-, and Daniels Range, which is furthest to the west, craton wards. Separated zircons were analysed for Pb-Pb- ages and trace-elements composition, including Ti, using LA-ICP-MS, as well as inclusion paragenesis using EDX and Raman spectroscopy. Obtained Pb-Pb ages span a range from 480 to up to 560-580 Ma, which is in agreement with previously reported syn- to post-kinematic magmatic activity in the Nimrod Glacier area. However, inherited ages from around 1-1.4 Ga and between 1.7 and 2.8 Ga were obtained in almost all samples, suggesting a dominant assimilation and reworking component in the crustal evolution of this active margin and “pure” I-type granitoids to be scarce. Zircons from the Daniels Range show particularly strong inheritance, (545 ±26 Ma, 1082 ±79 Ma, 2220 ±280 Ma, and a single grain with a concordant age of 3.4 Ga). Many zircons from this site also show strong alteration and fluid induced recrystallization structures. Only 75% of its zircon population (n=50) contain inclusions, none of those apatite. This is in strong contrast to all other sampled granitoids, which have a near 100% inclusion rate with apatite making up either 50 to 60% or even around 80% of all inclusions. Instead, the leading inclusion type in Daniels Range zircons is monazite followed by xenotime. These analyses confirm the applicability of apatite inclusions in zircon as indicators for magmatic origin. Regionally, indications for potential long term convergence related magmatism are observed.

HUDDLE BEHAVIOR OF PENGUINS

Klaus Morawetz[1], Daniel Zitterbart[2]

[1]FH Münster, Stegerwaldstr. 39, 48565 Steinfurt, Deutschland,
email: morawetz@fh-muenster.de

[2]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Am Alten Hafen 26, 27568 Bremerhaven

The huddle behavior of penguins is simulated by a cellular automaton model. The occurrence of collective behavior is found to be based on a minimal nearest and next nearest neighbor interaction. The interplay of stochastic and deterministic rules are discussed and the times scales of rotation, eruption are investigated.

BRINE CHANNEL DISTRIBUTION IN SEA ICE

Klaus Morawetz[1], Silke Thoms[2], Bernd Kutschan[2]

[1]FH Münster, Stegerwaldstr. 39, 48565 Steinfurt, Deutschland,
email: morawetz@fh-muenster.de

[2]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Am Alten Hafen 26, 27568 Bremerhaven

The formation of brine channels in sea-ice is described by two coupled order parameters, the tetrahedricity as structure of ice and the salinity. Their evolution equations follow from a Ginzburg-Landau-functional in the form of a phase-field theory conserving salinity. The stability analysis provides the phase diagram in terms of two parameters, one describing the velocity of the freezing process and the other one characterizing the velocity of structure formation. In thermodynamics these parameters determine the super-cooling or super-heating region and the specific heat respectively. In contrast to the Turing model the diffusivity does not enter this phase diagram but only determines the structure size. The numerical solution shows a microstructure formation of brine inclusions in agreement with the measured samples dependent on the salinity and temperature.

NEW DYNAMICAL MECHANISM FOR ANTIFREEZE PROTEINS (AFP)

Klaus Morawetz[1], Silke Thoms[2], Bernd Kutschan[2]

[1]FH Münster, Stegerwaldstr. 39, 48565 Steinfurt, Deutschland,
email: morawetz@fh-muenster.de

[2]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Am Alten Hafen 26, 27568 Bremerhaven

We propose a new dynamical mechanism on how proteins inhibit the freezing of water. We apply a Ginzburg-Landau type approach to describe the phase separation in the two-component system (ice, AFP). The time evolution of the ice reveals microstructures resulting from phase separation in the presence of AFPs. We observed a faster clustering of pre-ice structure connected to a locking of grain size by the action of AFP, which is an essentially dynamical process. The adsorption of additional water molecules is inhibited and the further growth of ice grains stopped. The interfacial energy between ice and water is lowered allowing the AFPs to form smaller critical ice nuclei. Similar to a hysteresis in magnetic materials we observe a thermodynamic hysteresis leading to a nonlinear density dependence of the freezing point depression in agreement with the experiments.

MÖGLICHE AUSWIRKUNGEN VON UNTERWASSERSCHALL AUF POLARE MARINE SÄUGETIERE

Mirjam Müller[1]

[1]Umweltbundesamt, Wörlitzer Platz 1, 06844 Dessau-Roßlau, Deutschland,
email: mirjam.mueller@uba.de

Für Meeressäuger ist die akustische Wahrnehmungsfähigkeit ihrer Umwelt lebenswichtig. Anthropogener Unterwasserschall, z.B. durch Airguns, kann zur Maskierung akustischer Umgebungssignale, also der Überlagerung biologisch wichtiger Geräusche führen. Eine derartige akustische Maskierung kann die Reduzierung des akustischen Raumes zur Kommunikation und generell des Informationsgehaltes von Signalen bedingen. Eine anthropogen bedingte Veränderung der marinen Geräuschkulissen kann daher als Habitatverschlechterung betrachtet werden. Eine Worst-Case-Studie des Umweltbundesamtes zeigt, dass Airgunsignale in polaren Gewässern den Kommunikationsraum von Walen noch in 2000 km Entfernung bis auf 1 % schrumpfen können. Die Entwicklung möglicher Schallschutzkonzepte für marine Säugetiere polarer Regionen sollte neben der Betrachtung des Verletzungsrisikos auch die Auswirkungen von Störung betrachten. Der Einfluss anthropogenen Schalls auf den Kommunikationsraum könnte als ein Indikator für die Bewertung von Störung herangezogen werden.

THE USE OF DRONE-BASED MULTISENSOR MAPPING IN ANTARCTIC SCIENCE

Osama Mustafa[1], Jan Esefeld[2], Fritz Hertel[3], Jakob Maercker[1], Hans-Ulrich Peter[2], Christian Pfeifer[1]

[1]ThINK - Thüringer Institut für Nachhaltigkeit und Klimaschutz, Leutragraben 1, 07743 Jena, Deutschland,
email: jakob.maercker@think-jena.de

[2]Polar & Bird Ecology Group, Institute of Ecology, Friedrich Schiller University Jena, Germany

[3]Umweltbundesamt/Federal Environment Agency, Dessau-Rosslau, Germany

In recent years drones (Unmanned Aerial Vehicles - UAV) are getting more and more popular for scientific and commercial purposes. Even in remote areas like the Antarctic this new technique enhances the opportunities of researchers for efficient acquisition of field data. In the seasons 2013/14 and 2014/15 a number of successful applications of drones were performed in the vicinity of King George Island, South Shetland Islands.

Bird colonies:

To carry out local population assessments three colonies of Pygoscelid penguins and six colonies of giant petrels (*Macronectes giganteus*) were mapped by using a drone. While RGB- and thermal imagery allow a precise identification of individual birds, the use of a Near Infrared (NIR) sensor allows a detailed outlining of guano deposits.

Vegetation:

The outstanding flora of Ardley Island is one of the reasons for its designation as an Antarctic Special Protected Area. In February 2015, a complete mapping of the vegetation extend was carried out on this island by using RGB and NIR-sensor and by deriving a Normalized Differenced Vegetation Index (NDVI) from the data of both sensors.

Topography:

Huge parts of the Antarctic are still lacking precise topographic information. Drone-based stereo-photogrammetry of RGB-images gives an efficient opportunity of generating high-resolution Digital Surface Models (DSM). For a number of small islands near Fildes Peninsula and Nelson Island DSMs in sub-decimeter resolution were created and made available for public use. Further examples for the use of precise topographic data are the investigation of dynamic landscape features like glaciers and the generation of base maps for sediment sampling at Fildes Peninsula.

Logistics:

Maps of logistic features like buildings and installations of scientific stations can be compiled efficiently by UAV-based RGB-imagery.

The results demonstrate that the use of drones provides a suitable tool for fast and efficient mapping of a variety of different features at a scale between satellite-based remote sensing and ground-based data acquisition. The use of multisensor imagery extends the capability of drones for being a helpful tool for Antarctic science.

SNOW COVER IMPACTS ON ANTARCTIC SEA ICE (SCASI)

Marcel Nicolaus[1], L. Kaleschke[2], N. Maaß[2], M. Lehning[3], K. Leonard[3], E. Trujillo[3]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Bussestraße 24, 27570 Bremerhaven, Deutschland,
email: marcel.nicolaus@awi.de

[2]Universität Hamburg, Deutschland

[3]Ecole Polytechnique Fédérale de Lausanne, School of Architecture, Civil and Environmental Engineering, Schweiz

The increase of Antarctic sea-ice extent over the last years is in contrast to the observations in the Arctic. The causes are a current topic of research, and numerical models are not able to reproduce the increasing sea-ice extent in the Antarctic. Besides atmospheric and oceanic processes, the heterogeneous and thick snow cover of Antarctic sea ice is a major factor governing the sea-ice mass balance with important feedbacks on global climate and weather. This snow cover also complicates airborne- and satellite-based remote sensing techniques, because it dominates many observations and determines methodologies and uncertainties. These facts raise the need for a better understanding of snow on Antarctic sea ice, especially in order to enhance remote sensing algorithms and climate models.

Here we present a new project and research concept of a German-Swiss cooperation. The overall goal of the project is to quantify the amount and distribution of snow on Antarctic sea ice, its physical properties and their evolution over time. The project is designed to develop a new and consistent snow-data product prototype for Antarctic sea ice, representing various length scales and different seasons. To achieve this goal, we will use high-resolution modeling, guided by in-situ data on Antarctic snow cover in combination with remote sensing data sets. Comprehensive in-situ snow datasets are used and merged with available satellite data from AMSR-2, SMOS, and CryoSat-2. The numerical models SNOWPACK and MEMLS will be coupled to simulate physical snow properties like snow depth, temperature, density, and microwave emissivity.

SEASONALITY OF SEA ICE PROPERTIES FROM AUTONOMOUS MEASUREMENTS

Marcel Nicolaus[1], A. Bartsch[1], K. Grosfeld[1], S. Hendricks[1], G. Heygster[2], L. Kaleschke[3], C. Melsheimer[2], R. Ricker[1], S. Schwegmann[1], R. Treffeisen[1]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Bussestraße 24, 27570 Bremerhaven, Deutschland,

email: marcel.nicolaus@awi.de

[2]Institut für Umweltphysik, Universität Bremen, Bremen, Deutschland

[3]Institute of Oceanography, Universität Hamburg, Hamburg, Deutschland

The status, variability, and trends in Arctic and Antarctic sea ice are mostly discussed based on satellite measurements of sea ice extent, because this may be observed with reasonable uncertainties. But at the same time, we are still lacking a good understanding of key processes that determine the observed variability and change. Satellite observations of sea ice thickness and snow depth, which are considered to be key parameters in this respect, are permanently improving. However, uncertainties are still large in these data sets, and even the general seasonality is uncertain for some times and regions. Hence, additional observational data are needed to support method development, product validation, and to obtain detailed insight into processes. These data need to cover the entire seasonal cycle and reach into regions that are hardly accessible by manned expedition. Here we present results from autonomous measurements from sea-ice tethered instruments (buoys) on Arctic and Antarctic sea ice. We focus on the seasonality of snow depth on sea ice, but also present results from sea ice thickness and drift in relation to sea ice concentration. The time series allow new insights into spatial and temporal variability of these key variables. All data are obtained from Meereisportal.de, which provides online data of various sea ice parameters, but in particular sea ice concentration, buoy observations, and sea ice thickness from CryoSat-2.

ARCTIC AND ANTARCTIC LARGE WHITE-HEADED GULL SPECIES NEST MATERIALS – SIMILARITY ACROSS THE GLOBE

Iwan Parnikoza[1], Hadwiczak M.[2], Barcikowski M.[3], Stempniewicz L.[3]

[1]Institute of Molecular Biology and Genetics, National Academy of Science of Ukraine, Akademica Zabolotnogo Str. 150, 03143 Kyiv, Ukraine,

email: kunakh@imbg.org.ua

[2]Pomeranian Landscape Parks Administration, Poniatowski Str. 4A, 76-200 Słupsk, Poland

[3]Department of Vertebrate Ecology and Zoology, PolandWita Stwosza Str. 59, 80-308 Gdańsk, Poland

Previously we have shown that the most southern gull from the large white-headed gulls group, the kelp gull *Larus dominicanus*, from the Argentine Islands (maritime Antarctic) uses *Sanionia* moss species and *Deschampsia antarctica* Desv. Sprouts as nest building materials (Parnikoza et al., 2012). Typically, the moss is used for nest base construction and D. antarctica is used for nest tray lining. In the high Arctic conditions, the northernmost white headed gull, the glaucous gull *Larus hyperboreus*, also uses plants for its nests, in most cases as the main component. It was interesting to compare the materials and techniques of nest building used by these two related species in most extreme conditions.

Initially, 4 glaucous gull nests were studied in the NW coast of Bjørnøya (Bear Island the southernmost island of the Svalbard archipelago) from Nordvestbukta to Kapp Duner during a University of Gdansk expedition in July 2008. Additionally 20 nests were studied during a University of Gdansk and Norwegian Polar Institute expedition in June 2014. It was shown that the glaucous gull, similar to its Antarctic relative, prefer nesting at elevated sites where the snow melts faster. At these places vegetation is generally sparse. Only the ornithophylic plant *Cochlearia groenlandica* L. inhabits such locations, with the cover sometimes reaching up to 50 %. The glaucous gull builds their conical nests here from the plant material, resembling those built by the kelp gull. The most interesting fact is that the main component of this nest in both years was the moss *Sanionia uncinata* (Hedv.) Loeske, the same species that kelp gull uses in Antarctica. So we can suppose that the mechanic properties of *Sanionia* and its wide spread in both regions make it a preferred choice for both gull species. The glaucous gull also used dry plants for nest lining, which resembles the use of D. antarctica by the kelp gull. In the nest material collected in 2014, dry shoots of *Cochlearia groenlandica* were the most common. However, this plant is absent from the 2008 material. The reason for these differences remains unclear. In most nests of both seasons the grass *Dupontia fischeri* R.Br. additionally was present.

Due to poor vegetation at nest sites, the glaucous gull collected their main building material on *Sanionia uncinata-Dupontia fischeri* communities of high coastal plateau. Thus, this vegetation is available for gulls already in the beginning of nest building season. The top hill strategy used by the Antarctic kelp gulls in Argentine Island region promotes the

spread of *D. antarctica*. Whether the Bjørnøya plants have the same benefit remains to be determined.

This work was also supported by the agreement on scientific cooperation between the Polish Academy of Sciences and the National Academy of Sciences of Ukraine within the project 'Adaptive strategy of mutual survival of organisms in extreme environmental conditions' (2015-17).

ANTARCTIC HAIR GRASS AND KELP GULL INTERACTIONS: COMPARISON OF TWO MARITIME ANTARCTIC

Iwan Parnikoza[1], Esefeld J. [2], Mustafa O.[3], Braun C. [2], 2Peter H.-U. [2], 1Kuhakh, V. [1], Kozeretska I. [4]

[1]Institute of Molecular Biology and Genetics, National Academy of Science of Ukraine, Akademica Zabolotnogo Str. 150, 03143 Kyiv, Ukraine,

email: Parnikoza@gmail.com

[2]Institute of Ecology, University Jena, Dornburger Str. 159, 07743 Jena, Germany

[3]ThINK - Thuringian Institute of Sustainability and Climate Protection, Leutragraben 1, 07743 Jena, Germany

[4]Taras Shevchenko National University of Kyiv, Ukraine

A detailed study of the interaction between the kelp gull (*Larus dominicanus*) and Antarctic hair grass (*Deschampsia antarctica* Desv.) in the Argentine Islands region provided some evidence for the existence of strong relations between these species (Parnikoza et al., 2012; 2014). The main reason for this might be the fact that both hair grass and kelp gull during their growing/ breeding season have to choose those oases that get free of snow earlier and for longer time.

At the same time, the gulls could potentially give rise to new populations of *D. antarctica* over newly appearing areas. However, the question whether the same interaction occurs in other regions of the maritime Antarctic, particularly those with longer duration of the growing season remains unsolved. Luckily, the Fildes Peninsula (King George Island, South Shetland Islands) located approximately 400 km north is quite suitable for exploring such a synergy. Populations of *D. antarctica*, here as in the Argentine Islands, are relatively small, while the growing season lasts longer. The gulls start nesting earlier. For example on December 14th 2015 the gulls in the Argentine Islands have just been building their nests, whereas the Fildes Peninsulas' gulls have already had chicks.

In the 2013/14 season we analyzed nesting material composition of 14 nests of *Larus dominicanus* from different locations on Fildes Peninsula including Ardley Island. We found hair grass in 8 nests, where it ranged 2-80% of total nesting material. In 4 nests *D. antarctica* was rooted. These nests were placed directly on top of the hair grass populations or in very close proximity to them. In all other nests hair grass was absent. Distance to these nests from *D. antarctica* populations is 200 -1000 m. For the sake of certainty we repeated our survey in season 2014/15. In those nests that were reused, or in the new nests near abandoned ones, we found no difference in the pattern from that in the previous year.

We want to point out that, under the conditions of Argentine Islands the hair grass and the gull are literally forced to such "cooperation" due to short growing season. At the same time the

climate at Fildes Peninsula is milder so gulls have more options to choose. Argentine Islands nicely model the extreme conditions situation, which shows that in a harsh environment these two species get environmentally locked on each other.

This study was carried out as part of the State target scientific and technical research program in the Antarctic by 2011-2020.

SATELLITE-DERIVED FAST-ICE CLIMATOLOGY AND FAST-ICE GROWTH RATES OF ATKA BAY, ANTARCTICA

Stephan Paul[1], Mario Hoppmann[2], Sascha Willmes[2], Günther Heinemann[2]

[1]Umweltmeteorologie, Universität Trier, Behringstraße 21, 54296 Trier, Deutschland,

email: paul@uni-trier.de

[2]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, 27568 Bremerhaven, Deutschland

The landfast sea ice of Atka Bay is one of the few locations around Antarctica, where nearly continuous studies of sea ice and factors influencing its evolution are possible due to the presence of the German overwintering station Neumayer III. The sea ice in Atka Bay grows thicker than other fast ice and does not melt in situ due to the presence of a sub-ice platelet layer. Usually it breaks up in summer owing to the influence of a variety of factors, such as passing icebergs, warmer water- and air temperatures, tides, winds and the presence of a nearby polynya. However, up to now, no quantitative investigation on the processes involved in the formation and break-up of the Atka Bay fast ice has been conducted. As part of the international Antarctic Fast Ice Network (AFIN), we present the first long-term time series of Moderate-Resolution Imaging Spectroradiometer (MODIS) derived Atka Bay fast-ice coverage, as well as growth-rate estimates during spring and wintertime fast-ice formation for the period 2002-2014. We combine these results with iceberg observations, ERA-Interim atmospheric reanalysis data, meteorological measurements taken directly at Neumayer III, and continuous CTD data obtained below the nearby ice shelf. By doing so, we try to identify the main factors governing the fast-ice formation and break-up.

SEA ICE MASS BALANCE INFLUENCED BY ICE SHELVES (SIMBIS): FINAL REPORT

Stephan Paul[1], Mario Hoppmann[2], Priska A. Hunkeler[2], Sascha Willmes[2], Marcel Nicolaus[2], Günther Heinemann[2], Ralph Timmermann[2]

[1]Umweltmeteorologie, Universität Trier, Behringstraße 21, 54296 Trier, Deutschland,

email: paul@uni-trier.de

[2]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, 27568 Bremerhaven, Deutschland

The overall goal of the SIMBIS project was to improve our understanding of formation processes and properties of Antarctic sea ice and how these are influenced by its snow cover and platelet ice, which is formed in the water column from super-cooled water originating from ice-shelf cavities. In order to achieve this goal, we combined in-situ measurements with satellite-derived data sets and numerical simulations. A major field campaign was performed on land-fast sea ice of Atka Bay, close to Neumayer III station, from November 2012 to January 2013. These measurements were embedded into the AFIN (Antarctic Fast Ice Network) routine observations at Neumayer III station that are operational since 2010. A variety of measurement methods of sea-ice and platelet-layer thickness, investigation of snow properties and snow stratigraphy as well as atmospheric measurements were used to describe the physical properties of sea ice and its snow cover, as well as their seasonality. In order to up-scale the local measurements we used different remote sensing procedures (ground-based as well as spaceborne). Here, we present a concluding summary of achieved results in describing the seasonality of platelet-ice formation and accumulation under sea ice as well as platelet-layer properties from ground-based EM measurements, linkages between snow properties and X-band SAR backscatter, and how and to what degree the sea-ice mass balance and sea-ice properties are dominated by ocean/ice-shelf interactions.

OBSERVING THE INTRASEASONAL DYNAMIC OF A PYGOSCELIS PENGUIN COLONY – COMPARISON OF A MULTITEMPORAL ANALYSIS OF VERY HIGH RESOLUTION SATELLITE IMAGES WITH PHENOLOGICAL DATA

Christian Pfeifer[1], Jan Esefeld[2], Fritz Hertel[3], Jakob Maercker[1], Hans-Ulrich Peter[2], Marie-Charlott Rümmler[2], Martin Senf[2], Osama Mustafa[1]

[1]ThINK - Thüringer Institut für Nachhaltigkeit und Klimaschutz, Leutragraben 1, 07743 Jena, Deutschland,
email: jakob.maercker@think-jena.de

[2]Polar & Bird Ecology Group, Institute of Ecology, Friedrich Schiller University Jena, Germany

[3]Umweltbundesamt/Federal Environment Agency, Dessau-Rosslau, Germany

The effects of global climate change are noticed at many places of the Antarctic particularly the Antarctic Peninsula. This rising trend in global air temperature has far-reaching effects on the marine ecosystem and triggers a cascade of changes. Satellite images taken over the past two decades show that the extent of sea ice cover is altering. Census data of many penguin colonies notice changes in individual number, spatial distribution and species composition. An Antarctic-wide monitoring program could, in the long term, provide important information on alterations of penguin colonies serving as indicator for changes in ecosystems. Because of the large number of colonies and their often difficult accessibility a spatially consistent monitoring program can only be carried out by using satellite based remote sensing techniques.

Because of the limitations of cloud cover, especially at the Antarctic Peninsula, satellite images acquired have to be used at non-optimal dates in the course of the breeding season. This could be early in the season when the colony is not yet fully occupied or late in the season when there are crèches. This study investigates if or by which degree those images from non-optimal dates can be used for abundance estimations of penguin colonies. Therefore, a multi-temporal analysis using several very high resolution satellite images from the breeding season 2014/15 was performed at the Ardley Island penguin colony in the vicinity of King George Island. Because the spatial resolution of the satellite images is too low for detecting penguin individuals, the area covered by guano stains was mapped instead and compared with breeding pair numbers based on different ground based-mapping methods. These methods include GPS mappings on-site and UAV (Unmanned Aerial Vehicle)-based mappings which were performed close to the acquisition date of the satellite images used in this study. The results of the satellite-based surveys were additionally compared with frequently conducted phenological surveys of 138 *Pygoscelis papua* nests. This survey shows a clear distinction between different breeding stages like the incubating stage, the hatching stage and the crèche stage. While the study is still in progress, the first results of these comparisons will be presented and discussed.

GELISOLS IN THE LENA RIVER DELTA AND ITS HINTERLAND – GENESIS AND DIVERSITY

Eva-Maria Pfeiffer[1], Sebastian Zubrzycki[1], Lars Kutzbach[1], Irina Yakshina[2]

[1]Institute of Soil Science, Center for Earth System Research and Sustainability, Universität Hamburg, Allende-Platz 2, 20146 Hamburg, Germany,
email: empfeiffer@uni-hamburg.de
[2]Lena Delta Reserve, Tiksi, Russia

The North-Siberian Lena River Delta (LRD) is the largest Arctic delta and an important interface between the Arctic Ocean in the North and the large Siberian land masses in the South. LRD consists not only of Holocene deltaic sediment deposits as a river terrace and the modern active floodplains but also of remnants of the former Pleistocene mainland including large islands of ice-complex sediments and the Arga-Muora-Sise Island, which is composed of pure sand sediments of still debated origin. The highly diverse landscape structure of LRD is reflected by a great variety of permafrost-affected soils (gelisols).

This study aims at describing this great gelisol diversity and at analysing the dominant soil-forming processes in this comparatively scarcely studied soil region. The soil development in the investigated continuous permafrost region is limited by the short thawing period of around three months (June to September) and takes place in the shallow (below 1 m) seasonally thawed active layer. The geological parent material plays an important role for the development of soils in the LRD region. The distribution of the various soil types closely follows the pattern of the geomorphic units characterised by differing sedimentation conditions. The properties and genesis of the soils on the Holocene river terrace and the modern floodplains are strongly affected by the enormous amounts of fluvial sediments (about 12 x 10^6 tons per year) brought by the Lena River into its delta. The fluvial sedimentation together with the also pronounced aeolian sedimentation results in a fast vertical growth of soils. The upward rise of the soil surface leads to an upward movement of the permafrost table resulting in fast incorporation of soil material formed in the supra-permafrost zone into the permafrost.

Due to the morphodynamics of ice-wedge polygons and resulting formation of patterned ground with elevated rims and depressed and water-saturated centres, the Holocene river terrace of the delta is in its main extent covered by a soil complex of Glacic Aquiturbels and Typic Historthels. The active floodplain levels are dominated by sandy or gleyic subgroups of the Orthel suborder as e.g. Psammentic Aquorthels or Typic Psammorthels. The surfaces of the Arga-Muora-Sise Island are frequently reshaped by aeolian sedimentation and erosion. The soils on these scarcely vegetated landscapes are dominated by cryoturbated and sand-rich soil subgroups with high moisture contents, e.g., various Psammoturbels and Aquiturbels. The modern soils covering the older Pleistocene ice-complex plains are influenced by wide ice-wedge net structures and consist of a soil complex of Glacic Aquiturbels and Ruptic Historthels. The widespread thermokarst depressions within the ice-complex are covered by Ruptic Histoturbels and Ruptic Historthels, whereas the slopes are dominated by various Aquiturbels and Fluvaquentic Historthels. For the largely unexplored hinterland of LRD it can be

assumed that the active genesis of the soils lasts longer than in the active delta regions due to a much lower sedimentation and more stable surface conditions. In these regions widespread cryoturbated and peat-rich soil groups like Histoturbels and Historthels as well as Fibristels are found. An increased understanding of spatial variability and genesis of permafrost-affected soils is essential for meaningful predictions of climate change consequences in Arctic permafrost regions.

INTEGRATING GIS, FUNCTIONAL TRAITS AND FOOD WEBS IN ARCTIC MARINE RESEARCH: CREATING ADDED VALUE FOR SCIENCE AND STAKEHOLDERS

Dieter Piepenburg[1], Thomas Brey[1]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Am Handelshafen 12, 27570 Bremerhaven, Deutschland,
email: Dieter.Piepenburg@awi.de

Arctic marine biota are affected profoundly and at large scales, albeit with distinct regional differences, by accelerating environmental change, such as ocean warming and acidification, ice-shelf and sea-ice decline. Moreover, increasing human activities, e.g., exploration/ exploitation of natural and mineral resources, ship traffic, and tourism, add further cumulative pressures on them. Substantial effects are expected, leading to shifts in key ecosystem functions and services, e.g., biodiversity, trophic interactions, carbon and nutrient cycling, calcification and others. To understand, predict and mitigate the profound ecological consequences of these environmental changes, there is a need to describe the ecological status quo in terms of structural and functional properties on both regional and pan-Arctic scales. Moreover, the assessment of shifts in ecosystem functioning and ecosystem services requires the ability to identify and analyze the relationships between environmental drivers and ecosystem functions in both time and space. To address this challenge, we propose to develop, implement and utilize a pan-Arctic knowledge system on benthic biota (PANABIO), which integrates reliable, quality-controlled and geo-referenced data on marine communities with environmental information (observation and model data) at high spatial resolution and modeling tools. A close international cooperation of researchers is required to combine data and expertise in a joint cross-disciplinary effort to establish such a system. With the option of coupling to models of species distribution patterns and organism energetics, as well as to dynamic climate and oceanographic models, PANABIO would allow for

(a) providing ecological baseline data to gauge ecosystem changes against,

(b) analyzing coupling mechanisms between environmental drivers and ecosystem functions/ services on regional and pan-Arctic scales,

(c) developing future ecosystem scenarios in response to external forcing, and

(d) creating online stakeholder-oriented visualization and analysis tools.

The talk will demonstrate the huge benefits of pan-Arctic data-integration efforts to advance our knowledge and understanding of processes determining the distribution of benthic species and communities in the changing Arctic.

PAN-ARCTIC POLYNYA DYNAMICS AND THERMODYNAMIC ICE PRODUCTION ESTIMATES FOR 2002/2003-2014/2015 BASED ON MODIS THERMAL INFRARED IMAGERY AND ERA-INTERIM REANALYSIS

Andreas Preußer[1], Sascha Willmes[1], Günther Heinemann[1], Stephan Paul[1]

[1]Umweltmeteorologie, Universität Trier, Behringstr. 21, 54296 Trier, Deutschland,
email: preusser@uni-trier.de

In this circumpolar study, we use high-resolution MODIS thermal infrared satellite data to infer spatial and temporal characteristics of 11 prominent coastal polynya regions in the Arctic. Daily thin-ice thickness distributions were calculated from swath-data of MODIS ice-surface temperatures, combined with ECMWF ERA-Interim atmospheric reanalysis data in an energy balance model for the winters of 2002/2003 to 2014/2015 (November to March). Valuable quantities such as polynya area and total ice production were derived from daily thin-ice thickness composites. A coverage-correction scheme was applied to account for the varying amount of cloud-gaps in the daily composite images, depending on the specific region and time in winter. During the investigated period, the average total wintertime accumulated ice production in all 11 polynyas is estimated with about 2000 km³. The largest contributions originate from the Kara Sea region (~22%), the North Water Polynya (~14%) and scattered smaller polynyas in the Canadian Arctic Archipelago, while other well-known ice production regions (Laptev Sea, Chukchi Sea) contribute with around 6-7%. In general, daily ice production rates decrease from high values in November and December towards lower values at the end of a freezing season. Compared to previous pan-Arctic studies using passive microwave remote sensing data, our estimates are considerably larger although certain differences regarding the observed winter-period and polynya mask-areas do exist. Despite the short record of 13 winter-seasons, significant positive trends in ice production could be detected for some regions of the eastern Arctic, while other polynyas showed more interannual variability with no significant trend. The ice production estimates underline the basin-scale importance of coastal polynya systems considering their contribution to the cold halocline layer through salt release during ice-formation processes. Although reliable thin-ice thickness validation data is still absent and despite potential ambiguities from inherent cloud effects in the MODIS data, we think that our study contains the most accurate estimations of circumpolar polynya dynamics and ice production to date and represents a valuable dataset for atmosphere- and ocean-modelling applications.

SNOW MICROSTRUCTURE AND MODELLING IN SUPPORT OF PERMAFROST SCIENCE

Martin Proksch[1], Isabelle Gouttevin[2], Moritz Langer[3], Pirmin Ebner[1], Charles Fierz[1], Martin Schneebeli[1]

[1]WSL Institute for Snow and Avalanche Research SLF, Flüelastrasse 11, CH-7260 Davos Dorf, Schweiz,
email: proksch@slf.ch

[2]Laboratory of Cryospheric Sciences CRYOS, Ecole polytechnique fédérale de Lausanne EPFL, CH-1015 Lausanne, Schweiz

[3]Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Research Unit Potsdam, Telegrafenberg A 43, 14473 Potsdam, Germany

Permafrost underlies ~22% of the Northern Hemisphere ground surface and has been observed and projected to undergo severe degradation in the context of global warming. Yet, permafrost modelling is still a challenging task, even at monitoring stations where observations of ground properties exist. One of the main problems is the representation of the thermal properties of snow, which very much depend on snow microstructure and accumulation depth.

Here, we present the results of a spring campain lead on Samoylov Island, Lena Delta (72.4°N, 126.5°E), Siberia, where snow was investigated in terms of stratigraphy and microstructural parameters. Several snow profiles and transects were measured in order to characterise the snow over the polygonal tundra landscape. Cast snow samples were analysed by micro-computed tomography in the cold laboratory at SLF, Davos in order to calculate physical properties for relevant transport processes in the snowpack, such as thermal conductivity and permeability.

Additionally, the snow cover model SNOWPACK is applied at Samoylov, to assess its capability to represent a high-arctic snowpack. Overall, SNOWPACK predicts realistic profiles of physical and structural properties similar to the observed ones. This is an encouraging step for the application of snow modelling in support of the permafrost science community.

HOLOCENE LAKE-SYSTEM DEVELOPMENT IN HIGH MOUNTAIN ENVIRONMENTS OF THE TIBETAN PLATEAU

Arne Ramisch[1], Bernhard Diekmann[2]

[1]Technische Universität, Wissenschaftszentrum Weihenstephan, Hans-Carl-von-Carlowitz Platz 2, 85354 Freising, Deutschland,

email: arne.ramisch@tum.de

[2]Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar- und Meeresforschung, Telegrafenberg A43, 14473 Potsdam, Deutschland

Changing environmental conditions associated with a predicted change in global temperatures is believed to affect water availability on the high mountain environment of the Tibetan Plateau, potentially affecting approximately 20 % of the global population. The reconstruction of past environmental conditions may provide past climatic analogues to modern warming scenarios and help to elucidate the environmental response to climate forcing in this cold and arid environment. Here we present a Holocene record of environmental change inferred from inorganic lacustrine sediments of Lake Heihai, located on the northern fringe of the Tibetan Plateau. Changes in the inorganic mineral assemblage of a sediment core from the deepest part of the lake revealed major variations in sediment fluxes during the past ~12 ka induced by varying environmental conditions. After a prolonged dry and cold phase during the Late Glacial, allogenic sediment supply to Lake Heihai is characterized by a sudden intensification of precipitation generated sediment supply around ~10.7 cal. ka BP and a gradual decrease from ~7.9 cal. ka BP to present. This Holocene trend is in phase with known variations in atmospheric circulation systems over monsoonal Asia. The gradual long-term trend to more arid conditions is accompanied by several changes in the predominant endogenic carbonate phase, one of which evidences the onset of permafrost formation at ~3.9 cal. ka BP and hence a complete disappearance of the lake body. The disappearance is synchronous to a phase of weakened monsoonal precipitation as recorded in several continental and terrestrial archives throughout the Asian continent. For the central Kunlun Fault system, this climate event is the driest and coldest of the past 12 ka. The observed local paleoenvironmental evolution in the region of Lake Heihai was compared to two well-studied lake systems: Lake Donggi Cona situated on the north eastern Tibetan Plateau and Lake Nam Co on the southern Tibetan Plateau. The supra-regional comparison was based on the allogenic sediment input. Variations in allogenic sediment supply were characterized by factor analysis of elemental concentration in core sediments measured by X-Ray fluorescence scans. To account for a potential individual response of lake systems to climate forcing, a phase space reconstruction was carried out on the previously calculated elemental factors. Phase space reconstruction revealed that despite the individuality in the environmental setting of each lake, a similar sedimentary system consisting of three (yet unidentified) essential variables controls the allogenic sediment supply in each drainage basin. The Holocene dynamics in the allogenic sediment flux suggests the presence of a universal attracting state for lakes situated on the Tibetan Plateau. The attracting state is mainly characterized by short-term variation synchronous to solar output variations. Forcing mechanisms not originating from solar variations destabilize the systems dynamics and lead to unpredictable responses in sedimentary patterns of the lake systems. The last major destabilization phase was evident in the Early Holocene under increased monsoonal rainfall intensities caused by orbital variations.

MULTI-MISSION SATELLITE ANALYSIS OF WILKINS ICE SHELF, ANTARCTIC PENINSULA: STRUCTURES AND DYNAMICS

Melanie Rankl[1], Veit Helm[2], Matthias Braun[1]

[1]Institut für Geographie, Friedrich-Alexander-Universität Erlangen-Nürnberg, Wetterkreuz 15, 91058 Erlangen, Deutschland,

email: melanie.rankl@fau.de

[2]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, 27568 Bremerhaven, Deutschland

Wilkins Ice Shelf has shown considerable ice front retreat since the 1990s. This retreat includes various break-up events, such as in 2008 (Feb: 425 km², May: 160 km², Jul: 1220 km²) and in 2009 (790 km²). The break-up occurred in winter and summer with contrasting surface conditions, which indicates potentially different mechanisms for the various break-up events. WIS shows quite specific peculiarities like a large number of ice rises, highly variable ice thicknesses across the ice shelf, and only limited nourishing by direct inflow from tributary glaciers.

The present study analyzed satellite data (especially SAR) to reveal changes of glaciological structures like e.g., fractures and shear margins, the position of the grounding line, changes of frontal positions, ice surface velocities and ice thickness variations. We used different altimeter measurements, e.g., (ICESat, CryoSAT-2, NASA IceBridge) to derive the ice thickness distribution over the ice shelf. We further exploited data of the german TanDEM-X mission (2012-2013) which allowed for precise elevation measurements over the entire swath and complemented the point-based altimeter observations. The bi-static TanDEM-X acquisitions are not affected by temporal decorrelation, but might be affected by volume decorrelation. Limitations in the analysis of the data were the absolute reference and the variable penetration depth of the SAR signal in regard to surface conditions.

Surface velocities of the ice shelf and its tributary glaciers were derived from different SAR sensors (TerraSAR-X, ALOS PALSAR, ERS, ENVISAT) and dates (1992-1996, 2006-2009) using intensity tracking techniques. Time periods before and after break-up events were covered in order to study impacts of changes in buttressing resulting from the new ice front positions.

A LOW-IMPACT INDIVIDUAL MONITORING SYSTEM FOR ADELIE PENGUINS

Sebastian Richter[1], C. Le Bohec[2,3], B. Fabry[1], DP. Zitterbart[1,4]

[1]Friedrich Alexander Universität Erlangen-Nürnberg, Lehrstuhl für Biophysik, Henkestraße 91, Erlangen, Deutschland,

email: srichter@biomed.uni-erlangen.de

[2]Institut Pluridisciplinaire, Hubert Curien, CNRS, Strasbourg, France

[3]Laboratoire Européen Associé 'BioSensib' (LEA 647 / CNRS-CSM), Monaco

[4]Alfred-Wegener-Institute for Polar and Marine Research, Bremerhaven, Germany

Adelié Penguins are one of the most southerly breeding seabirds and form large colonies of up to several 10,000 breeding pairs. Despite their abundance and popularity, it is poorly understood how collective behavior and social hierarchy determine the structure of the colony and the breeding success of individual penguins. Furthermore, many available methods interfere with the animals' behavior. For example, the use of devices attached to animals such as data loggers or flipper bands require repeated human interaction for attachment and recovery, thereby inducing stress for the individuals and the colony. It was shown that attached devices have long-term impacts on breeding success, and they are inefficient for studying large groups.

A recent approach to study individual animals is the use of subcutaneous implanted RFID tags. As a passive identification system, there is no need to capture individuals repeatedly, e.g. to exchange batteries or to collect data. The small size and subcutaneous placement minimize the invasiveness of the method. Due to the short detection range of the RFID tags (60 cm) , identification is accomplished with static antennas. While identification of individuals becomes trivial, however, the placement of antennas is limited to a few fixed locations such as transit pathways and chokepoints. To identify individuals at other locations of interest inside the colony, e.g. nesting sites, handheld antennas can be used, but this requires close penguin-human interaction and limits the value of the method.

To reduce disturbances yet to allow for a more extensive monitoring of individual penguin behavior, we augmented an existing RFID identification system (ANTAVIA) with a set of cameras to surveil a confined breeding ground for Adelié Penguins. Upon entering or leaving the area, the penguins have to pass an RFID antenna, which allows us to identify individuals. We then follow and track the motion of each individual with 3 panorama video cameras using computer vision based video analysis. Our long-term tracking unveils biologically relevant data about nesting site, breeding partners, or preferred pathways within the colony. Furthermore, this information will allow us to draw conclusions about the social hierarchy.

We will present the current state of development with a focus on how mesoscale remote sensing techniques can help to reduce human impact while surveying a large area over long time periods.

THE VENTILATION AND CIRCULATION OF THE SOUTHERN INDIAN OCEAN ON GLACIAL / INTERGLACIAL TIMESCALES

Thomas Ronge[1], Ralf Tiedemann[1], Frank Lamy[1], Gerhard Kuhn[1]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Marine Geologie, Am Alten Hafen 26, 27568 Bremerhaven, Deutschland, email: tronge@awi.de

With this project, we want to enhance our knowledge of the global carbon cycle on glacial/ interglacial time-scales. To achieve this objective, it is of crucial importance to understand the role of the Southern Ocean on the release and uptake of greenhouse gases. As the southern Indian Ocean is currently fundamentally underrepresented in paleoceanographic reconstructions, it is our aim to reconstruct the contribution of this ocean to the atmospheric pattern of CO_2. Therefore, we plan to use a novel multiproxy-approach, combining stable ($\delta^{13}C$) and radiogenic ($\delta^{14}C$) isotope reconstructions with analyses of B/Ca-derived carbonate ion concentrations on a sediment core depth transect of the Kerguelen Islands. These analyses will provide a detailed insight into the history of water mass ventilation in the Indian Ocean on glacial/interglacial timescales. Ultimately, we want to combine the findings of this project with other water mass ventilation studies (e.g. Skinner et al., 2010; Sarnthein et al., 2013; Ronge et al., under review) and Earth System Modeling. These findings, in combination with previous studies from the Atlantic and Pacific Oceans will for the first time allow a comprehensive reconstruction of CO_2-enriched deep-water during the last glacial, the ventilation throughout the deglaciation and the contribution to the atmospheric CO_2-level.

EVOLUTION OF SURFACE VELOCITY, ICE EXPORT AND MASS BALANCE OF OUTLET GLACIERS TO LARSEN-A AND -B EMBAYMENTS, ANTARCTIC PENINSULA, SINCE 1995

Helmut Rott[1,2], Jan Wuite[1], Markus Hetzenecker[1], Thomas Nagler[1], Dana Floricioiu[3]

[1]ENVEO IT GmbH, Innsbruck, Austria,
email: Helmut.Rott@uibk.ac.at
[2]Institute for Meteorology and Geophysics, University of Innsbruck, Austria
[3]DLR IMF, Oberpfaffenhofen, Germany

The Larsen Ice Shelf on the Antarctic Peninsula has been subject to accelerating retreat due to climate warming which culminated in the collapse of the two northernmost sections, the Larsen-A and Prince Gustav Channel (PGC) ice shelves in January 1995, followed by disintegration of the main section of Larsen-B in March 2002. After these events outlet glaciers of the Antarctic Peninsula, previously feeding the floating ice shelves, became tidewater calving glaciers. These new boundary conditions caused significant acceleration of glacier flow and increased ice export. We use time series of synthetic aperture radar (SAR) data from the satellite missions ERS-1, ERS-2, Envisat, ALOS, and TerraSAR-X to analyse the evolution of ice flow of the outlet glaciers since 1995. Glacier volume change is estimated for several glaciers based on surface topography derived from interferometric SAR data of the TanDEM-X mission, available for different dates since 2011. The data base is complemented by ice thickness and surface elevation data from the NASA Icebridge campaign and altimeter data of NASA's ICESat. Ice velocity maps and estimates of ice thickness are used to retrieve ice discharge. TanDEM-X derived glacier volume change and ice discharge are combined to estimate the surface mass balance at the scale of individual glaciers as residual parameter. Our analysis shows that the collapse of Larsen-A and of the main section of Larsen-B Ice Shelf triggered a near immediate response of most tributary glaciers with increased velocities maintained to date. However, the behaviour of the individual glaciers varies, and velocities show significant fluctuations over time. After an initial speed up during the first years after collapse, several of the main glaciers slowed down significantly, whereas other glaciers continue to show widespread fluctuations in velocity and periods of major frontal retreat alternating with more stationary positions. Major acceleration is also observed for the remnant section of Larsen-B in SCAR Inlet and its larger tributaries. The acceleration of SCAR Inlet ice shelf started soon after the 2002 collapse event, but most of the velocity increase happened in the first years, followed by rather small variations in velocity since 2009. The data set, presented in this contribution, provides spatially detailed information on the dynamic response of the grounded ice masses to the disintegration of Larsen-A and -B, including the glaciers that are draining now directly into the ocean as well as the remnant ice shelf in SCAR Inlet and its tributary glaciers.

THE IMPACT OF UNMANNED AERIAL VEHICLES ON THE BEHAVIOR OF PENGUINS, GIANT PETRELS AND SEALS

Marie-Charlott Rümmler[1], Osama Mustafa[2], Jan Esefeld[1], Jakob Maercker[2], Martin Senf, Fritz Hertel[3], Hans-Ulrich Peter[1]

[1]Polar & Bird Ecology Group, Institute of Ecology, Friedrich Schiller University Jena, Dornburger Str. 159, 07743 Jena, Germany,

email: marie-charlott.ruemmler@uni-jena.de

[2]ThINK - Thüringer Institut für Nachhaltigkeit und Klimaschutz, Leutragraben 1, 07743 Jena, Deutschland

[3]Umweltbundesamt/Federal Environment Agency, Dessau-Rosslau, Germany

In recent years, the usage of unmanned aerial vehicles ('drones' or UAVs) has rapidly increased, even in Antarctic regions. Not only scientists use drones, i.e. for mapping or monitoring purposes, but also film teams for documentaries, cinema productions, station members and tourists bring them to produce video or image material of the Antarctic wildlife.

While there are guidelines for the operation of aircrafts near concentrations of birds in Antarctica, the possible impact of UAVs on Antarctic wildlife remains quite unknown. UAVs are significantly smaller than planes and produce less noise but could be sensed as a predator for some species because of their appearance and flight characteristics and therefore cause stress. Due to their potential to cause negative impacts on wildlife and particulary considering the amount of private use, it is important to form international agreed guidelines for UAV usage in the Antarctic. After our first surveys in the Antarctic season 2013/14 we were able to continue our studies from November 2014 to February 2015 on King George Island, South Shetland Islands, Antarctica. The project is a cooperation of the Thuringian Institute for Sustainability and Climate Protection (Jena) and the working group for Polar- and Ornitho- Ecology (Friedrich Schiller University, Jena) commissioned by the German Environment Agency. The aim of the project is to contribute to the scientific basis for UAV-guidelines. To quantify the impact of drones on the bird fauna we overflew different focal species with an octocopter in different altitudes and directions while recording their behavioral response. As in the recent year we focused on two penguin species, the Adelie penguin *(Pygoscelis adeliae)* and the gentoo penguin (*Pygoscelis papua*). Several breeding groups were visited regularly (if possible every 2 weeks) during their breeding period. Besides their behavioral responses we recorded physiological reactions by measuring the heart beat rate by using artificial eggs fitted with appropriate sensors. Other breeding birds studied in the project were southern giant petrels (*Macronectes giganteus*), of which we observed a small colony of about 10 birds. Additionally, the impact on mammals was examined by observing the reactions of southern elephant seals (Mirounga leonina) and Antarctic fur seals (*Arctocephalus gazella*). The data analysis is in progress, first results of this study will be presented.

LATERAL EXTRUSION AT THE EASTERN MARGIN OF THE EAST AFRICAN-ANTARCTIC OROGEN IN DRONNING MAUD LAND, SØR RONDANE

A. Ruppel[1], Läufer A.[1], Jacobs J.[2,3], Elburg M.[4], Krohne N.[5], Eagles G.[6], Mieth M.[7], Jokat W.[6], Damaske D.[1], Lisker, F.[5]

[1]Federal Institute for Geosciences and Natural Resources (BGR), Hannover, Germany,
email: antonia.ruppel@bgr.de

[2]University of Bergen, Bergen, Norway

[3]Norwegian Polar Institute, Tromsø, Norway

[4]University of of Johannesburg, Johannesburg, South Africa

[5]FB 5 Geoscience, University of Bremen,Bremen, Germany;

[6]Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Bremerhaven, Germany

[7]Statoil, Harstad, Norway

The geology of Sør Rondane has been the focus of intense research and occupies a key position for reconstructing the late Neoproterozoic to early Paleozoic geodynamic evolution in eastern Dronning Maud Land (DML). Sør Rondane appears to be located close to the supposed intersection of the East African-Antarctic Orogen (EAAO) and the Kuunga Orogen.

The western part of Sør Rondane is subdivided in two distinct terranes. The amphibolite to granulite-facies NE terrane is mainly composed of metasupracrustal rocks, with detrital zircon ages in part younger than 750 Ma, deposited on older basement of unknown, possibly Rayner-type, crust (Shiraishi et al., 2008). Metamorphism has been dated by U-Pb on zircon at ca. 640-600 Ma and amphibolite-facies retrogression dated at ca. 590-530 Ma. The SW terrane is subdivided by the Main Shear Zone (MSZ) into two lithothectonic units, i.e. Pan-African greenschist- to granulite-facies metamorphic rocks with “East African” affinities in the N and a Rayner-age early Neoproterozoic gabbro-tonalite-trondhjemite-granodiorite (GTTG) complex with “Indo-Antarctic” affinities in the S. The GTTG complex has suffered Pan-African greenschist- to lower amphibolite-facies thermal overprint, but also contains large domains with only weak deformation except for its northern margin close to the MSZ. The deformation there is related to high shear strain along this structure. New zircon crystallisation ages of the GTTG cluster around 1000-930 Ma. It is interpreted to have formed along a juvenile oceanic arc, in which the wide age range might indicate a long-lasting accretionary orogen.

The MSZ is characterized by a right-lateral sense of movement and high-strain ductile deformation under peak amphibolite-facies conditions. The structure can be traced over a distance of ca. 120 km between Lågkollane in the W and Lunckeryggen in the E and reaches several hundred meters in width. The MSZ cannot be traced further to the W where it seems to terminate at the north-eastern border of the NW-SE oriented prominent magnetically defined SE DML Province. The north-eastern border zone may coincide with a significant dextral shear

zone that runs from the Schirmacher Oasis into the region S of Sør Rondane (Schirmacher-Rondane Lineament). The SE DML Province most likely consists of Rayner-age (1000-900 Ma) crust with evidence of intense Pan-African reworking indicated by new geochronological data and was part of a large Tonian Oceanic Arc Super Terrane (TOAST). The continuation of the MSZ into eastern Sør Rondane and beyond is not clear either, since it appears to terminate at a N-S oriented region with low magnetic signatures (central Sør Rondane corridor) that is possibly related to extensional tectonics. Crosscutting relationships with dated magmatic rocks bracket the activity of the MSZ between Latest Ediacaran to Cambrian times (c. 560-530 Ma). Based on new combined aeromagnetic and structural results from a four-seasons survey of the greater Sør Rondane region, we propose that the crustal structural architecture of eastern DML and is strongly influenced by N-directed (with Africa/Antarctica restored to its original position in Gondwana) lateral extrusion of the EAAO. This process was likely driven by the combination of (i) indentation of the SE DML block towards the conjugate stable Kalahari-Grunehogna cratonic foreland, (ii) extensional collapse of the previously (c. 580-550 Ma) thickened and gravitational instable crust of central DML, and (iii) large-scale tectonic escape of crustal blocks in eastern DML along major shear zones such as the Schirmacher Rondane Lineament and MSZ towards an unconstrained yet unknown region at a lateral position of the EAAO.

DESICCATION TOLERANCE OF ANTARCTIC LICHEN PHOTOBIONTS: A TRANSCRIPTOMIC APPROACH

Andres Sadowsky[1], Sieglinde Ott[1]

[1]HHU Düsseldorf, Institut für Botanik,
Universitätsstraße 1, 40225 Düsseldorf, Deutschland,
email: andres.sadowsky@hhu.de

Photosynthetic organisms in Antarctic terrestrial biota are challenged by low temperatures as well as by longer periods of drought, high insolation, and short vegetation periods. Despite these harsh conditions, the lichen symbiosis survives and largely forms the dominant vegetation. The question arises which mechanisms cause the high resistance to the above mentioned parameters in the lichen symbiosis and its dominance in Antarctic terrestrial habitats, and how far is it based molecularly? Lichens are poikilohydric life forms and many species, especially in the Antarctic, resist long-term dehydration. Desiccated lichens are highly resistant against multiple extremes of abiotic factors. The isolated photosynthetic partners of the symbiosis, the photobionts, show limited desiccation tolerance and the potential to reactivate quickly upon rehydration. The recent knowledge on the genetic level of desiccation tolerance in photobionts is scarce. Transcriptomic studies are suitable to investigate and compare differential gene expression. The analysis of transcription of the lichen symbiosis under stress conditions is a new field of research and has not been applied to Antarctic lichen photobionts before. A comparative transcriptomic study of the desiccation tolerance of two isolated photobionts is presented. These green algae isolated from two continental Antarctic lichen species display differential physiological responses to abiotic stressors such as light, cold and drought. Of the c. 6,000 transcribed genes detected in each photobiont, c. 15% experience differential expression upon desiccation. The cellular functions influenced include heat shock proteins and parts of the antioxidative pathways, as well as the photosynthetic light reaction, small sugar metabolism, growth, and cell proliferation. The results indicate that protection of protein conformation may be a key factor in desiccation tolerance, while the strategy can be based on various mechanisms. The remarkable reactivation potential of lichens may be based on these strategies which are triggered by desiccation. The results foster the knowledge on the role of photobionts in the lichen symbiosis and its potential to adapt to as well as to colonize habitats described by severe environmental conditions as e.g. on continental Antarctica.

„WIE GLEICHGÜLTIG GEHT DIE NATUR ÜBER UNSERE LEISTUNGEN HINWEG.“ UM EIN INSTITUTIONELLES GEDÄCHTNIS FÜR DIE ARKTIS- UND ANTARKTISFORSCHUNG. DAS ARCHIV FÜR DEUTSCHE POLARFORSCHUNG (ADP) 2011–2013

Christian Salewski[1]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Am Alten Hafen 26, 275768 Bremerhaven, Deutschland,
email: Christian.Salewski@awi.de

Der Vortrag verfolgt zunächst das Ziel, die prinzipielle Archivwürdigkeit der Polar- und Meeresforschung und die Notwendigkeit ihrer institutionalisierten Erinnerung aufzuzeigen. Dies soll mit Bezug auf die großen Schwierigkeiten der Polar- und Meeresforschung geschehen, die Arktis und Antarktis zu erforschen, mit Bezug auf den besonderen Charakter der Polargebiete und mit Bezug auf Leistungen der mit ihnen befassten Wissenschaft. In einem archivhistorischen Rückblick will das Referat zweitens die wesentlichen Faktoren benennen, welche in Deutschland seit dem 19. Jahrhundert die systematische und fachgerechte Archivierung von Materialien aus der Polar- und Meeresforschung bestimmt haben. Dabei will es die Rolle beschreiben, welche das Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung (AWI) seit seiner Gründung im Jahr 1980 als Bestandsbilder bei der Produktion von Unterlagen dieser Wissenschaft und als Archivträger bei der Sicherung und Archivierung von archivwürdigen Dokumenten aus diesem Bereich gespielt hat. Dabei wird der Vortrag die Bedeutung des Instituts für die Entwicklung des AdP besonders hervorheben. Als drittes beabsichtigt der Vortrag, das AdP selbst vorzustellen. Hierzu werden die Ziele dieses jungen historischen Spezialarchivs dargelegt und dessen Sprengel sowie die geografischen Grenzen seines Sammlungsbereichs skizziert. Außerdem gibt der Vortrag einen Überblick über dessen in stetigem Wachstum begriffenen, vielfältigen und inhaltlich viel-schichtigen Archiv- und Sammlungsbestände.

Abschließend wendet sich das Referat direkt an mögliche Archivgeber und Benutzer. Ihnen wird es die Wege, dem AdP Archiv- und Sammlungsgut zu übergeben, sowie die Nutzungs-möglichkeiten, aber auch -grenzen unter den vorgegebenen rechtlichen Rahmenbedingungen erläutern.

RECENT YEARS OF EXTREME ICE-MASS BALANCE IN GREENLAND: INSIGHTS FROM GRACE AND ATMOSPHERE MODELS

Ingo Sasgen[1,2], Bert Wouters[3,4], Xavier Fettweis[5], Christoph Dahle[2], Christopher Vernon[4], Jason E Box[6], Michiel van den Broeke[7]

[1]Department of Geosciences, Pennsylvania State University, State College, PA, United States,

email: sasgen@gfz-potsdam.de

[2]Department of Geodesy and Remote Sensing, German Research Centre for Geosciences, Potsdam/ Wessling, Germany

[3]Department of Physics, University of Colorado, Boulder, CO, United States

[4]School of Geographical Sciences, University of Bristol, Bristol, United Kingdom

[5]Department of Geography, University of Liège, Liège, Belgium

[6]Geological Survey of Denmark and Greenland, Copenhagen, Denmark

[7]Institute for Marine and Atmospheric research Utrecht (IMAU), Utrecht, The Netherlands

The Greenland Ice Sheet (GrIS) experienced two years of extreme mass balance in 2012 and 2013; while 2012 exhibited exceptionally vigorous ice loss in summer, the ice sheet was close to balance in 2013. Here we analyse the output of two GrIS surface-mass balance models and compare it to the GRACE observations at the regional scale. We show that the 2012 losses were caused by enhanced melt production, mainly originating in the south-west of the ice sheet. In contrast, melt production was much lower in 2013 – making this year similar to the conditions observed between the years 1960-1990, in which the ice sheet is considered to have been close to balance. To a large extent, the observed mass variability is a consequence of the large-scale North Atlantic atmospheric circulation, as reflected by the North Atlantic Oscillation (NAO) index; circulation either favours transporting heat from the mid latitudes along the west coast of the GrIS or allows for more cold air to flow from the Canadian Arctic. We show the level of agreement between GRACE and the atmospheric models, infer the snow, net melt and ice dynamic contributions in the 2012 and 2013 mass balance anomalies, and discuss whether pre-conditioning of the ice sheet in 2012 played a role for the mass balance in 2013. The transition from extreme melt year to a near-balance year is unprecedented in the multi-decadal records of the atmospheric models; and both years are exceptional regarding the trends observed in the last decade.

WEST ANTARCTIC GLACIAL-ISOSTATIC ADJUSTMENT IN THE PRESENCE OF WEAK EARTH STRUCTURE

Ingo Sasgen[1,2], Volker Klemann[2], David Pollard[1], Hannes Konrad[2]

[1]Department of Geosciences, Pennsylvania State University, State College, PA, United States,
email: sasgen@gfz-potsdam.de

[2]Department of Geodesy and Remote Sensing, German Research Centre for Geosciences, Potsdam/ Wessling, Germany

The glacial-isostatic adjustment (GIA) in Antarctica is an important correction for satellite-derived ice-sheet mass balances. Moreover, it reflects the past ice evolution and potentially constrains the viscoelastic structure of solid Earth. Although much improvement has been made to consistently model GIA accounting for diverse observational evidence, predictions remain ambiguous. In Antarctica, the primary unknown is the Earth structure; recent seismic indicate lithosphere thicknesses and viscosity values in West Antarctica much lower than commonly assumed. Here, we explore the impact of a weak Earth structure for West Antarctica on the induced GIA signal. We present disc-load experiments characterizing the effect of a low asthenosphere viscosity, as well as of a ductile layer in the crustal lithosphere on the predicted GIA. We then employ the weak Earth structure together with a complex ice sheet reconstruction and show the implications for the interpretation relative sea level indicators and present-day uplift rates. Finally, we determine the impact of these simulations on quantifying the ice-sheet mass balance from satellite gravimetry.

FIRN COMPACTION MODELING FOR AN ARCTIC ICE CAP – FIRST RESULTS

Björn Saß[1], Matthias Braun[1]

[1]Institute of Geography, University of Erlangen, Wetterkreuz 15, 91058 Erlangen, Deutschland, email: bjoern.sass@fau.de

Our motivation is to address uncertainties which result from converting geodetic volume change into glacier mass balance. We are currently developing an application which rises the accuracy of geodetic mass balances. Here, we want to present steps of development and discuss first results.

Until now, we calculated glacier mass balances with a constant conversion factor of 850 kg/m³ or the density of ice (917 kg/m³) for entire glacier basins, altitude dependent density variations and firn layer thickness were unnoticed this way. Or we used constant densities for the ablation (900 kg/m³) and accumulation (600 kg/m³) areas, whereby not homogenous density variations with varying climate conditions were not considered. A decline of the accuracy in the amount of mass change must be assumed for each approach. Although the significance of the uncertainty is not clear at the moment, it is a systematic component of uncertainty in geodetically determined mass balances, and thus need to be addressed for accuracy improvement. We achieve our goal – a tool for accuracy improvement – by combining and modifying existing models (FDM, COSIMA, Crocus, snow2blow, OPM) and the combination of verifiable physical parameters (climate, melt pattern, firn ice transition, pore closure) and model components (density assumptions, constants, refreezing, snow drift). Methodically we combine remote sensing data (TanDEM-X, ICESat, CryoSat-2, Aster) and methods (InSAR, geodetic approach), climate data reanalysis and downscaling (ERA-Interim) and the extensive analysis of data from the International Polar Year 2007/8, in particular the IPY KINNVIKA archive (GPR, snow pit, stake and AWS measurements, GPS and DGPS profiles). This year we analyze the surface climate and energy balance and actualize the digital elevation dataset of our study area (see below), with the main goal to retrieve exemplary 1D firn compaction rates as a function of climatic conditions. Thereafter we compare elevation data sets in geodetic manner and update and extend mass balance time series of the study area. Subsequently, 2017, we will model the firn compaction rate for the entire study area and correct our mass balance time series. The model will be offered to the scientific community. Our main study area for the next two years is the Vestfonna Ice Cap (VIC) on the island Nordaustlandet in the north east of Svalbard. The VIC is ~2400 km² in size and has a dome like shape with well defined outlet glaciers. Further test sites are in the planning. At the end of our study, we will be able to estimate firn densification on glaciers and ice caps to retrieve the amount of elevation change that is attributed to compaction. Additionally we will be able to derive layer based densities to be used for geodetic volume to glacier mass change conversion. On the Polartagung 2015 we present a poster showing the study concept and first results.

EISMASSENBILANZ UND GLAZIAL-ISOSTATISCHER AUSGLEICH IM GEBIET DES AMUNDSENMEERES, WEST-ANTARKTIS, MIT HILFE GEODÄTISCHER BEOBACHTUNGEN UND MODELLIERUNG

Mirko Scheinert[1], Martin Horwath[1], Andreas Groh[1], Peter Busch[1], Christoph Knöfel[1], Ludwig Schröder[1]

[1]TU Dresden, Institut für Planetare Geodäsie, Helmholtzstr. 10, 01062 Dresden, Deutschland, email: Mirko.Scheinert@tu-dresden.de

Der größte Anteil des Eismassenverlusts in der Antarktis von ca. 110 Gt/a ist für den westantarktischen Eisschild festzustellen. Der äquivalente globale Meeresspiegelanstieg beträgt ca. 0,4 mm/a. Ein Zusammenbruch dieses marin basierten Eisschilds würde den globalen Meeresspiegel weit über die Werte hinaus ansteigen lassen, die bis 2100 prädiziert werden. Dabei ist die für Änderungen am meisten sensitive Region gerade das Gebiet des Amundsenmeeres, insbesondere mit den großen Eisströmen von Pine-Island-, Thwaites und Smith-Gletscher. Auch deshalb hat sich diese Region in den letzten Jahren zu einer Schlüsselregion für intensivierte Forschung entwickelt.

Um die Eismassenbilanz zu bestimmen, werden die geodätischen Methoden der Satellitengravimetrie und -altimetrie zusammen mit präzisen, wiederholten GPS-Messungen genutzt. Jedoch ist die Korrektion aufgrund des glazial-isostatischen Ausgleichs (GIA) nach wie vor eine Hauptquelle der Unsicherheit und somit für den größten Fehleranteil in den auf der Satellitengravimetrie basierenden Schätzungen der Eismassenbilanz verantwortlich. Zudem liegt der GIA-Masseneffekt in der gleichen Größenordnung wie die derzeitigen Eismassenänderung selber. Modellen, die für die Prädiktion von GIA-Effekten benutzt werden, mangelt es nach wie vor an auf Messungen basierenden Randbedingungen sowie an ausreichender Komplexität sowohl der Eisauflastgeschichte als auch der Rheologie.

Im entsprechenden DFG-SPP-Projekt soll von einer antarktisweiten Analyse ausgegangen und dann auf die Region des Amundsenmeeres fokussiert werden. Dabei wird die Kombination von Satellitengravimetrie und -altimetrie für die Schätzung des GIA-Effekts verwendet. Wiederholte GNSS-Messungen konnten bereits an drei Stationen im Arbeitsgebiet durchgeführt werden. Ursprünglich für Anfang 2015 geplante Messungen konnten aufgrund der Absage der Polarstern-Fahrt PS90 nicht realisiert werden. Diese werden für 2017 neu geplant; ein zusätzliche Messung soll in der kommenden Saison stattfinden. Schließlich sollen die aufgrund der in-situ-Messungen bestimmten vertikalen Deformationen für eine Validierung und Verbesserung der GIA-Modellierung genutzt werden. Dazu müssen auch die Ergebnisse geophysikalischer, glazial-morphologischer und geologischer Untersuchungen herangezogen werden, um speziell Randbedingungen für eine realistische Datierung und Positionierung der Eisauflasten zu erschließen.

Der Beitrag gibt eine Übersicht über den gegenwärtigen Stand der Forschung sowie der Arbeiten am Institut sowie über zukünftig geplante Aktivitäten, die z.B. auch das Gebiet der antarktischen Halbinsel einschließen.

GEODÄTISCHE MESSUNGEN IM GEBIET DES SUBGLAZIALEN LAKE VOSTOK: IMPLIKATIONEN FÜR GEODYNAMIK UND GLAZIOLOGIE

Mirko Scheinert[1], Andreas Richter[1], Ludwig Schröder[1], Martin Horwath[1], Reinhard Dietrich[1], Lutz Eberlein[1], Mathias Fritsche[1], Joachim Schwabe[1], Heiko Ewert[1], Sergey V. Popov[2], Valery V. Lukin[3], Alexey Yu. Matveev[4], Evgenyi V. Brovkov[4], Denis V. Fedorov[4], Alexey A. Ekaykin[5], Vladimir Ya. Lipenkov[4], Diana Vladimirova[5]

[1]TU Dresden, Institut für Planetare Geodäsie, Helmholtzstr. 10, 01062 Dresden, Deutschland, email: Mirko.Scheinert@tu-dresden.de

[2]Polar Marine Geoscience Expedition (PMGE), St. Petersburg, Russia

[3]Russian Antarctic Expedition (RAE), St. Petersburg, Russia

[4]Aerogeodeziya, St. Petersburg, Russia

[5]Arctic-Antarctic Research Institute (AARI), St. Petersburg, Russia

Im Verlauf von mehr als einer Dekade, seit 2001/2002 bis zur jüngst beendeten Antarktissaison 2014/2015, wurden geodätische Messungen im Gebiet des subglazialen Lake Vostok und im Sektor der Stationen Progress und Vostok, Ostantarktis, realisiert. Wiederholte GNSS-Messungen von ca. 60 Signalen an der Eisoberfläche erlauben es, dreidimensionale Positionsänderungen der Firnpartikel zu bestimmen. Wiederholte kinematische GNSS-Messungen ermöglichen die Ableitung von Höhen und Höhenänderungen der Eisoberfläche entlang von Profilen bzw. in Kreuzungspunkten. Diese in-situ Messungen werden mit hochaufgelösten, regionalen geometrischen Modellen und einer Wiederholspuranalyse von Laseraltimetrie-Daten des Satelliten ICESat kombiniert.

Höhenänderungen der Eisoberfläche über dem Lake Vostok widerspiegeln den kombinierten Effekt von lokalen Eismassenänderungen, der Bilanz des Wasserkörpers sowie der Zirkulation im größten subglazialen See der Erde. Durch die Kombination der verschiedenen Beobachtungstechniken sowie mit Modellen z.B. der Eisdicke und Seebathymetrie ist es möglich, die Beiträge verschiedener individueller Prozesse innerhalb des Sees bzw. des Eisschildes zu separieren. Unsere Untersuchungen ergeben folgende Schlussfolgerungen:

(1) Im Bereich des Lake Vostok befindet sich der antarktische Eisschild nahezu in ausgeglichener Massenbilanz. (2) Es ist kein Ausfluß aus dem Lake Vostok zu erwarten. (3) In der letzten Dekade konnte keine Zunahme des Wasservolumens im See festgestellt werden. (4) Damit kann der Lake Vostok nicht als "aktiver" subglazialer See bezeichnet werden. (5) Räumlich-zeitliche Höhenänderungen als Folge der Seezirkulation betragen maximal 1 cm. (6) Die Firnverdichtung erfolgt linear innerhalb des betrachteten Zeitbereichs von einer Dekade. Damit kann nachgewiesen werden, dass die Eisoberfläche über dem Lake Vostok sich hervorragend als Gebiet für die Kalibrierung der Satellitenaltimetrie eignet. Beispielhaft werden Offsets für die verschiedenen Arbeitsperioden des Laseraltimeters GLAS an Bord von ICESat präsentiert.

DIE GESCHICHTE DER KOHLENSTOFF-EINLAGERUNG IN BIS ZU 200 TAUSEND JAHRE ALTEN BÖDEN IN NORDSIBIRIEN

Georg Schwamborn[1], Lutz Schirrmeister[1], Sebastian Wetterich[1], Jens Tronicke[2], Stephan Schennen[2], Margret Fuchs[3], Josefine Walz[4], Hans-W. Hubberten[1]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Telegrafenberg A43, 14473 Potsdam, Deutschland,

email: georg.schwamborn@awi.de

[2]Universität Potsdam, Institute of Earth and Environmental Science, Potsdam-Golm, Deutschland

[3]Helmholtz-Zentrum Dresden-Rossendorf e. V, Dresden, Deutschland

[4]Institute of Soil Science, Center for Earth System Research and Sustainability, Universität Hamburg, , Deutschland

Auf Bol'shoy Lyakhovsky, die südlichste der Neusibirischen Inseln, wurden fünf Bohrkerne mit einer Gesamtlänge von 52 m gewonnen. Sie erfassen Permafrostböden aus dem Holozän bis zurück ins Prä-Eem (ca. 200 Tausend Jahre vor heute). Die z.Zt. laufenden geowissenschaftlichen Analysen der Kerne beinhalten sedimentologische, geophysikalische, biogeochemische und mikrobiologische Techniken. Hauptziel des Projektes ist es, die aktuelle natürliche Produktion von Treibhausgasen in Permafrostböden zu bewerten, um eine künftige Treibhausgasproduktion in einer wärmer werdenden Arktis besser abzuschätzen. Die heutigen Raten der Treibhausgasproduktion werden dabei mit Signalen des Abbaus organischer Substanz in den zurückliegenden zwei Glazial-Interglazial-Zyklen in Beziehung gesetzt. Diese Studie ist Teil des deutsch-russischen Gemeinschaftsprojektes CARBOPERM, das mehr als 50 Wissenschaftler aus verschiedenen Instituten in Deutschland und Russland verbindet. Das 3-Jahres-Projekt widmet sich dem besseren Verständnis der Bildung, Umwandlung und Freisetzung von organischem Kohlenstoff in nordsibirischen Permafrostlandschaften.

GROUND-BASED REMOTE SENSING OF THE ATMOSPHERIC BOUNDARY LAYER IN THE LAPTEV SEA AREA AND COMPARISONS WITH REGIONAL CLIMATE SIMULATIONS

Pascal Schwarz[1], Clemens Drüe[1], Oliver Gutjahr[1], Svenja,Kohnemann[1],Günther Heinemann[1], Alexander Makshtas[2]

[1]Umweltmeteorologie, Universität Trier, Behringstraße 21, 54296 Trier, Deutschland,
email: schwarzp@uni-trier.de
[2]Arctic and Antarctic Research Institute,
St. Petersburg, Russia

In the winter season 2014/2015 a field campaign at the Tiksi observatory (71°38N, 128°52E) was carried out by the University of Trier with support of the Arctic and Antarctic Research Institute (AARI) and the GEOMAR Kiel in framework of the interdisciplinary Transdrift project. One goal of the campaign is to help to improve the understanding of processes within the Arctic stable boundary layer (SBL). Within the SBL, there are several important phenomena and processes like low level jets, surface and lifted inversions, the development of the mixing height or the determination of the energy balance, which can be best investigated with a mix of high-resolution ground-based remote sensing systems and flux tower measurements. We use a SODAR/RASS, a scintillometer, a ceilometer as well as the local flux tower to investigate the SBL for the Arctic winter. In addition, regional climate model simulations using the COSMO-CLM (consortium for small-scale modelling – climate limited area modelling) driven by Era-interim reanalysis data have been performed. Results are shown for measurements of the mixing height, surface energy fluxes and low level jets events as well as comparison between the measured data with COSMO-CLM and Era-interim.

SEASONAL AND MULTIANNUAL VARIABILITY OF PERMAFROST IN ALPINE TALUS SLOPES BELOW THE TIMBERLINE

Daniel Schwindt[1], Christof Kneisel[2]

[1]Technische Universität, Wissenschaftszentrum Weihenstephan, Fachbereich für Geomorphologie und Bodenkunde, Hans-Carl-von-Carlowitz Platz 2, 85354 Freising, Deutschland,

email: daniel.schwindt@tum.de

[2]Universität Würzburg - Lehrstuhl für Physische Geographie, Deutschland

In the central Alps permafrost can be expected above 2300 m a.s.l., at altitudes where mean annual air temperatures are below -1 °C. Isolated permafrost occurrences can be detected in north-exposed talus slopes, far below the timberline, where mean annual air temperatures are positive. Driving factors are assumed to be a low income of solar radiation, a thick organic layer with high insulation capacities as well as the thermally induced chimney effect.

Aim of the study is to achieve a deeper understanding of the factors determining the site-specific thermal regime, as well as the spatially limited and temporally highly variable permafrost occurrences in vegetated talus slopes. Three supercooled talus slopes in the Swiss Alps (Val Bever and Val Susauna, Upper Engadin; Brüeltobel, Appenzeller Alps) were chosen for investigation. Substantially different site characteristics – rooted in the nature of talus substrate, in humus- and vegetation distribution, altitude and climatic conditions – were a central criterion in the selection of study sites. Investigation of spatiotemporal permafrost dynamics are based on joint application of different geophysical methods (electrical resistivity tomography (ERT) in 2D, 3D and 4D; seismic refraction tomography (SRT) in 2D and 4D). Investigations of the ground thermal regime were based on the analysis of temperature logger data. Besides recording air- and ground surface temperatures, focus was set on the temperature evolution in vents and in the organic layer. The existence of permafrost could be proven at all study sites. Spatially, permafrost bodies show a narrow transition to neighbouring, unfrozen areas. The temporal variability of permafrost has proven to be exceptionally high, with the magnitude of seasonal variations distinctly exceeding intra-annual changes. Thereby, the winter season is characterized by a significant supercooling. During snowmelt a growth in volumetric ice content is induced by refreezing of percolating meltwater on the supercooled talus. The results confirmed the fundamental influence of the chimney effect on the existence and temporal variability of permafrost in talus slopes. Divergences in the effectiveness of the thermal regime were detected between the study sites. These are mainly based on differences in the nature of talus material, humus characteristics and vegetation composition. During summer, the organic material is usually dry at the daytime, inducing a high insulation capability and a protection of the subsurface against high atmospheric temperatures. Bouldery talus slopes typically show an organic layer that is fragmented by large boulders, which induces a strongly reduced insulation capability and allows an efficient heat exchange by convective airflow and percolating precipitation water. In the winter half-year, the thermal conductivity of the organic layer increases massively under moist or frozen conditions, allowing an efficient, conductive

cooling of the talus material. The convective cooling in bouldery talus slopes affects an earlier onset and a higher magnitude of supercooling than under consistent humus conditions. Here, conductive heat flow is dominant and the cooling in autumn is buffered by a prolonged zero curtain. The snow cover has proven to be incapable of prohibiting an efficient supercooling of the talus slope in winter, almost independent from thickness.

RECENT CHANGES IN ICE DYNAMICS OF NORTHERN ANTARCTIC PENINSULA GLACIERS REVEALED FROM MULTI-MISSION REMOTE SENSING DATA

Thorsten Seehaus[1], Matthias Braun[1], Sebstián Marinsek[2], Pedro Skvarca[3]

[1]Institut für Geographie, Universität Erlangen Nürnberg, Wetterkreuz 15, 91058 Erlangen, Deutschland,
email: thorsten.seehaus@fau.de

[2]Instituto Antártico Argentino, Buenos Aires, Argentina

[3]Glaciarium, Museo del Hielo Patagónico, El Calafate, Argentina

The climatic conditions at the Antarctic Peninsula changed considerably during the last 50 to 60 years. Numerous ice shelves strongly retreated or disintegrated completely within the last decades. Increased ice discharge, widespread ice front retreat and glacier surface lowering were reported by various authors. The major ice loss is addressed to glaciers formerly draining into ice shelves. The loss of the buttressing forces caused increased ice discharge at this former tributary glaciers.

We analyse time series of various SAR satellite sensors (ERS-1/2 SAR, ENVISAT ASAR, ALOS PALSAR, TerraSAR-X/TanDEM-X) in regard to study changes in surface velocities. Ice thickness data is integrated to estimate variations in the ice discharge. Changes in surface elevation are derived from high resolution bi-static TanDEM-X satellite data, ASTER and SPOT stereo images. At the Dinsmoor-Bombardier-Edgeworth glacier system, former Larsen-A tributary, a strong increase in surface velocity of up to 600% relative to pre-ice-shelf-collapse conditions was found in 2000 with a subsequently deceleration till present. Since 1995 the surface lowering amounts up to 140 m and the area loss of grounded ice to 58 km². Similar dynamic adjustments to ice shelf disintegration were also found at the Prince-Gustav-Channel area. By combining all data sets the total mass loss is approximated. Our results will help to improve the mass loss estimates at the Antarctic Peninsula und the understanding of glacier adjustments to ice shelf collapse.

REAKTION DER ATMOSPHÄRE AUF EINE VERRINGERUNG DER ARKTISCHEN MEEREISDICKE

Tido Semmler[1], Thomas Jung[1,2], Soumia Serrar[1]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Am Handelshafen 12, 27570 Bremerhaven, Deutschland,
email: Tido.Semmler@awi.de
[2]Universität Bremen, Deutschland

Um den Einfluss dünneren arktischen Meereises auf die Atmosphäre im Winter zu verstehen, haben wir mit dem Integrated Forecast System des Europäischen Zentrums für Mittelfristige Wettervorhersage idealisierte Ensemble-Experimente mit erhöhter Meereisoberflächentemperatur durchgeführt. Der Fokus ist die schnelle Reaktion der Atmosphäre auf eine plötzliche Verringerung der arktischen Meereisdicke, um die Rolle verschiedener Prozesse zu unterscheiden. Unsere Ergebnisse zeigen, dass Turbulenz in der Grenzschicht der wichtigste Prozess ist, der die anomale Wärme vertikal verteilt. Die Reaktion der großskaligen atmosphärischen Zirkulation ist relativ klein mit bis zu 2 hPa im Bodenluftdruck während der ersten 15 Tage; wenn das System im zweiten und dritten Monat der Simulationen nahezu einen neuen Gleichgewichtszustand erreicht hat, treten stärkere Differenzen bis zu 4 hPa auf. In den ersten Tagen beobachten wir über der Arktis Luftdruckverringerung am Boden und Erhöhung in der Mitte der Troposphäre, was durch die anomale Wärme am Boden einfach zu erklären ist. Bereits nach wenigen Tagen entwickelt sich ein anomales Hochdruckgebiet über Nordwest-Sibirien und Nordost-Europa, das sowohl am Boden als auch in der mittleren Troposphäre ausgeprägt ist. Dieses führt zu verringerter Westwindströmung in Teilen von Nord- und Mitteleuropa sowie Nordasien und kann zu weniger maritimen Einfluss auf unser Klima führen. Diese Reaktion zeigt sich auch im Quasi-Gleichgewichtszustand nach mehreren Monaten, und zwar noch verstärkt. Daraus und aus weiterer Analyse lässt sich schließen, dass bereits schnelle troposphärische Prozesse wie der verringerte Transport von Wellenenergie auf der synoptischen Skala vom östlichen Nordatlantik nach Nordeuropa und Nordwest-Sibirien die beschriebene Änderung der großskaligen Zirkulation initiieren können.

HABITAT CHANGES OF POLAR BEARS IN SUMMER AS ASSESSED BY LONG TERM OBSERVATIONS IN THEIR NORTH-EAST GREENLAND RANGE

Benoit Sittler[1], Johannes Lang[1]

[1]Landespflege, Universität Freiburg,
Tennenbacherstr. 4, 79106 Freiburg, Deutschland,
email: benoit.sittler@landespflege.uni-freiburg.de

Large reductions in sea ice extent are currently affecting the habitats of ice-dependant marine top-predators. The response of polar bears (*Ursus maritimus*) that are dependent on sea ice for hunting seals has been documented every summer on a yearly basis since 1988 in a coastal site of Traill Island, in its North-East Greenland range. Summer occurrence of polar bears, measured as the probability of encountering bears and the number of days with bear presence, has increased significantly from the 1990's to present. The strongest changes took place in the early 2000s. The shifts in polar bear occurrence coincided with trends for shorter sea ice seasons and less spring sea ice in the Greenland Sea, off the coast of NE Greenland. This resulted in a strong inverse relationship between the probability of bear encounter on land and the length of the sea ice season. Besides their visits at remains of muskox carcasses in tundra dating back to late winter, it was also shown that bears regularly check offshore islets supporting arctic tern and eider duck colonies. Observations made in this site are in line with similar surveys made on Svalbarden, suggesting that increased summer occurrence of polar bears on land and associated negative effects on bird reproduction is now occurring on a large geographic scale in the Arctic.

VERGLEICH VON MASSENBILANZEN AUS GEODÄTISCHEN GNSS-BODENMESSUNGEN, PEGELABLESUNGEN UND SATELLITENALTIMETRIE IM SWISS-CAMP GEBIET (WEST-GRÖNLAND)

Manfred Stober[1], Michael Hönes[1], Helmut Rott[2,3], Dana Floricioiu[4]

[1]Hochschule für Technik Stuttgart, Schellingstr. 24, 70174 Stuttgart, Deutschland,

email: manfred.stober@hft-stuttgart.de

[2]ENVEO IT, Innsbruck, Austria

[3]Institute of Meteorology and Geophysics, University of Innsbruck, Innrain 52, Innsbruck, Austria

[4]Remote Sensing Technology Institute, DLR, Oberpfaffenhofen, Germany

Mit der Messkampagne im Sommer 2014 wurden die Langzeitstudien im Gebiet Swiss Camp und bei ST2 fortgesetzt. Beim Swiss Camp (Meereshöhe 1170 m) hat der Autor seit 1991 bis 2014 nunmehr 12 geodätische Kampagnen durchgeführt. Im Durchschnitt alle zwei Jahre wurde ein Netz bestehend aus 4 Pegeln (Dreieck mit Zentralpunkt) gemessen. Das zweite Messgebiet, ST2 (Meereshöhe 1000 m), wird erst seit 2004 beobachtet mit nunmehr 6 Messungen. Bestimmt wurden geodätische Höhen an Pegelstandorten sowie flächenhaft die Oberflächentopographie, spezifische Oberflächenmassen-bilanzen an Pegeln, Fließgeschwindigkeiten und die Deformation der Eisoberfläche. Die digitalen Geländemodelle der Eisoberfläche aus Bodenmessungen dienen auch dem Vergleich mit Höhen und Höhenänderungen aus Satellitendaten, wie von CryoSat-2 und TanDEM-X.

Ergebnisse

Das Langzeitprojekt geeignet sich in einmaliger Form zur Ableitung von Höhenänderungen bzw. Massenbilanzen in Bezug zu Klimaänderungen. Beim Swiss Camp (SWC) hat sich 2014 die negative Massenbilanz verstärkt fortgesetzt. Während im Zeitraum 1991-2002 die Höhenabnahme von -0,2 m/a noch recht gering war, hat sie sich zuletzt im Zeitraum 2011-2014 auf -1,46 m/a beschleunigt. Die entsprechende geodätische Massenbilanz (GMB) beträgt jetzt -1,31 m w.e./a. Im Vergleich hierzu kann aus Pegelablesungen eine spezifische Oberflächenmassenbilanz (SMB) von -1,21 m w.e./a abgeleitet werden. Der dynamische Anteil der Massenbilanz kann aus der Differenz bestimmt werden. Zusammen mit Ergebnissen aus einer Strain-Analyse ist dies als dynamisches Ausdünnen wegen der zunehmenden Fließgeschwindigkeit zu deuten.

Im Gebiet ST2, welches ca. 170 Meter tiefer und näher am Eisrand gelegen ist, ergeben sich entgegengesetzte Resultate. Hier stehen Messungen seit 2004 bis 2014 mit 6 Kampagnen zur Verfügung. Während dieser Zeit verstärkt sich die (negative) geodätische Massenbilanz (GMB) von -0,35 m w.e./a (2004-2005) auf nunmehr -1,47 m w.eq./a und die SMB von -1.18 m w.e./a auf -1,55 m w.e./a. Der dynamische Anteil an der Massenbilanz als Differenz

zwischen GMB und SMB ist somit umgekehrt als bei Swiss Camp. Ebenfalls im Gegensatz zu SWC nimmt bei ST2 die Fließgeschwindigkeit ab und auch die Strain-Analyse führt zu entgegengesetzten Ergebnissen, bedingt vermutlich durch die Untergrundtopographie.

Die digitalen Höhenmodelle eignen sich wegen ihrer hohen Genauigkeit zur Validierung von Höhen und Höhenänderungen aus Satellitenmessungen, bei der Kampagne 2014 von CryoSat-2 und TanDEM-X. Die CryoSat-Daten stammen von HELM et al. (2014) mit Höhenänderungen zwischen 1/2011 und 1/2014. Unser Vergleich ergibt durchschnittliche Abweichungen von 0,25 m/a (SWC) und 0,57 m/a (ST2). Aus einem Überflug von TanDEM-X stellte uns das DLR ein unkalibriertes Höhenmodell mit horizontaler Auflösung von 5 Metern zur Verfügung. Aus fast 2000 Bodenpunkten ergab sich die mittlere Höhenanpassung von 3,1 m mit einer Standardabweichung von 0,025 m bzw. 1,07 m pro Einzelpunkt.

CONNECTIVITY AND MIGRATION IN SOUTHERN OCEAN FOOD WEBS - A STABLE ISOTOPE APPROACH

Gabriele Stowasser[1]

[1]British Antarctic Survey, High Cross, Madingley Road, Cambridge CB3 0ET, UK,
email: gsto@bas.ac.uk

The Scotia Sea, the focus area of the majority of our studies, is a physically energetic region with some of the highest levels of productivity in the Southern Ocean. Here 30% of the world's populations of Antarctic krill occur, acting as an important link between primary production and vertebrate predators. However, recent studies have shown that although krill are important there are many other species and interactions that affect the overall food web structure. This has highlighted the lack of important information on many of the most basic food web interactions and emphasised the need to improve knowledge of food web structure involving interactions other than krill. This is particularly crucial as in recent years evidence has emerged that climatic change in the western Scotia Sea and the west Antarctic Peninsula and the resulting reduction in sea-ice extent may already have knock-on effects in the form of reduced krill abundances and consequent predator population decline.

This presentation will give a brief overview of the Ocean Ecosystem programme at the British Antarctic Survey and show examples in which stable isotope analysis has served scientists to better understand connectivity and migration patterns of species that either permanently inhabit or utilise Southern Ocean ecosystems on a seasonal basis. Stable isotopes have been useful in answering a wide variety of questions regarding food web structure, biomass size-trophic level interactions, feeding migration strategies, foraging specialisations and past climate interpretations.

IMPACT OF REMOVED ARCTIC SUMMER SEA ICE ON ATMOSPHERE CIRCULATION IN AN ENSEMBLE OF COUPLED MODEL SIMULATIONS

Lukrecia Stulic[1], Tido Semmler[1]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Bussestr. 24, 27570 Bremerhaven, Deutschland, email: lstulic@awi.de

Arctic sea ice has undergone substantial decline in the last 3 decades and climate model studies show that Arctic could be ice-free in the late summer even by the middle of this century. Sea ice plays an important role in the climate system, therefore, it is important to investigate the sole influence of the Arctic sea ice loss on the atmosphere and ocean circulations. In the present study, results of the experiments carried out with the coupled global model ECHAM6-FESOM were analyzed. In an ensemble of 100 members, Arctic sea ice thickness was reduced by 80% on 1st of June in the sensitivity experiments, and changes through the following year were compared to the reference experiments. The reduction in the Arctic sea ice thickness led to an ice-free Arctic for the next 5 months in the sensitivity experiments and, as a consequence, it led to a strong increase in the surface temperature over the Arctic region in the following autumn and winter, making the respo

nse of other parameters most pronounced in those seasons. Strong baroclinic circulation anomalies were found over the Arctic, while barotropic response was found over north-eastern and southern parts of Europe. Increase in the geopotential heights over the high latitudes and decrease in the meridional temperature gradients are expected to reduce the westerly flow. Pressure pattern resembles conditions in which more cold air can burst to Europe. Precipitation increased over central Arctic area and also Mediterranean area in the winter, which resembles the synoptic activity shift in the same season from the northern Atlantic towards southern Europe.

DIE RUSSISCHE SÜDPOLEXPEDITION (1819–1821) UND DER WIND DES KALTEN KRIEGES

Erki Tammiksaar[1]

[1]Universität Tartu, Abteilung Geographie, Vanemuise Str. 46, EE50410 Tartu, Estland,
email: erki.tammiksaar@emu.ee

Fabian Gottlieb von Bellingshausen hatte mit seiner Südpolexpedition im Januar 1821 das erste Mal bewiesen, dass südlich des Südpolarkreises tatsächlich festes Land zu entdecken war. Doch gilt Januar 1821 heute nicht als Entdeckungsdatum der Antarktis. Stattdessen wird seit 1949 behauptet, dass Russen die Antarktis schon ein Jahr zuvor – nämlich im Januar 1820 – entdeckt hätten. Ist dieser Unterschied wissenschaftlich zu begründen oder müssen wir in diesem Fall den Widerspruch mehr aus der politischen Konkurrenz zwischen dem kommunistischen Osten und dem kapitalistischen Westen nach dem Zweiten Weltkrieg suchen? In meinem Vortrag möchte ich dieses sehr komplizierte Thema aus der wissenschaftsgeschichtlichen Perspektive betrachten und beweisen, dass es keinen Grund dafür gibt, nach der ersten Entdeckung der Antarktis zu suchen.

RESPONSES TO CHANGING SEA ICE CONDITIONS

David Thomas[1]

[1]School of Ocean Science, Bangor University, Menai Bridge, Anglesey, UK,
email: d.thomas@bangor.ac.uk

The most obvious “changing sea ice conditions” are clearly the well documented changes in Arctic sea ice extent, and associated changes in multiyear ice dominated systems to ones with ice that lasts less than one year. This presentation will consider the possible consequences of these changes: The most obvious will be the altered seasonal plankton dynamics, with subsequent consequences for both pelagic and benthic systems. What we know about the influences of the Southern Ocean seasonal sea ice dynamics on dominating biogeochemical processes can give us insight into the nature of such changes. As well as addressing the possible responses, part of the discussion will extend to considering the pertinent research that is needed for identifying the biogeochemical changes taking place and what kind of information is needed to predict future change.

ONLINE SEA ICE KNOWLEDGE AND DATA PLATFORM: WWW.MEEREISPORTAL.DE

Renate Treffeisen[1], Jölund Asseng[1], Annekathrin Bartsch[1], Benny Bräuer[1], Bernadette Fritzsch[1], Klaus Grosfeld[1], Stefan Hendricks[1], Wolfgang Hiller[1], Georg Heygster[2], Thomas Krumpen[1], Christian Melsheimer[2], Marcel Nicolaus[1], Robert Ricker[1], Marietta Weigelt[1]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Klimabüro, Am Handelshafen 12, 27570 Bremerhaven, Deutschland,

email: renate.treffeisen@awi.de

[2]Institut für Umweltphysik (IUP) der Universität Bremen, Deutschland

Arctic and Antarctic sea ice are both important components of the climate system but changing and behaving differently. Therefore, there is a great public interest in sea ice information, which requires up-to-date information at different levels for various target groups. Until now, most sea-ice related web pages are only available in English, in particular with regard to actual information and data. Given these considerations meereisportal.de was developed as a comprehensive German knowledge platform concerning sea ice in both Polar Regions, initiated in the framework of the Helmholtz climate initiative REKLIM as a joint project of the University of Bremen (Institute for Environmental Physics) and the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research under the management of the regional Helmholtz climate office at the Alfred Wegener Institute. The platform has been online since April 2013 and provides (1) comprehensive background information on sea ice, (2) expert statements on recent observations and developments and (3) an extensive map and data archive. Since its relaunch, all three pillars of meereisportal.de are constantly improved and extended. We will present the portal, its content and function in order to collect direct user feedback and to announce it to the broader glaciological community.

"WHY THE ARCTIC MATTERS"

Fran Ulmer[1]

[1]Chair of the U.S. Arctic Research Commission (USARC), US

Fran Ulmer will describe the rapid rate of change that is occurring in the Arctic, from the environment to the economy. She will explain how this region and the changes it is experiencing is relevant to the rest of the world. She will also describe the Arctic Council, its structure and its focus under the U.S. Chairmanship which began this year.

DEPOSITIONAL VARIABILITY IN A THERMOKARST LAKE BASIN IN ICE-RICH PERMAFROST OF ARCTIC SIBERIA

Polina Vakhrameeva[1,2], Boris Biskaborn[3], Dmitry Bolshiyanov[1,2], Bernhard Diekmann[3,4], Larisa Savelieva[1], Dmitry Subetto[5,6]

[1]St. Petersburg State University, St. Petersburg, Universitetskaya nab., 7-9, 199034 St.Petersburg , Russia, email: whitepolarhedgehog@gmail.com

[2]Arctic and Antarctic Research Institute, St. Petersburg, Russia

[3]Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Germany

[4]University of Potsdam, Germany

[5]Herzen State Pedagogical University, St.Petersburg, Russia

[6]Russian Academy of Sciences, Institute of Northen Water Problems, Petrozavodsk, Russia

Distinctive Late Pleistocene ice-rich permafrost deposits containing polygonal ice wedge systems (Ice Complex) are typical for East Siberian continuous permafrost. Postglacial warming caused massive formation of specific thermokarst lake basins (alases) on this substrate. These permafrost degradation landforms are associated with high spatial and temporal dynamics of thermokarst and depositional processes. Normally alases experience three main evolutionary stages, which result in accumulation of three successive lithostratigraphical units: (1) taberites (subaerial), (2) lacustrine sediments (subaquatic), (3) complex alas deposits (subaerial and subaquatic). To study alases is important for understanding thermokarst development and its interplay with climate change. Geomorphological investigations using field and remote sensing methods are usually employed for that, while sediments inside the basins are remaining poorly understood.

To fill the gap we have been studying Lake El\'gene-Kyuele (71°17\'N, 125°34\'E), which is large residual alas lake in tundra zone of NE Siberia. Field investigations as well as laboratory analyses (grain-size, organic matter characteristics, pollen, macrofossils, AMS 14C and 210Pb dating) of several lake sediment cores and a palaeo-lake sediment profile were undertaken. These revealed all three sedimentary horizons mentioned above, in which certain facies were differentiated. Our study shows that transformations of the depositional environments were caused by lake level fluctuations controlled by the natural thermokarst basin evolution. However some data prove possible influence of regional hydroclimate changes on these processes.

Most variaty of depositional settings is attributed to the last basin development stage. In modern Lake El'gene there are two general settings – proximal and distal – which are forming with distance from lake thermoerosional bluffs. Proximal sediment records reveal a quasicyclic pattern, whereas the latter is not expressed explicitly in the distal ones. Indeed, a few models suggest that the Ice Complex deposits exposed on a lake shore can be subjected to cyclic degradation. Yet it is problematic to prove that in the sedimentary archives because of the unreliable radiocarbon dates.

FORMATION OF ANTARCTIC BOTTOM WATER ON THE NORTHWESTERN WEDDELL SEA

Mathias van Caspel[1], Hartmut Hellmer[1], Ralph Timmermann[1], Michael Schröder[1]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Bussestraße 24, 27570 Bremerhaven, Deutschland,
email: mcaspel@awi.de

The dense water flowing out from the Weddell Sea (WS) contributes to Antarctic Bottom Water (AABW) and plays an important role in the Meridional Overturning Circulation. The larger amount of this dense water consists of Weddell Sea Deep Water (WSDW) formed in the WS, mainly in front of the Filchner-Ronne Ice Shelves and the Larsen Ice Shelf (LIS). We performed model simulations and analysis of hydrographic data that highlight the importance of the second source. Model simulations indicate that dense waters placed on the continental shelf off LIS flow down the slope and contribute to the WSDW that renews the AABW further downstream. Measurements made during the *Polarstern* cruise ANT XXIX-3 (2013) add evidence to the importance of the source in the western Weddell Sea. Using Optimum Multiparameter Analysis we show that the dense water found on the continental shelf in front of the former Larsen A and B together with water originating from Larsen C increases the thickness of the WSDW layer in 50%, and changes the temperature and salinity of this water mass. These modifications occur close to the WSDW outflow paths and therefore have high influence on the AABW properties.

DIVERSITY IN A COLD HOT-SPOT: DNA-BARCODING REVEALS PATTERNS OF EVOLUTION AMONG ANTARCTIC DEMOSPONGES (CLASS DEMOSPONGIAE, PHYLUM PORIFERA)

Sergio Vargas Ramirez[1], Michelle Kelly[2], Kareen Schnabel[3], Sadie Mills[3], David Bowden[3] & Gert Wörheide[1,4,5]

[1]LMU München, Richard-Wagnerstr.10, 80333, München, Deutschland,

email: sergio.vargas@lmu.de

[2]National Centre for Coasts and Oceans, National Institute of Water and Atmospheric Research, Private Bag 99940, Newmarket, Auckland 1149,

New Zealand

[3]National Centre for Coasts and Oceans, National Institute of Water and Atmospheric Research, Private Bag 14901, Wellington, New Zealand

[4]GeoBio-Center LMU, Richard-Wagner Str. 10, 80333 München, Deutschland

[5]Bavarian State Collections of Palaeontology and Geology, Richard-Wagner Str. 10, 80333 München, Deutschland

The approximately 350 demosponge species that have been described from Antarctica represent a faunistic component distinct from that of neighboring regions. Sponges provide structure to the Antarctic benthos and refuge to other invertebrates, and can be dominant in some communities. Despite the importance of sponges in the Antarctic subtidal environment, sponge DNA barcodes are scarce but can provide insight into the evolutionary relationships of this unique biogeographic province. We sequenced the standard barcoding COI region for a comprehensive selection of sponges collected during expeditions to the Ross Sea region in 2004 and 2008, and produced DNA-barcodes for 53 demosponge species covering about 60% of the species collected. The Antarctic sponge communities are phylogenetically diverse, matching the diversity of well-sampled sponge communities in the Lusitanic and Mediterranean marine provinces in the Temperate Northern Atlantic for which molecular data are readily available. Additionally, DNA-barcoding revealed levels of in situ molecular evolution comparable to those present among Caribbean sponges. DNA-barcoding using the Segregating Sites Algorithm correctly assigned approximately 54% of the barcoded species to the morphologically determined species. Here we provide insights on the evolutionary forces shaping Antarctica\'s diverse sponge communities, and a barcode library against which future sequence data from other regions or depth strata of Antarctica can be compared. The opportunity for rapid taxonomic identification of sponge collections for ecological research is now at the horizon.

IMPACT OF TEMPERATURE AND LABILE CARBON ON ORGANIC MATTER DECOMPOSITION IN PERMAFROST-AFFECTED SOILS OF THE NORTHEASTERN SIBERIAN TUNDRA

Josefine Walz[1], Luisa Böhme[1], Christian Knoblauch[1], Eva-Maria Pfeiffer[1]

[1]Institute of Soil Science, Center for Earth System Research and Sustainability, Universität Hamburg, Allende-Platz 2, 20146 Hamburg, Germany,
email: josefine.walz@uni-hamburg.de

The large carbon pools of Arctic permafrost-affected soils are influenced by warming of the Polar Regions. Higher soil temperatures directly affect microbial activity, generally resulting in enhanced decomposition of soil organic matter (SOM) and production of greenhouse gases. Furthermore, permafrost thaw and deepening of the active layer provide an additional SOM pool for decomposition. Indirectly, higher temperatures and rising atmospheric CO_2 concentrations can lead to higher plant net primary production and above-ground uptake of CO_2. It is expected that part of this additional carbon is stored in soils. It remains unclear, whether a higher allocation of below-ground carbon increases the SOM pool or further stimulates microbial SOM decomposition (priming effect), resulting in further carbon losses.

To examine the effect of increasing temperature and input of labile carbon on SOM decomposition, we incubated active layer and shallow permafrost soils.

A GLACIER SURGE OF BIVACHNY GLACIER IN THE PAMIR MOUNTAINS OBSERVED IN TIME SERIES OF DIGITAL ELEVATION MODELS AND VELOCITY MAPS

Anja Wendt[1], Dana Floricioiu[2], Christoph Mayer[1]

[1]DBayerische Akademie der Wissenschaften, Kommission für Erdmessung und Glaziologie, Alfons-Goppel-Str. 11, 80539 München, Deutschland, email: wendt@keg.badw.de

[2]Deutsches Zentrum für Luft- und Raumfahrt (DLR), Institut für Methodik der Fernerkundung (IMF), Wessling, Deutschland

The Pamir Mountains are known to hold various surge type glacier that show an unstable flow behaviour characterized by quiescent and active phases.

For Bivachny Glacier, an approximately 25 km long former tributary of Fedchenko Glacier, three surges are known for the 20th century (Kotlyakov et al., 2008). The most recent surge occurred between 2011 and 2014, and was observed using a series of high-resolution digital elevation models derived from data of the German TanDEM-X mission. From the bi-static synthetic aperture radar data acquired by the two satellites, digital elevation models (DEMs) with a horizontal resolution of 12 m and a vertical accuracy in the order of 2 m were derived. While comparison with older data show that mass has been accumulated in the upper ablation zone before the surge, the time series of DEMs show the advance of the up to 140 m thick surge bulge down the glacier with a speed of about 10 m per day. In September 2014 the surge front reached the confluence with Fedchenko Glacier.

Velocity maps derived by feature tracking using SAR and optical data show the associated velocity evolution of the surging glacier. These two high-resolution data sets provide a comprehensive insight into the progress of a glacier surge and its topographic and kinematic changes.

RADAR INTERNAL LAYERS: SYNCHRONIZATION WITH ICE-CORE RECORDS AND LAYER TRACING

Anna Winter[1], Olaf Eisen[1], Daniel Steinhage[1]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Am Alten Hafen 26, 27568 Bremerhaven, Deutschland,

email: anna.winter@awi.de

The internal layering architecture of ice sheets, detected with radio-echo sounding (RES), contains clues to their past ice-flow dynamics and mass balance. The most common way of relating the recorded travel time of RES reflections to depth is by integrating a wave-speed distribution. This results in an increase of the absolute error with increasing depth.

We present the synchronization of measured RES-internal layers with ice-core records from the Antarctic deep drill sites Dome C and Dome F. Synthetic radar traces are obtained from ice-core density and conductivity data with a 1D model of Maxwell\'s equation to calculate electromagnetic wave propagation. Comparing measured and synthetic radar traces, pronounced internal reflections in RES data are matched to conductivity peaks, which have considerably smaller depth uncertainties. Moreover, the identified reflectors are assigned with an age, provided by ice-core dating, at once. Different ice-core sites are tied together by tracing the isochronous reflectors in connecting RES profiles. This allows the comparison of ice cores independent of their dating as well as to determine the age-depth distribution along connecting RES profiles.

With our method, the overall error is not cumulative with depth, but depends on the accuracy of the nearest tie point, e.g. a peak in conductivity.

FOOD SELECTIVITY AS A DRIVER OF DIVERSITY IN ANTARCTIC DEEP-SEA INVERTEBRATES

Laura Würzberg[1], Isabella Stöger[2], Jan Pawlowski[3], Franck Lejzerowicz[3], Angelika Brandt[1]

[1]Cenak - Centrum für Naturkunde, Universität Hamburg, Martin-Luther-King-Platz 3, 20146 Hamburg, Deutschland,

email: laura.wuerzberg@uni-hamburg.de

[2]Zoologische Staatssammlung München, Deutschland

[3]Universität Genf, Schweiz

In order to obtain more information on the general diet composition of selected Southern Ocean deep-sea isopod and polychaete species, but also to gain insights into potential species-specific food preferences, gut content analyses by means of molecular methods were conducted. A special focus was hereby put on the role of foraminiferas as a dietary component, as these protozoans have been suspected to be an important component within some deep-sea invertebrates' food spectra. Applying specific and universal primers, DNA fragments from gut contents were successfully amplified by polymerase chain reaction (PCR) and analysed with next generation sequencing (NGS). The results show that a high diversity of dietary items is found in most invertebrate guts and the occurrence of relatively long DNA fragments indicates that the ingested material originates rather from fresh (living) foraminiferans than from detrital material. Moreover, species-specific as well as local differences become apparent. The potential influence of food selectivity on deep-sea invertebrate diversity is discussed.

THE IMPACT OF A CHANGING ENVIRONMENT ON YOUNG MACROALGAL STAGES AND COMMUNITIES

Katharina Zacher[1], Gabriela Campana[2], Juan Debandi[2], Liliana Quartino[2], Dolores Deregibus[2], Christian Wiencke [1]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Am Handelshafen, 27570 Bremerhaven, Deutschland,

email: Katharina.Zacher@awi.de

[2]Instituto Antárctico Argentino, Universidad de Lujan, Argentina

The Western Antarctic Peninsula (WAP) is a hotspot for changes caused by humans. The total column ozone is not expected to increase in the next several decades leading to an increased UVB radiation at the earth's surface and, hence, on polar organisms. Global warming is accelerated at the WAP in comparison with the global mean and in some areas water temperatures have risen by 2°C in the last 50 years. Seaweeds are an essential part of the polar coastal ecosystem showing a high level of endemism. Little is known how these communities react on stressors such as UV radiation, light intensity, increasing temperatures and sedimentation and decreased salinity (from the melt water run-off from the glaciers). A variety of field and laboratory experiments on seaweed communities and young developmental stages (spores) were performed over the last ten years in order to tackle this question. A focus was lying on the interactive effects of various variables such as UV

and grazing or temperature, sedimentation and grazing and the effect of light and temperature among others. We also performed long term colonization experiments over 4 years to elucidate the general patterns of polar seaweed succession. Interactive effects occurred for example between grazing and UV radiation in field experiments and between temperature and light intensity in laboratory experiments. Other data are currently analyzed. Our results showed that juvenile stages are especially vulnerable to environmental perturbations and that the degree of susceptibility is species-specific. Shift in community structure as a response to environmental change are likely to occur with yet unknown consequences for the associated heterotrophic organisms.

CENOZOIC EXHUMATION HISTORY OF THE ROSS PROVINCE OF MARIE BYRD LAND, WEST ANTARCTICA

Maximilian Zundel[1], Cornelia Spiegel[1], Frank Lisker [1]

[1]Universität Bremen, Geodynamik der Polargebiete, Klagenfurter Straße, 28359 Bremen, Deutschland, email: zundel@uni-bremen.de

The 3000 km long West Antarctic Rift System is a large-scale continental structure within the Antarctic continent. Its precise location, geometry, and tectonic evolution are, however, still poorly constrained and understood. This is mainly attributed to the West Antarctic Ice Sheet, which perennially covers most of the West Antarctic Rift System. Nevertheless, Marie Byrd Land, an area that stretches 1000 km along the main course of the West Antarctic Rift System provides the possibility to study the exhumation history of one of the rift flanks of the West Antarctic Rift System. The crustal block of Marie Byrd Land comprises two distinct provinces; (i) the Ross province, which represents the more inland, rift-proximal part showing affinities to North Victoria Land, and (ii) the rift-distal Amundsen province, which is characterized by affinities to the crustal blocks of Thurston Island and the Antarctic Peninsula. Existing thermochronological data of the Amundsen province suggest an initial rifting of the West Antarctic Rift System between 100 and 60 Ma, which gave rise to widespread tectonic denudation and block faulting over large areas. Apatite fission-track data of the Ross province reveal a comparable tectonic history during Late Cretaceous times. Apatite (U-Th)/He data from the Amundsen province locally yield evidence for an Oligocene rifting period and a subsequent uplift of the Marie Byrd Land dome at 20 Ma. This rifting probably infers the separation of Thurston Island from Marie Byrd Land concomitant with the decomposition of West Antarctica along the West Antarctic Rift System. Whether the West Antarctic Rift System also affected the Ross province during the Oligocene to Miocene and how its Cenozoic exhumation history is distinct from that of the Amundsen province is still disputed. For this, the first apatite (U-Th)/He data from the Ford Ranges and Edward VII Peninsula of the Ross province were obtained and interpreted in combination with re-evaluated apatite fission-track data. Here we present these combined data, which allow constraining a comprehensive Cenozoic thermochronological evolution, and thus an exhumation and tectonic history, which overall improves the geological understanding of the West Antarctic Rift system.

Die **Berichte zur Polar- und Meeresforschung** (ISSN 1866-3192) werden beginnend mit dem Band 569 (2008) als Open-Access-Publikation herausgegeben. Ein Verzeichnis aller Bände einschließlich der Druckausgaben (ISSN 1618-3193, Band 377-568, von 2000 bis 2008) sowie der früheren **Berichte zur Polarforschung** (ISSN 0176-5027, Band 1-376, von 1981 bis 2000) befindet sich im electronic Publication Information Center **(ePIC)** des Alfred-Wegener-Instituts, Helmholtz-Zentrum für Polar- und Meeresforschung (AWI); see http://epic.awi.de. Durch Auswahl “Reports on Polar- and Marine Research“ (via “browse”/”type”) wird eine Liste der Publikationen, sortiert nach Bandnummer, innerhalb der absteigenden chronologischen Reihenfolge der Jahrgänge mit Verweis auf das jeweilige pdf-Symbol zum Herunterladen angezeigt.

The **Reports on Polar and Marine Research** (ISSN 1866-3192) are available as open access publications since 2008. A table of all volumes including the printed issues (ISSN 1618-3193, Vol. 1-376, from 2000 until 2008), as well as the earlier **Reports on Polar Research** (ISSN 0176-5027, Vol. 1-376, from 1981 until 2000) is provided by the electronic Publication Information Center **(ePIC)** of the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI); see URL http://epic.awi.de. To generate a list of all Reports, use the URL http://epic.awi.de and select “browse”/ ”type” to browse ”Reports on Polar and Marine Research”. A chronological list in declining order will be presented, and pdf-icons displayed for downloading.

Zuletzt erschienene Ausgaben:

Recently published issues:

690 (2015) High latitudes and high mountains: driver of or driven by global change? 26th Intern. Congress on Polar Research, 6 – 11 September 2015, Munich, Germany, German Society for Polar Research, edited by Eva-Maria Pfeiffer, Heidemarie Kassens, Christoph Mayer, Mirko Scheinert, Ralf Tiedemann and Members of the DGP Advisory Board

689 (2015) The Expedition PS89 of the Research Vessel POLARSTERN to the Weddell Sea in 2014/2015, edited by Olaf Boebel

688 (2015) The Expedition PS87 of the Research Vessel POLARSTERN to the Arctic Ocean in 2014, edited by Rüdiger Stein

687 (2015) The Expedition PS85 of the Research Vessel POLARSTERN to the Fram Strait in 2014, edited by Ingo Schewe

686 (2015) Russian-German Cooperation CARBOPERM: Field campaigns to Bol’shoy Lyakhovsky Island in 2014, edited by Georg Schwamborn and Sebastian Wetterich

685 (2015) The Expedition PS86 of the Research Vessel POLARSTERN to the Arctic Ocean in 2014, edited by Antje Boetius

684 (2015) Russian-German Cooperation SYSTEM LAPTEV SEA: The Expedition Lena 2012, edited by Thomas Opel

683 (2014) The Expedition PS83 of the Research Vessel POLARSTERN to the Atlantic Ocean in 2014, edited by Hartwig Deneke

682 (2014) Handschriftliche Bemerkungen in Alfred Wegeners Exemplar von: Die Entstehung der Kontinente und Ozeane, 1. Auflage 1915, herausgegeben von Reinhard A. Krause

681 (2014) Und sie bewegen sich doch …Alfred Wegener (1880 – 1930): 100 Jahre Theorie der Kontinentverschiebung – eine Reflexion, von Reinhard A. Krause

680 (2014) The Expedition PS82 of the Research Vessel POLARSTERN to the southern Weddell Sea in 2013/2014, edited by Rainer Knust and Michael Schröder

ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR-
UND MEERESFORSCHUNG

BREMERHAVEN

Am Handelshafen 12
27570 Bremerhaven
Telefon 0471 4831-0
Telefax 0471 4831-1149
www.awi.de

HELMHOLTZ
GEMEINSCHAFT