

# TERRA NOSTRA

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## **23. Internationale Polartagung**

**der Deutschen Gesellschaft für Polarforschung  
Münster, 10. - 14. März 2008**

**Programm und  
Zusammenfassung der Tagungsbeiträge**



**WESTFÄLISCHE  
WILHELMS-UNIVERSITÄT  
MÜNSTER**

**AWI**   
Stiftung Alfred-Wegener-Institut  
für Polar- und Meeresforschung  
in der Helmholtz-Gemeinschaft

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# **TAGUNGSPROGRAMM**

## Vortragsprogramm

## SONNTAG, 9. März 2008

- 14:30 – 17:30 DGP – Vorstandssitzung (Restaurant Stuhlmacher, 48143 Münster, Prinzipalmarkt 6/7)
- 18:00 – 20:00 **Registrierung** - Archäologisches Museum  
**Icebreaker** - Archäologisches Museum  
Am Domplatz 20 - 22, 48143 Münster

## MONTAG, 10. März 2008

- 8:30 – 9:30 **Registrierung**

- 9:30 – 10:30

## Eröffnung

**Prof. Dr. Georg Kleinschmidt**

Deutsche Gesellschaft für Polarforschung

**Prof. Dr. Karl-Hans Hartwig**

Prorektor für strategische Planung und Qualitätssicherung  
der WWU Münster

**Prof. Dr. Tilmann Kuhn**

Prodekan des Fachbereichs Physik der WWU Münster

**Ehrungen****Kaffeepause****Umweltarchiv Sedimente**

- 11:00 – 11:15 *Gerhard Kuhn (AWI Bremerhaven), with contributions from the ANDRILL Science Committee and Science Management Office*  
The first campaigns of the ANDRILL McMurdo Sound Portfolio and its future perspectives
- 11:15 – 11:30 *Donata Helling (AWI Bremerhaven), Gerhard Kuhn (AWI Bremerhaven), Hilmar von Eynatten (University of Göttingen) and MIS science team members*  
The Ross Ice Shelf dynamics during the Late Pliocene and the Early Pleistocene – climate conditions warmer than today?
- 11:30 – 11:45 *Diana Magens, Frank Niessen & MIS Science Team (AWI Bremerhaven)*  
High-resolution physical properties of the AND-1B sediment core – A tool for constraining the past behavior of the Ross Ice Shelf/Ice Sheet, Antarctica
- 11:45 – 12:00 *Henning Schröder, Thomas Wonik (GGA Hannover)*  
Physical properties, climate signals, and structural features of Tertiary sediments in the Southern McMurdo Sound (Antarctica) derived from downhole logging in the ANDRILL-SMS project
- 12:00 – 12:15 *Olaf Juschus, Martin Melles, Volker Wennrich, Hendrik Vogel (University of Cologne)*  
Lithostratigraphical and biogeochemical characteristics of sediments from central part of Lake El'gygytyn, NE Siberia

- 12:15 – 12:30 *Hendrik Vogel (University of Cologne), Peter Rosén (Umeå University, Sweden), Martin Melles (University of Cologne), Olaf Juschus (University of Cologne), Per Persson (Umeå University, Sweden)*  
Fourier transform infrared spectroscopy (FTIRS), a fast and cost effective tool for quantitative and semi-quantitative analysis of biogeochemical properties in sediments from Lake El'gygytgyn, NE Siberia
- 12:30 – 12:45 *Volker Wennrich (University of Cologne), Pavel Minyuk (North-East Interdisciplinary Science Research Institute, Magadan, Russia), Olaf Juschus (University of Cologne), Martin Melles (University of Cologne)*  
High resolution structural and elemental analyses of sediments of Lake El'gygytgyn, NE Siberia

### Mittagspause

#### Polarbiologie I

- 14:15 – 14:45 **Eingeladener Vortrag**  
N.N.
- 14:45 – 15:00 *Hans-Ulrich Peter (Universität Jena), Steffen Hahn (Centre for Limnology, Maarssen, The Netherlands), Matthias Kopp (Universität Jena), Richard Phillips (British Antarctic Survey, Cambridge, UK), Markus Ritz (Universität Jena)*  
Skuas - wanderers between the poles
- 15:00 – 15:15 *Kim Jochum (IWFO Hannover and University of Alaska Fairbanks, USA), Falk Huettmann (University of Alaska Fairbanks, USA)*  
Individual recognition in Polar Bears: Lessons and Applications from modeling short term behaviour data
- 15:15 – 15:30 *Birgit Drees, Birgit Sieg (University of Münster)*  
A Model of Altitudinal Zonation of Arctic Vegetation
- 15:30 – 15:45 *Helga Bültmann (University of Münster)*  
Cryptogams in Arctic vegetation

### Kaffeepause

#### Geodäsie / Geophysik

- 16:15 – 16:30 *Karsten Gohl (AWI Bremerhaven), Estella Weigelt (AWI Bremerhaven), Dimitry Teterin (Vernadsky Institute for Geochemistry, Moscow, Russia), Graeme Eagles (AWI Bremerhaven, now: University of London, UK), Gabriele Uenzelmann-Neben (AWI Bremerhaven) and Robert Larter (British Antarctic Survey, Cambridge, UK)*  
Tectonics of the Amundsen Sea Embayment, West Antarctica: Constraining factor for ice-sheet expansion?
- 16:30 – 16:45 *Jan Müller (TU Dresden), Sven Riedel (AWI Bremerhaven), Mirko Scheinert (TU Dresden), Martin Horwath (TU Dresden), Reinhard Dietrich (TU Dresden), Daniel Steinhage (AWI Bremerhaven), Wilfried Jokat*  
Bestimmung eines regionalen Geoids für Dronning-Maud-Land aus einer Kombination von flugzeuggestützten Messungen und Satellitendaten

16:45 – 17:00 *Michael Studinger (Columbia University, Palisades, USA)*  
 Moho topography of the West Antarctic Rift System from inversion of  
 aerogravity data: ramifications for geothermal heat flux and ice  
 streaming

#### **Arbeitskreise**

17:00 – 18:30 Geodäsie Raum: S1 im Schloss

17:00 – 18:30 Glaziologie Raum: S2 im Schloss

20:00 – 21:30 **Abendvortrag (Rathausfestsaal, Prinzivalmarkt 8 - 10,  
 48143 Münster)**

#### **Begrüßung durch Karin Reismann**

Bürgermeisterin der Stadt Münster

**Prof. Wilfried Korth**, Technische Fachhochschule Berlin

**Auf Skiern übers Grönlandeis - Dem Klimawandel auf der Spur**

### **DIENSTAG, 11. März 2008**

#### **Atmosphärische Zirkulation**

9:00 – 9:15 *Diedrich Fritzsche (AWI Potsdam), Hanno Meyer (AWI Potsdam),  
 Rainer Schütt (AWI Potsdam), Thomas Opel (Humboldt-Universität  
 Berlin, AWI Potsdam)*

Stabile Wasserisotope eines Eiskerns von Akademii Nauk (Sewernaja  
 Semlja) als Proxies für Paläotemperatur und überregionale  
 atmosphärische Zirkulation

9:15 – 9:30 *Michael Krachler (University of Heidelberg), William Shotyk (University  
 of Heidelberg), James Zheng (Geological Survey of Canada, Ottawa),  
 David Fisher (Geological Survey of Canada, Ottawa)*

Heavy metal deposition to the Arctic during the last 16 000 years:  
 Comparison of natural background values and recent enrichments

9:30 – 9:45 *Eckart Schultz (DWD Freiburg), V. Dietze (DWD Freiburg), U. Kaminski  
 (DWD Freiburg), B. Sittler (University of Freiburg) and S. Norra  
 (University of Karlsruhe)*

Evidence of a long-range transport of coarse particles to NE-Greenland

9:45 – 10:00 *Micha Gryscha, Clemens Drüe, Siegfried Raasch, Dieter Etling  
 (Leibniz Universität Hannover)*

Large-Eddy Simulation von Wolkenstraßen in einem Kaltluftausbruch

10:00 – 10:15 *Gennadi Milinevsky (Shevchenko University of Kyiv, Ukraine),  
 Alexander Evtushevsky (Shevchenko University of Kyiv, Ukraine), Asen  
 Grytsai (Shevchenko University of Kyiv, Ukraine), Andrew Klekociuk  
 (Australian Antarctic Division, Kingston, Australia)*

Antarctic total ozone distribution and tropopause height zonal  
 asymmetry in connection to Antarctic Peninsula warming



**Landeis / Schelfeis**

- 10:15 – 10:30 *Hans Oerter, EPICA team (AWI Bremerhaven)*  
Two EPICA ice cores revealing 800,000 years of climate history: an overview.

**Kaffeepause**

- 11:00 – 11:15 *Matthias Braun (Universität Bonn), Norbert Blindow (Universität Münster), Albert Moll (Universität Bonn), Martin Rückamp (Universität Münster), Sonja Suckro (Universität Münster)*  
Fernerkundungsaktivitäten und Feldkampagnen auf King George Island
- 11:15 – 11:30 *Norbert Blindow (University of Münster), Sonja Suckro (University of Münster), Martin Rückamp (University of Münster), Matthias Braun (University of Bonn), Albert Moll (University of Bonn)*  
The geometry of the temperate ice cap of King George Island from GPR and GPS measurements
- 11:30 – 11:45 *Sonja Suckro (University of Münster), Norbert Blindow (University of Münster), Martin Rückamp (University of Münster), Matthias Braun (University of Bonn), Albert Moll (University of Bonn), Manfred A. Lange (The Cyprus Institute, Cyprus)*  
Isochrones, Raymond-bumps, watertable, and firn structure of the ice cap of King George Island
- 11:45 – 12:00 *Martin Rückamp (University of Münster), Norbert Blindow (University of Münster), Matthias Braun (University of Bonn), Sonja Suckro (University of Münster), Albert Moll (University of Bonn), Manfred Lange (The Cyprus Institute)*  
Dynamics of the ice cap of King George Island, Antarctica
- 12:00 – 12:15 *Manfred F. Buchroithner (University of Dresden), Tino Pieczonka (University of Dresden), Michael Baessler (University of Dresden), Tobias Bolch (University of Northern British Columbia, Canada)*  
Glacier recession and formation of glacial lakes in Khumbu Himalaya using space imagery
- 12:15 – 12:30 *Wilfried Korth (Technische Fachhochschule Berlin), Wieland Adler (Technische Fachhochschule Berlin), Martin Rückamp (Universität Münster), Uwe Hofmann (Technische Fachhochschule Berlin), Ulrich Münster (Technische Fachhochschule Berlin) und Frank Polte (Technische Fachhochschule Berlin)*  
Die wissenschaftlichen Ergebnisse der Grönlandüberquerung 2006

**Mittagspause**

- 14:00 – 14:15 *Manfred A. Lange (Universität Münster und Cyprus Institute, Cyprus), Sebastian Klauke (Universität Münster), Christoph Oelke (Universität Münster), Thomas Kleiner (Universität Münster), M. Baessler (Universität Dresden) und Reinhard Dietrich (Universität Dresden)*  
Massenbilanzstudien auf der Basis numerischer Modelle und Satellitenfernerkundungsdaten
- 14:15 – 14:30 *Malte Thoma (AWI Bremerhaven), Klaus Grosfeld (AWI Bremerhaven), Christoph Mayer (BAdW München), Irina Filina (University of Texas, Austin)*

- Subglacial Lakes in Antarctica: Numerical modelling of flow regime and accreted basal ice
- 14:30 – 14:45 *Helmut Rott (University of Innsbruck, Austria), Michael Eineder (DLR-IMF Oberpfaffenhofen) Dana Floricioiu (DLR-IMF Oberpfaffenhofen), Thomas Nagler (ENVEO IT, Innsbruck, Austria)*  
New observations of glacier acceleration at the Antarctic Peninsula observed by TerraSAR-X
- 14:45 – 15:00 *Svetlana Kovalenok (Ministry Education and Science of Ukraine, Kyiv), Vitaly Chizhevsky (National University Lvivska Politechnica, Lviv, Ukraine), Vladimir Glotov (National University Lvivska Politechnica, Lviv, Ukraine), Igor Neverovsky (Ukrainian Centre of Sea Ecology, Odessa, Ukraine), Yuri Popov (Hydrometeocenter of Black and Azov Seas, Odessa, Ukraine) Viktor Sytov (Ukrainian Centre of Sea Ecology, Odessa, Ukraine), Vladimir Ukrainsky (Hydrometeocenter of Black and Azov Seas, Odessa, Ukraine), Vladimir Vojtenko (East-Ukrainian National Volodymyr Dal' University, Lugansk, Ukraine)*  
Impact of Antarctic Peninsula regional climate warming on small glaciers and ice caps
- 15:00 – 15:15 *Matthias Braun (University of Bonn), Angelika Humbert (University of Münster und University of Darmstadt), Albert Moll (University of Bonn)*  
Structure and dynamics of Wilkins Ice Shelf (Antarctic Peninsula) as observed by a multi-sensor remote sensing approach
- 15:15 – 15:30 *Daniel Steinhage (AWI Bremerhaven)*  
Überarbeitete und erweiterte Datensätze der Eismächtigkeitsverteilung und des Untergrundreliefs in Dronning Maud Land, Antarktis
- Kaffeepause**
- Meereis**
- 16:00 – 16:15 *Sandra Krutzky (AWI Bremerhaven, Universität Bremen), Christian Haas (AWI Bremerhaven), Malte Thoma (AWI Bremerhaven), Peter Lemke (AWI Bremerhaven)*  
SAR-Beobachtungen und thermodynamische Modellierung von Meereis-Drift und Eisproduktion in der Larsen Region, Weddellmeer
- 16:15 – 16:30 *Patricia Cámara (University of Barcelona, Spain), P. Masqué (University Barcelona, Spain), J García-Orellana (University Barcelona, Spain), J.K. Cochran (Stony Brook University NY, USA), C. Hanfland (AWI, Bremerhaven), J.L. Mas (University of Sevilla, Spain), E. Chamizo (University of Sevilla, Spain)*  
Radionuclides in Sea-Ice Sediments from the Arctic Ocean as tracers of sea ice
- 16:30 – 16:45 *Sascha Willmes, Günther Heinemann, David Schröder, Heike Hebbinghaus (Universität Trier)*  
Systemsteuernde Prozesse in der Laptev-See: Atmosphäre und Meereis
- 17:00 – 18:30 **Postersitzung**

	<b>Arbeitskreise</b>	
19:00 – 20:30	AK Geowissenschaften	Raum: S1 im Schloss
19:00 – 20:30	AK Geschichte	Raum: S2 im Schloss

### MITTWOCH, 12. März 2008

#### Geologie

- 9.00 – 9.30** **Eingeladener Vortrag**  
*Steve Boger (University of Melbourne, Australia)*  
 The Kuunga Suture – its exposed remnants in East Antarctica and its rifted continuation in the Himalaya
- 9.30 – 9.45 *Franz Tessensohn (BGR Hannover, em.), Axel Ehrhardt (BGR Hannover)*  
 Kontinentale Transform Störungen: ein plattentektonischer Vergleich
- 9.45 – 10.00 *Holger Forke (Berlin Museum of Natural History) Christian Scheibner (University of Bremen), Dierk Blomeier (Norwegian Polar Institute, Tromsø, Norway)*  
 Upper Carboniferous and Permian cyclic carbonate shelf deposits (NE Svalbard) – a video presentation
- 10.00 – 10.15 *Hans-Jürgen Paech (ehemals BGR Hannover)*  
 Geologische Interpretation von Inkohlungsdaten aus tertiären und deren liegenden Schichten des Ujandina- und Indigirka-Zyrjanka Beckens (Zacha/ Jakutien in Nordost-Russland)
- 10.15 – 10.30 *Karsten Piepjohn (BGR Hannover)*  
 Korrelation der Sedimentbecken und tektonischen Ereignisse der vergangenen 650 Millionen Jahre auf dem Barentsschelf (Svalbard) und Nord-Grönland/Ellesmere Island (kanadische Arktis)

#### Kaffeepause

- 11.00 – 11.15 *Andrea Kipf (IFM-GEOMAR Kiel), Reinhard Werner (Tethys Geoconsulting Kiel), Karsten Gohl (AWI Bremerhaven), Folkmar Hauff (IFM-GEOMAR Kiel), Lothar Viereck-Götte (Universität Jena), Paul van den Bogaard (IFM-GEOMAR Kiel), Andreas Veit (Universität Jena), Kaj Hoernle, (IFM-GEOMAR Kiel)*  
 Erste Ergebnisse von Untersuchungen zu Ursachen und Auswirkungen des Magmatismus im Bereich der Marie Byrd Seamounts (Amundsenmeer)

#### Logistik / Umweltschutz / Tourismus

- 11:15 – 11:30 *Nicole Biebow (AWI Bremerhaven), Joern Thiede (AWI Bremerhaven), Martina Kunz-Pirrung (AWI Bremerhaven), Lester Lembke-Jene (AWI Bremerhaven), Paul Egerton (ESF, Strasbourg, Frankreich)*  
 AURORA BOREALIS: A European Research Icebreaker with Deep-Sea Drilling Capability
- 11.30 – 11.45 *Daniel Steinhage, Andreas Herber (AWI Bremerhaven)*  
 POLAR 5 – ein neues Polarforschungsflugzeug

- 11:45 – 12:00 *Fritz Hertel, Heike Herata (Umweltbundesamt Dessau, Germany)*  
Development of Environmental Management Options for Fildes Peninsula and Ardley Island (King George Island)
- 12:00 – 12:15 *Machiel Lamers, Bas Amelung (University of Maastricht, The Netherlands)*  
Business as (Un)Usual: Integrated Scenario Analysis for Tourism in Antarctica

### **Exkursionen**

- 14:00 – 18:00 **A: Glaziale und postglaziale Landschaftsentwicklung im Münsterland**

Leitung: **Dr. Eckhard Speetzen**

Treffpunkt: **Schlossplatz 2, Haupteingang**

Der Schwerpunkt dieser Exkursion, die durch die überwiegend landwirtschaftlich geprägten nördlichen und nordöstlichen Randbereiche der Stadt Münster führt, liegt auf der eiszeitlichen und nacheiszeitlichen Entwicklung der Landschaft mit ihren natürlichen („geogenen“) und anthropogenen Einflüssen. Darüber hinaus werden Zusammensetzung und Entstehung der glaziären und periglaziären Sedimente, die wirtschaftliche Bedeutung dieser Ablagerungen für die Versorgung mit Rohstoffen und Trinkwasser sowie die mit ihrer Gewinnung verbundenen Beeinträchtigungen der Umwelt erläutert. Ein besonderer Schwerpunkt liegt dabei auf der Trinkwasserversorgung der Stadt Münster, deren Jahresbedarf von etwa 18 Mio. m<sup>3</sup> zu über 60 % aus dem Münsterländer Kiessandzug und den Terrassen im Bereich der Ems gewonnen wird.

- 14:00 – 18:00 **B: Europareservat Rieselfelder - Historische und ökologische Entwicklung einer Kulturlandschaft**  
 Leitung: **Prof. Dr. Norbert Hölzel**  
 Treffpunkt: **Schlossplatz 2, Haupteingang**  
 Das „Europareservat Rieselfelder Münster“ ist mit seinen ausgedehnten Flachwasserseen, Röhrichten und Feuchtwiesen eines der bedeutendsten europäischen Rast-, Brut-, Nahrungs- und Mauserplätze für Zugvögel, insbesondere für Wat- und Entenvögel. Entstanden ist das Feuchtgebiet nördlich von Münster ursprünglich durch die Verrieselung von städtischen Abwässern seit dem Jahr 1901 in einem Heidegebiet. Dabei stellte sich ein Mosaik aus Wiesen, Flachwasserteichen und Schlammflächen ein. Viele gefährdete Vogelarten fanden hier einen Ersatzlebensraum, nachdem immer mehr natürliche Feuchtgebiete trocken gelegt wurden. Nach der Inbetriebnahme der Kläranlage drohten auch die Rieselfelder trocken gelegt zu werden. Aufgrund ihrer großen Bedeutung für den Vogelzug wurde das Gebiet erhalten und zum Teil wiedervernässt. Es hat den Status eines inter-national bedeutenden Feuchtgebiets gemäß der Ramsar-Konvention.  
 Das etwa 450 ha große Gebiet dient heute als sowohl der Naherholung als auch dem Naturschutz: Im Naturerlebnisgebiet können Besucher ein abwechslungsreiches Landschaftsbild mit Feuchtwiesen, Stauflächen und Obstwiesen und dessen Entwicklung erleben. Die extensive Nutzung geschieht zum Teil mit Heckrindern. Die Kernzone des Reservats hingegen ist weitgehend für die Besucher gesperrt, hier finden über 100 verschiedene Vogelarten Rückzugsräume.
- 14:00 – 18:00 **C: Münster quer - Historischer Rundgang durch die Altstadt von Münster**  
 Stattdessen Münster, Treffpunkt: wird noch bekannt gegeben.
- 18:00 – 19:30 **Schloss Droste-Hülshoff, Havixbeck (Besichtigung mit Führung) Abfahrt im Anschluss an die Exkursionen**
- 19:30 **Gemeinsames Abendessen (Privatbrauerei Klute in Havixbeck)**  
 Der Bustransfer zu den Exkursionen, zum Schloss Droste-Hülshoff und zur Privatbrauerei Klute sind (ausschließlich) für angemeldete Personen organisiert.

#### DONNERSTAG, 13. März 2008

##### Polarbiologie II

- 9:00 – 9:30 **Eingeladener Vortrag**  
*Jan Marcin Węśławski (Institute of Oceanology, Polish Academy of Sciences, Warszawy, Poland)*  
 Warming up of the European Arctic – more biodiversity, less wildlife
- 9:30 – 9:45 *Rainer Kiko, Anastasja Ershova, Maike Kramer, Rupert Krapp, Olga Preobrazhenskaya, Henrike Schünemann, Stefan Siebert, Iris Werner (University of Kiel)*  
 News from the sea-ice biological research in the Arctic and Antarctic

- 9:45 – 10:00 *Iryna Kozeretska, Parnikoza Ivan, Denis Evgen (Shevchenko University of Kyiv, Ukraine)*  
Habitat and leaf cyto-genetic characteristics of *Deschampsia antarctica* desv. in maritime Antarctic
- 10:00 – 10:15 *Mariia Shevchenko, Ivan Parnikoza, Alexandra Shevchenko (Shevchenko University of Kyiv, Ukraine)*  
Current state of *Poa annua* maritime Antarctic population
- 10:15 – 10:30 *Laura Würzberg, Angelika Brandt (University of Hamburg)*  
ANDEEP-SYSTCO: Trophodynamics of Southern Ocean benthic isopods: an approach to abyssal ecology

#### Kaffeepause

- 11:00 – 11:15 *Sieglinde Ott (University of Düsseldorf), Constanze Fiege (University of Düsseldorf), Andreas Engelen (University of Düsseldorf), Pete Convey (British Antarctic Survey, Cambridge, UK)*  
The diversity of diaspores at an Antarctic inland site – implications for ecosystem development
- 11:15 – 11:30 *Lars Ganzert (AWI Potsdam), A. Lipski (University of Osnabrück), D. Wagner (AWI Potsdam)*  
Antarctic microbial communities in mineral deposits on Livingston Island, South Shetland Islands

#### Sedimentologie / Spätquartär

- 11:30 – 11:45 *Andreas Borchers (AWI Potsdam), Hannes Grobe (AWI Bremerhaven), Bernhard Diekmann (AWI Potsdam)*  
Glaciomarine sediment records of late Quaternary ice-rafting and bottom-water activity at the MacRobertson-Prydz Bay continental margin, East Antarctica.
- 11:45 – 12:00 *Sabrina Ortlepp (University of Cologne), Bernd Wagner (University of Cologne), Martin Melles (University of Cologne), Peter Doran (University of Illinois at Chicago, USA) Fabien Kenig (University of Illinois at Chicago, USA)*  
Lake sediments as archives for the reconstruction of the late Quaternary environmental history of Taylor Valley, Southern Victoria Land, Antarctica
- 12:00 – 12:15 *Sonja Berg, Bernd Wagner, Martin Melles (Universität Köln)*  
Die spätquartäre Umwelt- und Klimageschichte der Rauer Inseln (Ostantarktis)- geochemische Untersuchungen an küstennahen marinen Sedimenten
- 12:15 – 12:30 *Peter Outridge (Geological Survey of Canada, Ottawa), Hamed Sanei (Geological Survey of Canada, Calgary); Gary Stern (Fisheries and Oceans Canada, Winnipeg), Paul Hamilton (Canadian Museum of Nature, Ottawa), Fari Goodarzi (Geological Survey of Canada, Calgary)*  
Sedimentary Fluxes of Mercury and Pyrolysable Organic Carbon as a Potential Paleo-thermometer for Arctic Aquatic Systems

- 12:30 – 12:45 *Martin Klug (Universität Köln), Steffi Schmidt (Universität Köln), Bernd Wagner (Geological Survey of Denmark and Greenland, Denmark), Martin Melles (Universität Köln), Ole Bennike (Geological Survey of Denmark and Greenland, Denmark), Oliver Heiri (Utrecht University, The Netherlands)*  
Holozäne Seesedimente Store Koldeweys, Nordost Grönland, als Archive für lokale und regionale Klima- und Umweltschwankungen

### Mittagspause

- 14: 00 – 15:30 **Mitgliederversammlung (Schloss)**  
**Deutsche Gesellschaft für Polarforschung**

### Geschichte

- 16:00 – 16:30 **Eingeladener Vortrag**  
*Erki Tammiksaar (University of Tartu, Estonia)*  
Polarforschung am Ende des 19. Jahrhunderts: die Forschungsreisen des Baron Eduard Toll
- 16:30 – 16:45 *Frank Berger (Historisches Museum Frankfurt am Main)*  
Carl Weyprecht: Die Geburt des ersten internationalen Polarjahrs. Aus den unedierten Briefen Carl Weyprechts
- 16:45 – 17:00 *Cornelia Lüdecke (Arbeitskreis Geschichte der Polarforschung, München)*  
Kalte Exotik – Eskimos im Blickpunkt der deutschen Ethnologie um 1880
- 17:00 – 17:15 *Robert Holzner (LMU München)*  
Das ArchaeObsprojekt auf Kerguelen. Archäologie in der Subantarktis
- 17:15 – 17:30 *Dietmar Gruber (Markgrafen-Gymnasium Karlsruhe)*  
ODEN - Einblick in wissenschaftliches Arbeiten
- 17:30 – 18:30 **Postersitzung**
- 20:00 – 21:00 **Abendvortrag (Rathausfestsaal, Prinzipalmarkt 8 - 10, 48143 Münster)**  
**Dr. Hartwig Gernandt, Alfred-Wegener Institut, Bremerhaven**  
**Neumayer III – die neue Antarktis-Station des AWI**

## FREITAG, 14. März 2008

### IPY Schulprojekte

- 9:00 – 9:15 *Franz Tessensohn (BGR Hannover, em.), Rainer Lehmann (Freie Waldorfschule Hannover-Bothfeld)*  
Das Projekt Coole Klassen
- 9:15 – 9:30 *Olga Lovick, Siri Tuttle (University of Alaska Fairbanks, USA)*  
The Grammar of Climate Change

9:30 – 9:45 *Anne Braunschweig (Universität Jena), 14 weitere Studenten (Universitäten Jena, Leipzig, Würzburg, Tübingen, Moskau (Russland), La Plata (Argentinien) und Hans-Ulrich Peter (Universität Jena)*  
Internationale Studentenexpedition nach King George Island / Antarktis

9:45 – 10:00 *Rainer Lehmann (Freie Waldorfschule Hannover-Bothfeld)*  
Das internationale Bohrprogramm ANDRILL und sein Schulprojekt ARISE

### IPY

10:00 – 10:15 *Karsten Gohl (AWI Bremerhaven), Reinhard Dietrich (University of Dresden),*  
The International Polar Year 2007/08: exciting activities and first results

10:15 – 10:30 *Karin Lochte, Eberhard Fahrbach, Karsten Gohl (AWI Bremerhaven)*  
Contribution of the Alfred Wegener Institute to the International Polar Year 2007/08

### Kaffeepause

11:00 – 11:30 **Eingeladener Vortrag**  
*Michael Studinger (Columbia University, Palisades, USA)*  
Antarctic Earth System Science during IPY: Exploring linkages between tectonic, glaciologic and biologic processes in Central East Antarctica with geophysical methods

11:30 – 11:45 *Martin Melles (University of Cologne), Hans-W. Hubberten (AWI Potsdam), Frank Niessen (AWI Bremerhaven), Norbert Nowaczyk (GFZ Potsdam), Volker Wennrich (University of Cologne), Olaf Juschus (University of Cologne), Pavel S. Minyuk (Northeast Interdisciplinary Scientific Research Institute Magadan, Russia), Julie Brigham-Grette (University of Massachusetts, USA), Christian Koeberl (University of Vienna, Austria)*  
Continental drilling at Lake El'gygytgyn, NE Russia, a contribution to the IPY Projects APEX and BIPOMAC

11:45 – 12:00 *Fred Daniels (University of Münster), Hans De Molenaar (Alterra, Wageningen, Netherlands)*  
Monitoring Ammassalik Vegetation Change (MAVC) - Global change in the low arctic tundra of southeast Greenland?

12:00 – 12:15 *Kristin Daniel, Lothar Viereck-Götte (University of Jena)*  
Volcano-ice Interaction during Formation and Geodynamic Position of the Hudson Mountains Volcanic Field, Western Ellsworth Land, Antarctica

12:15 – 12:30 *Frank Niessen (AWI Bremerhaven), T.R. Naish (Victoria University of Wellington, New Zealand), R.D. Powell (Northern Illinois University, DeKalb, USA), A. Pyne (Victoria University of Wellington, New Zealand), and the ANDRILL-MIS Science team*  
(<http://www.andrill.org/support/references/appendixc.html>)  
Late Neogene climate history of the Ross Embayment: Initial results from the AND-1B core, ANDRILL McMurdo Ice Shelf Project

### Mittagspause



- 14:00 – 14:15 *Reinhard Dietrich (TU Dresden), Andreas Richter (TU Dresden), Valery V. Lukin (Arctic and Antarctic Research Institute, St. Petersburg, Russland), Mathias Fritsche (TU Dresden), Vladimir Ya. Lipenkov (Arctic and Antarctic Research Institute, St. Petersburg, Russland), Alexander V. Yuskevich (Aerogeodeziya, St. Petersburg, Russland), Jens Wendt (Centro de Estudios Científicos, Valdivia, Chile), Alexey Yu. Matveev (Aerogeodeziya, St. Petersburg, Russland), Valery N. Masolov (Polar Marine Geosurvey Expedition, St. Petersburg, Russland)*  
Untersuchungen zu Bewegungsverhalten und Massenbilanz des antarktischen Eises im Bereich des subglazialen Lake Vostok
- 14:15 – 14:30 *Ursula Schauer (AWI Bremerhaven)*  
The changing Arctic Ocean - observations during IPY
- 14:30 – 14:45 *Lasse Rabenstein, Stefan Hendricks, Volker Leinweber, Christian Haas (AWI Bremerhaven)*  
Sea ice thickness measurements in the Trans Polar Drift in 2007, another year of minimum Arctic sea ice extent
- 14:45 – 15:00 *Mirko Scheinert (University of Dresden), Andrés F. Zakrajsek (Instituto Antártico Argentino, Buenos Aires, Argentina), Reinhard Dietrich (University of Dresden), Sergio A. Marensi (Instituto Antártico Argentino, Buenos Aires, Argentina), Lutz Eberlein (University of Dresden)*  
Long-time gravimetric registration at the Argentine Antarctic station Belgrano II as a contribution to the IPY project POLENET
- 15:00 – 15:15 *Lothar Viereck-Goette, Michael Abratis (University of Jena)*  
Initiation of Magmatism within the Ferrar Large Igneous Province, southern North Victoria Land, Antarctica
- Kaffeepause**
- 15:45 – 16:00 *Eva-Maria Pfeiffer (Universität Hamburg), Valerie Grebenets (Universität Moskau)*  
Permafrostböden und Klimaerwärmung: 11 Thesen zu Folgen der klimabedingten Permafrost-Degradation
- 16:00 – 16:15 *Hans-Wolfgang Hubberten (AWI Potsdam), Nikolay N. Romanovskii (Moscow State University, Russia)*  
Die Entwicklung des submarinen Permafrosts und die Stabilität von Gashydraten in den Schelfregionen Ostsibiriens
- 16:15 – 16:30 *Hugues Lantuit (AWI Potsdam), D. Atkinson (University of Alaska Fairbanks, USA), M. Grigoriev (Permafrost Institute, Yakutsk, Russia), V. Rachold (International Arctic Sciences Committee, Stockholm, Sweden), G. Grosse (University of Alaska Fairbanks, USA), H.-W. Hubberten (AWI Potsdam)*  
Coastal erosion and storminess evolution on Bykovsky Peninsula, Southern Laptev Sea, Russia.
- 16:30 – 16:45 *Larisa Nazarova (AWI Potsdam), Ludmilla Pestryakova (Yakutsk University, Russia), Ulrike Herzschuh (AWI Potsdam), Bernhard Diekmann (AWI Potsdam)*  
Biological proxies as a tool for palaeoecological inferences

- 16:45 – 17:00 *Dirk Wagner (AWI Potsdam), Andreas Gattinger (GSF Neuherberg), Arndt Embacher (GSF Neuherberg), André Lipski (University of Osnabrück)*  
Methane generation in holocene permafrost deposits of the Lena Delta, and its implication for the global methane budget
- 17:00 – 17:30 *Katharina Koch (AWI Potsdam), C. Knoblauch (University of Hamburg), Dirk Wagner (AWI Potsdam)*  
Characterization of methanogenic Archaea in submarine permafrost sediments of the Siberian Laptev Sea
- 17:30 **Posterprämierung und Schlussworte:  
Prof. Dr. Georg Kleinschmidt**
- Nachmittag **Sitzung der IPY Kommission**

## POSTERLISTE

Karin Behrend (University of Bremen), Christian Scheibner (University of Bremen), Dierk Blomeier (Norwegian Polar Institute, Tromsø, Norway), Holger Forke (Berlin Museum of Natural History)

Timing of a major transgression: From a terrestrial environment to a shallow marine carbonate platform (Upper Carboniferous, Malte Brunfjellet Formation, central Spitsbergen)

Dierk Blomeier (Norwegian Polar Institute, Tromsø, Norway), A. Dustina (University of Bremen), Christian Scheibner (University of Bremen), Holger Forke (Berlin Museum of Natural History)

The Late Palaeozoic, marine shelf strata of east and central Spitsbergen: Warm-water platform versus cool-water ramp deposits

Bernhard Chapligin (AWI Potsdam), Hanno Meyer (AWI Potsdam), Andreas Marent (TU Berlin), Hans Friedrichsen (Free University of Berlin and MS-Analysentechnik Berlin), Hans-Wolfgang Hubberten (AWI Potsdam)

Oxygen isotope micro analysis of diatom silica from El'gygytgyn Crater Lake, NE Russia

Luisa Cristini (AWI Bremerhaven), Philippe Huybrechts (AWI Bremerhaven and Vrije Universiteit Brussels, Belgium), Klaus Grosfeld (AWI Bremerhaven), Gerrit Lohmann (AWI Bremerhaven)

Simulating the Antarctic Ice Sheet with a coupled Atmosphere-Ice Sheet model approach

Maria Dewey (Geschwister-Scholl-Gymnasium Löbau)

"Nebel, Licht & Eis" - Schülerprojekt zum IPY 2007/2008

Susanne Diederich, Margarete Pauls (AWI Bremerhaven)

International Polar Year 2007/08 – A Unique Opportunity for Science Communication

Alevtina Dranitsina (Shevchenko University of Kyiv, Ukraine), G. D. Telegeev (NAS of Ukraine, Kyiv), M. V. Dybkov (NAS of Ukraine, Kyiv), I. N. Chumachenko (Shevchenko University of Kyiv, Ukraine), S. S. Maliuta (NAS of Ukraine, Kyiv), V.F. Bezrukov (Shevchenko University of Kyiv, Ukraine)

DNA polymorphism in penguin *pygoscelis papua* populations

Solveig Estrada (BGR Hannover)

Das Nationale Polarprobenarchiv – ein Beitrag der BGR zum Internationalen Polarjahr

Michael Fritz (University of Greifswald), Lutz Schirrmeister (AWI Potsdam) Hanno Meyer (AWI Potsdam), Hugues Lantuit (AWI Potsdam), Nicole J.Couture (McGill University, Montreal, Quebec, Canada), Wyne H. Pollard (McGill University, Montreal, Quebec, Canada)

Notes from a small island in the western Canadian Arctic – a joint approach using sedimentary and stable isotope records gives insights into postglacial permafrost history

Andrzej Gaździcki (Polish Academy of Sciences, Warszawa, Poland)

Oligocene-Miocene paleoclimate and paleontology of King George Island, West Antarctica  
Hans-Martin Garche (Auhagen)

Murmansk – Dudinka – Norilsk - Novy Port - Tiksi/Samoilov: Individualreisen im Norden der

Russischen Föderation und die mögliche Einbindung in den Unterricht

*Karsten Gohl (AWI Bremerhaven)*

Circum-Antarctic continent-ocean transition zones

*Monika Huch (Adelheidshof)*

Der Geologische Kalender 2008

*Angelika Humbert (University of Darmstadt, University of Münster), Thomas Kleiner (University of Münster), Ralf Greve, (Hokkaido University, Sapporo, Japan), Chris-Oliver Mohrholz (University of Münster), Christoph Oelke (University of Münster), Manfred A. Lange (University of Münster)*

A comparative modeling study of the Brunt Ice Shelf - Stancomb-Wills Ice Tongue System

*Bettina Kaiser (Universität Canterbury, Christchurch, Neuseeland), Robyn Schofield (AWI Potsdam), Hugues Lantuit (AWI Potsdam), Torsten Sachs (AWI Potsdam), Astrid Richter (AWI Potsdam), Laura Würzberg (Universität Hamburg), Daniel Haase (Universität Canterbury, Christchurch, Neuseeland)*

Polarjugend.de – Eine IPJ Bildungsinitiative von APECS Deutschland

*Enn Kaup (Institute of Geology at Tallinn University of Technology, Estonia)*

Formation of solar radiation, thermal and dissolved oxygen structures of antarctic lakes during the ice cover

*Thomas Kleiner, Christoph Oelke, Manfred A. Lange (University of Münster)*

A higher-order thermo-mechanical ice-flow model applied to grounding-line simulations

*Conrad Kopsch (AWI Bremerhaven), Karsten Gohl (AWI Bremerhaven), Detlef Damaske (BGR Hannover), Matthias König (AWI Bremerhaven)*

Geomagnetische Profilmessungen während ANT XXIII/9

*Oksana Kozeretska, Ivan Parnikoza, Evgen Denis (Shevshenko University of Kyiv, Ukraine)*

Distribution agents for Antarctic vascular plants

*Thomas Krumpfen, Christian Haas, Jens Hoelemann (AWI Bremerhaven)*

Monitoring dynamics and sea-ice export of the southern West New Siberian polynya, using model and remote sensing data

*Maryna Kursa (Shevchenko University of Kyiv, Ukraine), Vladimir Bezrukov (Shevchenko University of Kyiv, Ukraine), Markus Ritz (University of Jena), Sergiy Demidov (Shevchenko University of Kyiv, Ukraine)*

The level of chromosome instability in South Polar Skua (*Catharacta maccormicki*), Brown Skua (*C. lonbergi*) and their hybrids.

*Andreas Läufer (BGR Hannover), Detlef Damaske (BGR Hannover), Frank Lisker (Universität Bremen)*

Magnetische Anomalien nordöstlich von Cape Adare und ihre Beziehung zu tektonischen Strukturen in Nord-Victoria-Land (Antarktis)

*Marion Maturilli, Moritz Mielke, Annette Rinke, Jürgen Graeser (AWI Potsdam)*

Tethered Balloon Measurements on the North Pole Drifting Ice Station NP-35  
- The Arctic Planetary Boundary Layer and Coupling with Cyclones

Balázs Nagy (Eötvös Loránd University, Budapest, Hungary), Zoltán Szalai (Hungarian Academy of Sciences, Budapest, Hungary), Gergely Surányi (Eötvös Loránd University, Budapest, Hungary), Éva Bugya (Eötvös Loránd University, Budapest, Hungary)

Surface sediments of the Antarctic plain-tundra: moving and stable terrains

Thomas Opel (AWI Potsdam and Humboldt University Berlin), Diedrich Fritzsche (AWI Potsdam), Hanno Meyer (AWI Potsdam), Rainer Schütt (AWI Potsdam), Hubertus Fischer (AWI Bremerhaven), Frank Wilhelms (AWI Bremerhaven), Karin Weiler (University of Bern, Switzerland)

Long term changes of climate, environment and aerosols in the Central Russian Arctic – A 1.500 year ice core record of Akademii Nauk ice cap (Severnaya Zemlya)

Ivan Parnikoza (Shevchenko University of Kyiv, Ukraine), Osama Mustafa (University of Jena), Iryna Kozeretska (Shevshenko University of Kyiv, Ukraine)

Antarctic herb tundra colonisation zones in the context of an ecological gradient of glacial retreat

Hans-Ulrich Peter (Universität Jena), Christina Braun (Universität Jena), Osama Mustafa, (Universität Jena), Simone Pfeiffer (Universität Potsdam)

Fildes Peninsula und Ardley Island (King George Island, South Shetland Islands) – ein schützenswertes Gebiet der Antarktis?

Lucia Reichelt (University of Cologne), M.E. Weber (University of Cologne), Gerhard Kuhn, (AWI Bremerhaven), W.Ricken (University of Cologne)

Sediment lamination in the southeastern Weddell Sea, Antarctica: a high-resolution study

Gernot Reitmayr (BGR Hannover), Gino Casassa (CECS, Valdivia, Chile), C.Iturrieta (IGM, Santiago, Chile), A. Wendt (CECS, Valdivia, Chile), R. Zamora (CECS, Valdivia, Chile)

Patriot Hills-South Pole traverse: gravity data processing and interpretation

Astrid Richter (AWI Potsdam), Jean-François Gayet (Université Blaise Pascal, Clermont-Fd, France), Guillaume Mioche (Université Blaise Pascal, Clermont-Fd, France), André Ehrlich (University of Mainz), Manfred Wendisch (University of Mainz), Anne Hoffmann (AWI Potsdam), Christoph Ritter (AWI Potsdam), Roland Neuber (AWI Potsdam)

Airborne lidar observations of mixed-phase clouds in the Arctic

Christoph Ritter, A. Hoffmann, Astrid. Richter, R. Neuber (AWI Potsdam)

Analysis of forest fire aerosol with the Koldewey Aerosol Raman Lidar (KARL)

Christian Scheibner (University of Bremen), Dierk Blomeier (Norwegian Polar Institute, Tromsø, Norway), Holger Forke (Berlin Museum of Natural History), Peter Hülse (The University Centre in Svalbard, Norway) Barbara Reinicke (University of Freiburg)

Cycles and stratigraphic correlation during the Late Carboniferous on NE Svalbard (Spitsbergen)

Mirko Scheinert (TU Dresden), Jan Müller (TU Dresden), Sven Riedel (AWI Bremerhaven), Martin Horwath (TU Dresden), Helgard Anshütz (AWI Bremerhaven, jetzt: Norsk Polarinstitut, Polarmiljøesenteret, Tromsø), Bettina Bayer (AWI Bremerhaven), Lutz Eberlein (TU Dresden), Andreas Groh (TU Dresden), Daniel Steinhage (AWI Bremerhaven), Hans Oerter (AWI Bremerhaven), Reinhard Dietrich (TU Dresden), Wilfried Jokat (AWI Bremerhaven), Heinz Miller (AWI Bremerhaven)

Die Kombination von bodengebundenen, flugzeuggestützten und Satellitendaten zur Bestimmung von Schwerefeld, Magnetfeld, Eismassenhaushalt und Krustenstruktur im Dronning-Maud-Land, Antarktis - Ergebnisse des Forschungsprojektes VISA

*Steffi Schmidt (University of Cologne), B. Wagner (University of Cologne), O. Heiri (Utrecht University, The Netherlands), M. Klug (University of Cologne), Martin Melles (University of Cologne)*

Chironomids as indicator for the Holocene climatic and environmental history, a comparison from Duck and Hjort Lake of Store Koldewey of NE-Greenland

*Erki Tammiksaar (Centre for Science Studies, Estonian University of Life Sciences)*

"Compromises instead of rivalry – the prehistory of the organisation of the First International Polar Year"

*Manfred Stober (Hochschule für Technik Stuttgart)*

Vergleich zwischen geodätisch bestimmtem Strain und Eisdickenänderung

*Karl N. Thome (Bochum)*

Impact in Glacier-Ice near Muenster (Nordrhein-Westfalen)

*Gabriele Uenzelmann-Neben (AWI Bremerhaven), Karsten Gohl (AWI Bremerhaven), R.D. Larter (British Antarctic Survey, Cambridge UK), P. Schlüter (AWI Bremerhaven)*

Differences in ice retreat across Pine Island Bay, West Antarctica, since the Last Glacial Maximum: Indications from multichannel seismic reflection data

*Mayya Vergolyas (Dumansky Institute of Colloid Chemistry and Water Chemistry Kyiv, Ukraine), Vladimir Bezrukov (Shevchenko University of Kyiv, Ukraine)*

*Leonid Manilo (NASU, Kyiv, Ukraine)*

Genome instability of three Antarctic fish species

*Stefan W. Vogel (Northern Illinois University, USA), S. Tulaczyk (University of California Santa Cruz, USA), B. Lanoil (University of California Riverside, USA)*

Chemistry of an Antarctic Subglacial Environment – The role of subglacial geochemical processes in global biogeochemical cycles and quantifying subglacial hydrological processes

*Christoph Vogt (University of Bremen), Jens Matthiessen (AWI Bremerhaven), Tanja Mildner (AWI Bremerhaven), Jochen Knies (Geological Survey of Norway, Trondheim), Seung-Il Nam (Korea Institute of Geoscience and Mineral Resources (KIGAM), Daejeon), Jens Tietjen (AWI Bremerhaven)*

Pleistocene glaciation history of the Eurasian continental margin: Evidence from ODP holes on Yermak Plateau (Arctic Ocean)

*Estella Weigelt (AWI Bremerhaven), Karsten Gohl (AWI Bremerhaven), Gabriele Uenzelmann-Neben (AWI Bremerhaven), Rob Larter (British Antarctic Survey, Cambridge, UK)*

Ice-sheet variations as depicted in seismic records of the Amundsen Sea Embayment, West Antarctica

*Christine Wesche, Sven Riedel, Daniel Steinhage (AWI Bremerhaven)*

Höhenmodell der gegründeten Eiszungen im Umfeld der deutschen Überwinterungsstation Neumayer, Antarktis

*Björn Witha (University of Hannover), Siegfried Raasch (University of Hannover), Christof Lüpkes (AWI Bremerhaven)*

The effect of leads in the marginal sea-ice zone on the antarctic atmospheric boundary layer

# **VORTRAGSKURZFASSUNGEN**

- alphabetisch nach Name des/der Erstautors/Erstautorin sortiert -





## **Die spätquartäre Umwelt- und Klimageschichte der Rauer Inseln (Ostantarktis) - geochemische Untersuchungen an küstennahen marinen Sedimenten**

Sonja Berg, Bernd Wagner, Martin Melles

Institut für Geologie und Mineralogie, Universität Köln

Die Rauer Inseln bestehen aus einer Reihe kleiner Inseln, die nur wenige Kilometer vom Inlandeis entfernt der ostantarktischen Küste vorgelagert liegen. Die Inseln selbst sind vollkommen eisfrei und bieten daher ebenso wie die nahe gelegenen Oasen Larsemann Hills und Vestfold Hills Archive, die eine Charakterisierung der spätquartären Umwelt- und Klimageschichte der bisher wenig untersuchten östlichen Prydz Bucht ermöglichen.

Während einer Polarstern Expedition im März 2007 wurden auf den Rauer Inseln marine und lakustrine Archive beprobt, um den Zeitpunkt des Eisrückzugs nach dem letzten glazialen Maximum festzustellen, Veränderungen in Klima und Umwelt seither zu beschreiben und lokale von regionalen Signalen zu unterscheiden.

Der hier diskutierte Kern stammt aus einem marinen Becken, das von Land umschlossen ist und nur zwei schmale und seichte Durchgänge zum offenen Meer besitzt. Die ca. 22 m umfassende Sedimentsequenz lässt sich in zwei lithologische Einheiten gliedern: Die untere ist ein Sapropel, dessen Basis ein Alter von 40.000 Jahren aufweist, und in die Zeit vor dem letzten glazialen Maximum zu stellen ist. Die Textur der Sedimente legt eine Überprägung durch aufliegendes Eis nahe. Sie sind stark kompaktiert und weisen ein kryogenes Gefüge auf. Eine Lamination ist makroskopisch nicht mehr erkennbar. Die obere Einheit ist ebenfalls ein Sapropel, der jedoch fein laminiert und wasserreich ist. Diese Einheit umfasst die letzten 11.000 Jahre und deutet auf Sedimentationsraten zwischen 0,15 - 0,18 cm/Jahr hin. Die Bestimmung der Gehalte an Kohlenstoff, Schwefel und Stickstoff in 8 cm Schritten sowie anderer geochemisch relevanter Elemente in Millimeterschritten mittels RFA-Scanner (Itrax

XRF-Scanner) erlaubt es, sowohl langfristige und kurzfristige Fluktuationen zu beschreiben, als auch lokale von regionalen Signalen abzugrenzen.

## **Carl Weyprecht: Die Geburt des ersten internationalen Polarjahrs. Aus den unedierten Briefen Carl Weyprechts**

Frank Berger

Historisches Museum, Frankfurt am Main

Carl Weyprecht führte Zeit seines Lebens einen umfangreichen Briefwechsel. Vorgestellt wird eine Publikation unter dem Titel „Carl Weyprecht. Seeheld, Polarforscher, Geophysiker“. Aus Familienbesitz sind über 200 Briefen an seine Eltern bekannt. Diese Briefe wurden von Petra Kämpf bearbeitet. Dank Enrico Mazzoli (Triest) konnte der Briefwechsel zwischen Weyprecht und Graf Hans Wilczek, dem Mäzen von vier österreich-ungarischen Polarreisen, erschlossen werden. Bruno Besser (Österreichisches Institut für Weltraumforschung, Graz) und Reinhard Krause (Alfred Wegener Institut, Bremerhaven) behandelten den Briefwechsel zwischen dem führenden Geographen seiner Zeit, August Petermann, und Carl Weyprecht.

Die Briefe an die Eltern geben uns Einblick in den Alltag, die Sorgen und die Mentalität der österreichischen Kriegsmarine der 1850er und 1860er Jahre. In der Schlacht von Lissa wird Weyprecht zum Kriegshelden, der sich schon seit 1863 mit Geophysik beschäftigte. Mit August Petermann plante und diskutierte er die Polarexpeditionen der Jahre 1868 bis 1871. Graf Wilczek wurde ihm Freund und Mäzen, ein engagierter und uneigennütziger guter Geist hinter Weyprecht. Weyprecht und Wilczek formulieren in Dezember 1874 ihre große Idee. Es ging um die Einrichtung gleichzeitiger zirkumpolarer Messstationen an beiden Polen, zu finanzieren durch verschiedene Staaten. Wilczek trat dabei in Vorlage und garantierte die Einrichtung der österreichischen Station auf eigene Kosten.

1875 lagen die Pläne fertig auf dem Tisch. Weyprecht schrieb und agitierte, und bekam von allen Seiten Zuspruch. Ganz allein, zunächst nur unterstützt von Graf Wilczek, führte er seine Idee zur Realisierung. Rückschläge, wie die Kriege auf dem Balkan und die zögerliche Haltung ausgerechnet der deutschen Reichsregierung ließen das Projekt fast scheitern. Das Polarjahr wurde um insgesamt fünf Jahre über sein eigentliches Ziel hinaus verschoben. Als es endlich 1882/1883 glücklich und erfolgreich durchgeführt wurde, war Carl Weyprecht bereits tot.

Es liegt eine Tragik in dem frühen Tod Carl Weyprechts. Die Polarforschung kam nach 1883 erst einmal zum Stillstand. Mit dem hier vorliegenden Quellenbestand konnte demgegenüber ein wahrer Schatz ans Licht gehoben werden, der erlaubt, die Gefühle und sachleitenden Gedanken des Begründers der internationalen Polarforschung nachzuvollziehen.

### **AURORA BOREALIS: A European Research Icebreaker with Deep-Sea Drilling Capability**

Nicole Biebow<sup>1</sup>, Joern Thiede<sup>1</sup>, Martina Kunz-Pirrung<sup>1</sup>, Lester Lembke-Jene<sup>1</sup>, Paul Egerton<sup>2</sup>

<sup>1</sup>AWI Bremerhaven

<sup>2</sup>European Science Foundation, Strasbourg, France

The properties of the polar oceans are currently subjects of intense scientific and environmental debate since they underlie rapid and dramatic changes. News about the shrinking of the Arctic sea-ice cover, potentially leading to an opening of sea passages to the north of North America and Eurasia, and of the calving of giant table icebergs from the of Antarctic shelves are examples of these modern changes. Europe has a particular interest in understanding the Arctic environment and its potential for change because many of its highly industrialized nations reach into high northern latitudes and because Europe is under the steady influence of, and in exchange with the Arctic environment. In addition, considerable living and

non-living resources are to be found in the Arctic Ocean. Research in the polar regions can only be carried out by dedicated research vessels. Modern research vessels that are capable of penetrating into the central Arctic are rare. A new state of the art research icebreaker is therefore urgently required to fulfill the needs of European polar research.

The AURORA BOREALIS will be an optimized science platform that will serve as the base for long, international and interdisciplinary year-round expeditions to the central Arctic Ocean. AURORA BOREALIS will be the most advanced Polar Research Vessel in the world with a multi-functional role of drilling in deep ocean basins and supporting climate/environmental research and decision support for stakeholder governments for the next 35-40 years. The vessel will be a powerful research icebreaker with 44,000 tons displacement and a length of 196 m, with 50 Megawatt azimuth propulsion systems. The new technological features will include azimuth propulsion systems, satellite navigation and ice-management support and the deployment and operation of Remotely Operated Vehicles (ROV) and Autonomous Underwater Vehicles (AUVs) from the twin moon-pools. The most unique feature of the vessel is the deep drilling rig, which will enable sampling of the ocean floor and sub-sea up to 5000 m water and 1000 m penetration at the most inhospitable places on earth. The possibility to flexibly equip the ship with laboratory and supply containers, and the variable arrangement of other modular infrastructure (in particular, winches, cranes, etc.), free deck-space and separate protected deck areas, will allow the planned research vessel to cover the needs of most disciplines in marine research.

## **The geometry of the temperate ice cap of King George Island from GPR and GPS measurements**

Norbert Blindow<sup>1</sup>, Sonja Suckro<sup>1</sup>, Martin Rückamp<sup>1</sup>, Matthias Braun<sup>2</sup>, Albert Moll<sup>2</sup>

<sup>1</sup>Institute for Geophysics, University of Münster

<sup>2</sup>Center for Remote Sensing of Land Surfaces (ZFL), University of Bonn

The results of ground penetrating radar (GPR) measurements in 1997 and 2007 show that the ice cap of King George Island consists of predominantly temperate ice. The 50 MHz system used in 1997 had a rather high resolution but there was a loss of bedrock reflections in some places.

In 2007 we measured with a 25 MHz radar which was more powerful and less affected by scattering so the bedrock could be detected on all profiles. Synthetic aperture processing (migration) was applied to enhance the energy and the resolution of the bedrock returns. The roughness of the volcanic bedrock is high. The known ice cap geometry based on processed GPR data on profile grids with 500 to 1000 m spacing now comprises the higher parts of about half of the island.

Measurements with the newly developed helicopter-borne 30 MHz system UMAIR (University of Münster airborne ice radar) will fill the gaps in the crevassed parts of the ice cap.

## **The Kuunga Suture – its exposed remnants in East Antarctica and its rifted continuation in the Himalaya**

Steve Boger

School of Earth Sciences, University of Melbourne, Australia

The Prince Charles Mountains-Prydz Bay region of East Antarctica consists of a tectonic melange of Middle Archaean to Neoproterozoic terranes.

Although it remains debated as to how these terranes were exactly assembled, most rocks show some evidence of Cambrian reworking. This is taken by many to suggest that the present

configuration of these terranes is a relatively recent phenomenon - one that resulted from Cambrian aged ocean closure between at least some of the observed terranes. Orogenesis of this age (or a little older) is interpreted similarly throughout much of the southern hemisphere, and is generally considered to mark zones of continental collision between the cratonic components of Gondwana.

Although the collisional origin of the Cambrian aged belt (Kuunga Suture) observed in the Prince Charles Mountains-Prydz Bay region is now supported by a number of independent datasets, the acceptance of the Kuunga Suture as a major structure within Gondwana is not universally accepted. In part this may reflect the fact that there is little supporting evidence for the existence of this structure beyond where it is described in the Lambert Basin. The inferred trace of the Kuunga Suture within the remainder of Antarctica is for the most part ice-covered. Apart from a small region of southwestern Western Australia (the Leeuwin Complex), the trace of this belt beyond Antarctica is similarly unexposed. It is inferred to run along the rifted Australian-Indian margin and to exist either on the submerged West Australian continental margin, or to have been part of Greater India - the component of that continent that has been underthrust beneath Eurasia as part of the Eocene to Recent Indo Indo-Eurasian collision.

Little can be done to address the lack of exposure of the Kuunga Suture within Antarctica or Western Australia. However, parts of Greater India have survived Himalayan collision and today these rocks form uplifted thrust bound slices that now define the basement to the Himalayan orogeny. These rocks preserve widespread evidence for a pre-Himalayan history that strikingly matches the depositional, igneous and deformational history preserved along the Kuunga Suture. It is consequently proposed that the rocks from these two regions represent separate parts of the same but now widely dispersed orogenic belt. The correlation of these regions lends support to the notion that the Kuunga Suture can be traced along its proposed length and is thus likely

to represent one of the fundamental tectonic boundaries within Gondwana.

### **Glaciomarine sediment records of late Quaternary ice-rafting and bottom-water activity at the MacRobertson-Prydz Bay continental margin, East Antarctica**

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During cruise ANT-XXIII/9 with RV Polarstern, a sediment core was retrieved from a levee structure on the continental slope off MacRobertson Land, East Antarctica. The glaciomarine depositional environment there is influenced by Antarctic Bottom Water flow and drifting icebergs, released in Prydz Bay from the Lambert Glacier-Amery Ice Shelf System that drains about 20 % of the East Antarctic Ice-Sheet. On the basis of environmental proxy data inferred from sedimentological, mineralogical, and geochemical studies, the response of the glacial drainage system to climate changes is investigated. The 6.2 m long sediment record represents an undisturbed succession, tentatively assigned to the time interval from the Holocene to Marine Isotope Stage (MIS) 3.

Two major lithological units can be distinguished. The sediment sequence associated with the glacial stages MIS 2+3 shows a high content of clay and silt. Low silt/clay ratios indicate a weak activity of Antarctic Bottom Water. Probably, the production of Ice Shelf Water was inhibited by a grounded ice-sheet in Prydz Bay during the Last Glacial. The postglacial section is richer in biosiliceous remains than the older glacial sediments, underlining the warm-stage character of the deposits with enhanced biological productivity under reduced seasonal sea-ice coverage. Increased K/Ti ratios and changes in terrigenous mineral assemblages indicate a change in the source of detrital materials, with strong Prydz Bay provenance signals since the end of MIS 2. A low content of fine material and high silt/clay

ratios point to reinforced bottom circulation, while increased amounts of ice-rafted debris, quantified by counting the clasts >2 mm in X-Ray photographs, indicate the frequent presence of drifting icebergs. However, the middle part of the postglacial section includes intercalated sediments with abundant mica flakes, that in lithology and textural composition reveal affinities to the glacial sediments of MIS 2, suggesting a climate episode of cold reversal.

In conclusion, our findings demonstrate similar glacial-interglacial changes in glaciomarine environmental processes as observed along other parts of the Antarctic continental margin; for instance in the Weddell Sea realm. In the Prydz Bay area, this long-term climatic pattern seemed to be punctuated by a short-term cooling event in the mid-Holocene. Further chronostratigraphic information is needed to constrain its exact timing.

### **Structure and dynamics of Wilkins Ice Shelf (Antarctic Peninsula) as observed by a multi-sensor remote sensing approach**

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Wilkins Ice Shelf (WIS) is currently right at the -9°C isotherm, where the limit of existence of ice shelves is proposed by various authors. In this study, we combine various remote sensing technologies and products to obtain an improved understanding of the current structure and dynamics of the WIS. We document the retreat of the ice front of the WIS from 1986 to 2007, as well as the formation of cracks and extent of melt ponds by means of multi-spectral and SAR remote sensing imagery. A general analysis of ice shelf structures and their temporal changes is performed based on a Landsat mosaic from 1986/90 and a recent TERRA ASTER mosaic from 2001-06. Differential SAR Interferometry (ERS-1/2 tandem and

ice phase) was used to derive 2D flow fields for the south-eastern part of the ice shelf and its major tributary glaciers. Velocities range from 1.3 to more than 183  $\text{m a}^{-1}$  at the floating ice shelf and up to 333  $\text{m a}^{-1}$  further upstream of the inland glaciers. Multiple interferograms are utilized to inspect the fringe patterns with regard to the hinge zone and grounded areas, both ice rises and ephemeral grounding. Both the multi-temporal optical imagery as well as an interferogram with a long temporal baseline show indications for changes in the dynamics of tributary glaciers. Surface elevation data from the ICESat GLAS instrument have been analysed with regard to tidal effects, crack formation and the variability of the hinge zone. The surface elevation data was used to estimate the ice thickness, which was compared with radio echo sounding data from the early seventies.

The multi-sensor approach provides a detailed view of the recent and near-past state of the ice shelf as well as indications for ongoing changes in ice dynamics. The data set provides a formidable base for subsequent ice shelf modelling.

### Fernerkundungsaktivitäten und Feldkampagnen auf King George Island

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Der Vortrag gibt einen Überblick über die Arbeiten auf der Eiskappe von King George Island. Seit Mitte der 1990er Jahre wurden umfangreiche glaziologische Untersuchungen auf King George Island durchgeführt. Aus Fernerkundungsdaten konnte der Gletscherrückzug seit 1956 bis 2005 bestimmt werden. Aus Zeitreihen der Europäischen Satellitenmissionen ERS-1/2 und ENVISAT wurden Informationen zur Schmelzdynamik abgeleitet. Zudem konnten aus ERS-1/2 Tandemdaten ein Flächendatensatz zur Gletscherbewegung und der Oberflächentopographie im

zentralen Bereich der Eiskappe gewonnen werden.

Die Ergebnisse der Fernerkundung werden mit den Erhebungen während Feldkampagnen seit dem Südsommer 1997/98 in Beziehung gesetzt. In diesen wurden umfangreiche Daten zu glaziologischen Parametern wie Fließgeschwindigkeiten, Ablation und Akkumulation, Oberflächentopographie und Eisdicke erfasst.

Der Vortrag leitet zu weiteren Vorträgen mit detaillierten Betrachtungen der Struktur und Dynamik der Eiskappe über.

### Internationale Studentexpedition nach King George Island/Antarktis

Anne Braunschweig<sup>1</sup>, 14 weitere Studenten<sup>2</sup>, Hans-Ulrich Peter<sup>3</sup>

<sup>1</sup>Universität Jena

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Der Vortrag zeigt mit Farbfotos den Ablauf und die Ergebnisse der Internationalen Studentexpedition nach King George Island, die im Rahmen des Internationalen Polarjahres von Ende Dezember 2007 bis Anfang Februar 2008 stattfand. 15 Studenten aus 4 Ländern (Deutschland, Russland, Argentinien und Luxemburg) nahmen daran teil. Ausgangspunkt für die Feldarbeiten waren die russische Antarktisstation „Bellingshausen“ und die chinesische Antarktisstation „Great Wall“ auf Fildes Peninsula.

Folgende Forschungsschwerpunkte wurden im internationalen Team bearbeitet:

Die Auswirkungen von Global Change sind im Bereich der Südshetland-Inseln aufgrund des im Vergleich zu anderen Antarktisgebieten starken Temperaturanstiegs vielfältig nachweisbar. Ein Indikator ist die Veränderung der Vegetation. Dazu wurde eine GPS- und GIS-gestützte Kartierung des Vorkommens der Antarktischen Schmiele (*Deschampsia antarctica*) vorgenommen, die auf Fildes schon zweimal (1984/85 und 2000/01) untersucht worden war. Die Brutpaar-

zahlen und der Bruterfolg der auf Ardley Island brütenden Adelige-, Zügel- und Eselspinguine (*Pygoscelis adeliae*, *antarctica* und *papua*) wurden erfasst. Auffällig ist der langjährige Trend der Abnahme des Adeliepinguins als Folge der veränderten Eisverhältnisse und damit Nahrungsverfügbarkeit im Winter. Außerdem werden die ermittelten Bestandeszahlen anderer Vogelarten und der Robben sowie Daten zu deren Ökologie vorgestellt. Der Rückzug der Gletscher auf King George ermöglichte, nun freigelegt Fossilien zu kartieren. Es werden Ergebnisse über die Funde tertiärer Flora vorgelegt, die als Abdrücke in vulkaniklastischen Sedimenten, als inkohlte Pflanzenreste bzw. als verkieselte Hölzer gefunden wurden. Diese Expedition wäre ohne die finanzielle Unterstützung der Deutschen Gesellschaft für Polarforschung, des DAAD, der Gesellschaft der Freunde und Förderer der FSU Jena, der Gundermann-Stiftung sowie weiterer Sponsoren nicht möglich gewesen.

### Glacier recession and formation of glacial lakes in Khumbu Himalaya using space imagery

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Multi-temporal space imagery from 1962 (Corona KH-4), 1992 (Landsat TM), 2000 (Ikonos), 2002, 2003 and 2005 (Terra ASTER) were utilised to investigate the planimetric glacier changes in Khumbu Himal. In addition, the downwasting rate was estimated using digital surface models (DSM) derived from Stereo Corona and ASTER. Especially the DSM generation from the early Corona KH-4 stereo data in this high terrain relief is time-consuming and the results are only partly promising due to elevation errors. Nevertheless, the comparison of glacier

profiles based on the Corona and the ASTER DTM clearly showed the downwasting of the debris-covered glaciers. The highest downwasting rates for the Khumbu glacier with more than 15 metres from 1962 to 2002 (~0.4 m/a) can be found at the transition zone between the active and the stagnant glacier parts of the debris covered glacier tongue. The other debris-covered glaciers in the investigation area show similar behaviour.

The investigated ice coverage in Khumbu Himal decreased about 5% between 1962 and 2005, whereas the highest retreat rates are found between 1992 and 2001. The debris-coverage increased concomitantly with the decrease of the total glacier area, whereas the clean ice area decreased more than 10%.

The continuously recession and downwasting of the glaciers caused a rise of the total area of glacial lakes, and therefore led into an increasing danger of outburst floods (GLOF). Using the remote sensing data the glacial lakes were monitored and surface displacements were calculated. Based on the DSMs and the glacier surface velocities potential sites of future lake formations could be identified.

### Cryptogams in Arctic vegetation

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The important role of lichens for arctic biodiversity is widely known. Nevertheless are lichens and also bryophytes in vegetation studies rarely considered adequately due to identification difficulties. Recent and thorough vegetation studies however reveal that cryptogams are often main contributors to biodiversity in arctic vegetation and must thus not be neglected.

In the first part of this contribution it will be shown that small-scale phytodiversity in arctic cryptogam rich vegetation can even exceed temperate and subtropical grasslands, which are famous in that respect. The second part deals with terricolous lichen vegetation in Greenland and its small-scale units, synusia or

microcommunities. Cryptogams in vegetation description can be considered on two levels: 1. as components equal to vascular plants and 2. as components of an independent microcommunity system which comprises only rootless and poikilohydric cryptogams. This synusial system is already quite elaborated, especially in temperate Europe. By means of 300 small-scale plots from SE and W-Greenland the small-scale units and their habitats are shown using Canonical Correspondence Analysis. The synusial units are found to be sensitive bio-indicators of calcareous or non-calcareous substrate and of small-scale microclimate differences. The distribution of the small-scale units in landscape and larger scale vegetation units is shown. It is evident that most microcommunities can co-occur with several different plant communities. Like the cryptogam species, small-scale units usually have larger distribution areas than vascular plants and plant communities.

Biodiversity, functional diversity and similarities of lichen floras are discussed in a broader context compared with similar studies from temperate and boreal areas and the subalpine/alpine zone of the Austrian Alps. Although lichens are much more abundant in the Arctic and boreal region, the terricolous lichen floras were found to be astonishingly similar in size and composition from the temperate areas to the Arctic, much higher than of saxicolous species (here Sørensen coefficients comparing Austria, Germany, Finland, Sweden, Norway, Greenland, N-American Arctic).

The northern regions appear to be an important reservoir of terricolous cryptogam biodiversity. Increasing temperature might shift the balance in favour of more competitive vascular plant species to the disadvantage of terricolous lichens.

### Radionuclides in Sea-Ice Sediments from the Arctic Ocean as tracers of sea ice

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New Arctic sea ice is formed mainly over the shallow continental shelves. A large fraction of it is exported to the central Arctic Basin, and, after drifting following the Transpolar Drift and the Beaufort Gyre, it reaches melting areas such as the Fram Strait. Significant amounts of radionuclides, both of natural and artificial origin, are present in sea ice, which can be associated with sea-ice sediments. Sediments are entrained during the formation of new ice in source areas and incorporate radionuclides from their point of origin, as well as through scavenging from surface sea water and from atmospheric supply during drift. Thus, drifting sea ice is a mechanism for transport and redistribution of radionuclides in the Arctic Ocean, releasing them far from the original point of incorporation.

Therefore, in order to assess the fate of radionuclides in sea ice, it is essential to understand the processes involved in the incorporation, transport, accumulation and redistribution of radionuclides from different sources in sea ice. The concentrations of the artificial isotopes such as <sup>137</sup>Cs and Pu in sea-ice sediments reflect those of the sediments from sea ice formation areas, likely the continental shelves. This result is consistent with the Pu ratio (0.118-0.253) data found in sea ice sediments, with low Pu ratios corresponding to ice floes that would have originated in specific localisations in the Arctic continental shelves, such as Novaya Zemlya archipelago and Kara Sea. Also, the

geographical distribution radionuclide concentrations in sea-ice sediments mirrors the sea ice drifting patterns. In contrast, the inventories of  $^7\text{Be}$  and excess  $^{210}\text{Pb}$  in sea-ice sediments are derived from the enrichment processes during the transit time following atmospheric input of these radionuclides to the sea ice, as well as scavenging from surface sea water.

The data obtained from several areas in the Arctic support the concept that the fates of sea ice and the radionuclides entrained in it are coupled, and show the feasibility of using the radionuclides as tracers of sea-ice source areas, transit time, shifts in the patterns of drift and ultimate fates. Keywords: Arctic Ocean,  $^7\text{Be}$ ,  $^{137}\text{Cs}$ ,  $^{210}\text{Pb}$ , Pu isotopes, sea ice, sea ice-sediments.

### **Volcano-ice Interaction during Formation and Geodynamic Position of the Hudson Mountains Volcanic Field, Western Ellsworth Land, Antarctica**

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The Hudson Mountains Volcanic Field (HMFV), located in remote western Ellsworth Land, West Antarctica ( $73^{\circ}45' - 74^{\circ}55' \text{ S}$  and  $98^{\circ}20' - 100^{\circ}30' \text{ W}$  along Pine Island Bay), is No. 1900-028 in the "List of active volcanoes of the world" within the Global Volcanism Program based on reports on steaming vents as well as satellite data suggesting an explosive eruption at Webber Nunatak in 1985. Based on K/Ar data the volcanic field is believed to have experienced a Neogene to recent activity with a late Miocene to early Pliocene age for most of the succession.

HMFV is reported to (a) be formed by a large number of small, only slightly eroded cones, some with shallow but well-defined craters and (b) to comprise three larger, up to 750 m high eroded stratovolcanoes (Teeters Nunatak 617 m, Mount Moses 749 m, Mount Manthe 567 m). However, during Polarstern expedition ANT-XXIII/4

in spring 2006 neither signs of recent hydrothermal activity nor tephra deposits of recent explosive activity were observed. Based on the new field observations, at least Mount Moses and Mount Manthe do not represent stratovolcanic structures but were rather identified to consist of strongly eroded multiple successions of pillow sequences, hyaloclastic tuffs, breccias, and cross-bedded sandy sediments as well as less common shallow water lava flows. These observations require an ice cover during their formation that must have been higher by at least 300 m and 500 m, respectively, indicating an extent of the West Antarctic Ice Sheet that was more comparable to a Pleistocene glacial rather than the recent interglacial.

The newly sampled rocks are weakly alkaline olivine-phyric basalts (basanites) as well as mildly differentiated tephrites/trachybasalts. Some samples, although free of plagioclase phenocrysts as well, exhibit Si-saturation due to assimilation of a few percent of silicious crustal rocks contained as xenoliths. The chemical composition of rocks in the Hudson Mountains volcanic field (HMFV) is indistinguishable from the alkaline basalts and their differentiates in the Marie Byrd Land Igneous Province, e.g. of Mt. Murphy, the closest of the large complex volcanoes. However, rare earth element (REE) analyses or Sr-, Nd- and Pb-isotope analyses are still lacking. The continental segment underlying the Hudson Mountain Volcanic Field geodynamically is thus part of the Marie Byrd Land Block, supporting the lately presented aeromagnetic data of the British Antarctic Survey suggesting that the divide between the Ellsworth Land Block and Marie Byrd Land is located to the East of the volcanic field.



## Monitoring Ammassalik Vegetation Change (MAVC) - Global change in the low arctic tundra of southeast Greenland?

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The knowledge of the low-arctic vegetation of the Ammassalik district, Southeast Greenland, is mainly known from studies in the late 1960s by Daniels (1982) and De Molenaar (1976) at a time when there was little human impact or global warming effect. During the past 40 years significant changes have occurred. They include increases both in population and temperature. The population of the small town of Ammassalik has grown from nearly 700 to more than 1800 and now over 5000 tourists visit the district annually. Compared with the previous research period, climate changes include a mean annual temperature increase from -2.2°C to +0.3°C and a distinct longer period of summer warmth with higher temperatures.

The objectives of the research project (sponsored by the German Research Foundation) are to assess and evaluate the present status of key plant community types of the low arctic tundra near the town of Ammassalik in relation to global warming.

Fieldwork took place in summer 2007 by the same research team using the same methods as before. The fieldwork included resampling of old sample plots or stands, the checking of all vegetation types of the end of the 1960s, resampling of an old vegetation transect and checking and remapping of old vegetation maps.

Although many fieldwork data are still to be worked out, we are able to present some first results. They show, that main vegetation structures in the landscape appear unchanged in 40 years. Moreover the floristical composition and structure of the zonal dwarf shrub vegetation, the *Empetrum hermaphroditum*-*Vaccinium microphyllum* community, did not change at all. The same applies for the low shrub vegetation (*Festuco-Salicetum*). Plant

communities on southern exposed slopes with dry soil show a slight increase in xerophytes and thermophytes. Human impact on the tundra vegetation increased by the expansion of the town. These and future results are evaluated and discussed in the context of possible effects of global warming. Special attention will be paid to plant functional types and thermophily indices of the plant species.

Literature: Daniels, F.J.A. 1982: Vegetation of the Angmagssalik District, Southeast Greenland, IV. Shrub, dwarf shrub and terricolous lichens. *Meddr. Grönl. Bioscience* 10: 1-78. Molenaar, De, J.G. 1976: Vegetation of the Angmagssalik District, Southeast Greenland II. Hern and snow-bed vegetation. *Meddr. Grönl.* 198, 2: 1-265

## Untersuchungen zu Bewegungsverhalten und Massenbilanz des antarktischen Eises im Bereich des subglazialen Lake Vostok

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Die Kenntnis der Fließdynamik der Eiskecke über dem größten und herausragendsten subglazialen See, dem Lake Vostok, ist entscheidend für das Verständnis der hydrologischen, limnologischen und Sedimentationsprozesse in diesem Wasserkörper. Darüber hinaus bieten die spezifischen Bedingungen der schwimmenden, dem hydrostatischen Gleichgewicht gehorchenden Eiskecke eine einzigartige Gelegenheit zur Bestimmung von Höhenänderungen und der aktuellen Eismassenbilanz. In der Saison 2001/2002 wurden im Gebiet der russischen Antarktis-Station Vostok geodätische GPS-Festpunkte errichtet und erstmals mit GPS beobachtet. Diese Beobachtungen

wurden in der darauffolgenden Feldsaison wiederholt. Während der Saison 2006/2007 erfolgte auf diesen Punkten eine dritte GPS-Messung. Diese Wiederholungen in-situ-Messungen bilden die Grundlage für eine genaue Bestimmung von Geschwindigkeit und Richtung der Fließbewegung des Eises sowie von Höhenänderungen der Eisoberfläche. Eine Strain-Analyse der internen Geometrieänderungen zwischen den Festpunkten ermöglicht die Quantifizierung von Konvergenz/Divergenz und Beschleunigung des Eisflusses in der Umgebung der Station Vostok. Im Vortrag wird die Kombination der mit geodätischen Mitteln gewonnenen geometrischen Punktverschiebungen mit präzisen terrestrischen Eisdickenmessungen und repräsentativen Schneeakkumulationsdaten zur Untersuchung von Höhenstabilität und Eismassenbilanz der Eisdecke über dem Subglazialsee vorgestellt.

Darüber hinaus wird auf die in der Saison 2007/2008 erfolgte Weiterführung der Forschungen eingegangen, die einen wichtigen Beitrag zum IPY-Projekt SALES UNITED darstellen.

### **A Model of Altitudinal Zonation of Arctic Vegetation**

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The vegetation of arctic mountain complexes is still unexplored to a great extent. Hence, an altitudinal zonation hypothesis was formulated for the Circumpolar Arctic Vegetation Map (CAVM Team 2003, Walker et al. 2005). Based on similarities between environmental conditions along the altitudinal and latitudinal gradient (e.g. summer temperatures, growing season) it is hypothesized that the latitudinal bioclimate subzones are reflected in altitudinal vegetation belts. Corresponding to a difference of 2°C in mean-July temperature between adjacent latitudinal vegetation subzones and deduced from an adiabatic lapse rate of 6°C per 1000

elevation meters an altitudinal extent of 333 elevation meters is presumed for each altitudinal vegetation belt.

In order to check this hypothesis, the Altitudinal Zonation of Vegetation (AZV) Project was initialized in 2002. The study area is situated in noncarbonate mountain complexes of the Søndre Strømfjord region (continental West Greenland) reaching elevations up to 1330 m a.s.l. On the basis of comprehensive vegetation analyses according to the Braun-Blanquet approach the AZV-project provides fundamental data about arctic mountain vegetation and gives a picture of the present status of the ecosystem. The principal object is the elaboration of a model of altitudinal vegetation belts for continental West Greenland. First aspects of this model are presented. They encompass the characterization of mountain vegetation with regard to flora, vegetation types, vegetation pattern and habitat conditions and the differentiation of these vegetation characteristics along the altitudinal gradient. Besides, the suitability of plant species and vegetation types for characterization and delimitation of altitudinal vegetation belts is discussed. Concepts of altitudinal indicator species and plant communities based on limited altitudinal distribution or changes of habitat-type spectra are presented. The vegetation pattern is considered by idealized toposequences and representative, detailed vegetation maps of different altitudes. Borderlines between four altitudinal belts distinguished between south- and north-facing slopes are identified. The provided comprehensive data about mountain vegetation and its ecology can be used for monitoring approaches and nature conservation as well as for further studies and extrapolation purposes.

## Upper Carboniferous and Permian cyclic carbonate shelf deposits (NE Svalbard) – a video presentation

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The Carboniferous to Permian is characterized by the formation of the supercontinent Pangea as well as by pronounced climatic changes, from glacial to nonglacial conditions. The Late Paleozoic Ice Age (Visean - Sakmarian) caused high frequency and high amplitudinal sea-level fluctuations of more than 100 m, which led to a pronounced cyclicity of the deposits. In contrast, the Middle to Upper Permian sediments are deposited during low-frequent and low amplitudinal sea-level fluctuations.

The archipelago of Svalbard at this time was situated at the northern rim of Pangea linking the warm-temperate to cold areas of the Canadian Arctic with the subtropical/tropical Urals and Tethys areas. Formations of the Billefjorden Group (Famennian-Visean), Gipsdalen Group (Serpukhovian-Artinskian), and Tempelfjorden Group (Artinskian-Kazanian) are investigated on both sides of the Hinlopenstreet (NE Spitsbergen, Nordaustlandet) within a mapping project of the Norwegian Polar Institute.

The documentation and interpretation of the climatic and oceanographic changes and their effects on the sediment and on the marine organisms during the Carboniferous to Permian represent the center of the scientific interest of the joint Norwegian-German cooperation. This study is embedded in the larger study of Sedimentary and Climatic evolution of the Arctic during the Late Paleozoic (SCALP) and the video presentation provides an overview about the logistic requirements and conditions for geologic field work in arctic regions. It also intends to give an introduction to the carbonate shelf deposits of NE Svalbard with their rich fossil faunas and to illustrate the response of sedimentary environments to changes

in climate and sea-level. Further details about the different research topics are given as supplementary poster presentations (Behrend et al., Blomeier et al., Scheibner et al., this volume).

## Stabile Wasserisotope eines Eiskerns von Akademii Nauk (Sewernaja Semlja) als Proxies für Paläotemperatur und überregionale atmosphärische Zirkulation

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Im Zentrum der Eiskappe Akademii Nauk auf Sewernaja Semlja wurde 1999-2001 ein 724 m langer Eiskern gebohrt, um paläoklimatische Informationen in Jahresauflösung aus diesem Teil der russischen Arktis zu erhalten. Inzwischen liegen Analysen der Verhältnisse der Isotope Sauerstoff ( $\delta^{18}\text{O}$ ) und Wasserstoff ( $\delta\text{D}$ ) in 2,5 cm Auflösung für ein Drittel des etwa die letzten 2650 Jahre umfassenden Klimaarchivs vor. Diese Verhältnisse sind hauptsächlich von der Kondensations-temperatur abhängig, bei der einst der Niederschlag gebildet wurde. Änderungen im  $\delta^{18}\text{O}$ - und  $\delta\text{D}$ -Signal gelten als bewährte Indikatoren (proxies) für Paläotemperaturen. Die Isotopendaten des vorgestellten Eiskerns gestatten eine hoch aufgelöste Temperaturrekonstruktion für die zentrale russische Arktis, die anhand der seit 1840 vorliegenden meteorologischen Daten der norwegischen Station Vardø kalibriert werden konnte ( $T(\text{Vardø}) [^\circ\text{C}] = 0,37 * \delta^{18}\text{O}(\text{AN}) [‰] + 8,8; r=0,93$  im zehnjährigen gleitenden Mittel).

Dansgaard (1964) definiert den Deuterium Excess, eine aus  $\delta^{18}\text{O}$ - und  $\delta\text{D}$  abgeleitete Größe. Dieser Deuterium Excess enthält zusätzliche paläoklimatische Informationen, die üblicherweise als Indikatoren für relative Luftfeuchte und Meeres-Oberflächen-Temperatur im Quellgebiet angesehen werden (z.B. Merlivat & Jouzel, 1979).

Erstmals werden hier Deuterium-Excess-Daten des Eiskerns von Akademii Nauk vorgestellt und mit Literaturwerten verglichen. Für Sewernaja Semlja ergibt sich dabei ein weit kompliziertes Bild als für Grönland, Schottland oder Island. Der Deuterium Excess scheint hier stärker durch sekundäre Verdunstung beeinflusst zu sein und daher eher sich ändernde Zirkulationsmuster widerzuspiegeln, als auf Veränderungen im Quellgebiet hinzuweisen.

Literatur: Dansgaard, W. (1964): Stable isotopes in precipitation. *Tellus XVI*, 436-468. Merlivat, L. & J. Jouzel (1979): Global climate interpretation of the Deuterium-Oxygen 18 relationship for precipitation. *Journal of Geophysical Research* 84 (C8), 5029-5033.

### Antarctic microbial communities in mineral deposits on Livingston Island, South Shetland Islands

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Livingston Island, located at the tip of the Antarctic Peninsula, is characterised by an oceanic polar climate with temperatures above 0°C during the austral summer and a mean annual precipitation between 400 and 500 mm. Under these conditions a soil formation can be observed and lichens, mosses and some higher plants are able to grow in this environment. With cultivation-independent methods, it is possible to analyse complex microbial networks in the face of diversity, abundance, ecology and their reaction on climate change. Here, we investigated the bacterial community structure of different habitats located on Livingston Island by polymerase chain reaction (PCR) and denaturing gradient gel electrophoresis (DGGE) to get a first insight in the diversity of bacteria existing under these conditions. The aim of these studies is to identify the main microbial players in nutrient turnover within periglacial ecosystems of Antarctica. One transect and four separate profiles were sampled near the Bulgarian

station St. Kliment Ohridski (62°38'S/60°21'W). Two soil profiles were characterised by permafrost. The investigated mineral soils showed mostly gravelly sand texture. Moisture content of the soils ranged from 2.6% up to 15.6% and was partly quite variable within the different profiles. The values of total carbon and nitrogen were extremely low with < 0.10 to 0.46 % and < 0.10%, respectively, except for the upper layers of the profiles T1-1 and T1-4 that were covered by mosses. PLFA concentration decreased with increasing depth, which correlates well with the TC values. DGGE patterns from amplification of DNA showed large varieties in the vertical profiles and between the different sites.

Most sequences recovered from Antarctic soil profiles belong to the Bacteroidetes and to the *Acidobacteria* phylum. DGGE pictures showed a high diversity in most of the samples. The main influence on heterotrophic microbial growth and activity in low-nutrient habitats is probably the availability of organic compounds. Water can also be a limiting factor, but microorganisms seem to be well adapted to these conditions as it can be derived from the DGGE pattern. It is conceivable that the ways of C and N cycling in cold Antarctic habitats are short and that cold-adapted microorganisms might play a major role for the ecosystem development. To compare arctic and antarctic microbial communities phylogenetic investigations will be done using clone libraries for both Bacteria and Archaea.

### Neumayer Station III – a Sustainable Replacement for Future

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Germany will continue Antarctic research in the long-term. That needs a large share of field work, requires very specific station facilities and in turn regular investments to keep all infrastructure in top condition or to make necessary advanced replacements. Design and construction of Neumayer Station III is one of the most ambitious

projects of the Alfred Wegener Institute since 2002.

The new station with very innovative design will be erected close to its two predecessors on the Ekström Ice Shelf in Antarctica. The construction concept features above-ground and below-ground facilities combined in one large structure which can be raised hydraulically to compensate snow accumulation. So the lifetime of this building is no longer determined by snow pressure but only by its movement with the flow of the ice shelf.

The station part containing living and working space will be two storied and placed above ground on a 6 m elevated platform of about 68 by 24 metres. An aerodynamically shaped, insulated hull is to protect this platform and to reduce snow accumulation or erosion caused by the building around the base. A 76 m long, 26 m wide and 8.2 m deep trench in the snow under the platform, accessible via a ramp, will serve as garage and cold storage room. A flat, rigid roof in level with the snow surface covers the trench. The whole structure will be supported by 16 legs or columns founded on foundation pads which rest on the snow floor of the garage. A sophisticated energy management and the inclusion of wind power will contribute to fuel efficiency and minimization of unwanted exhaust gas emissions. By October 2007 all manufacturing works and test assembling of platform structure and container modules have been completed in Bremerhaven. On board MS Naja Arctica, operated by the Danish shipping company Royal Arctic Lines, about 3.500 tons of construction material and consumables were carried southbound to Atka Bay. The construction works started in December 2007 and will be completed until February 2009.

The new station as its predecessors will be the main German research and logistic base in Antarctica. It will continue feeding international networks with high quality long-term data records, hosting project groups, and providing logistics for aircraft missions and deep field traverses contributing to large international programmes. Likewise it will provide more comfortable conditions for living and

science to next generation of polar researchers.

### **Tectonics of the Amundsen Sea Embayment, West Antarctica: Constraining factor for ice-sheet expansion?**

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An understanding of the glacial history of the Amundsen Sea Embayment and Pine Island Bay (PIB) is essential for proposing models on the future development of the West Antarctic Ice Sheet (WAIS). It requires both an understanding of the tectonic history, because basement morphology and inherited erosional features may control the flow direction of ice-sheets and the influx of Circum-Polar Deep Water at later times.

We attempt to reconstruct the tectonic history with the aim to search for basement features and crustal boundaries which may be correlated to the flow and dynamics of ice-sheet advances. The Amundsen Sea Embayment of West Antarctica is in a prominent location for a series of tectonic and magmatic events from Paleozoic to Cenozoic times. It played a central role in the rifting and break-up of greater New Zealand from West Antarctica as it is the location where the junction of Chatham Rise and Campbell Plateau (New Zealand) lies conjugate to the West Antarctic margin. New seismic, magnetic and gravity data from the Amundsen Sea Embayment and Pine Island Bay reveal the crustal thickness and tectonic lineations. The Moho is 24-22 km deep on the shelf. NE-SW trending magnetic and gravity anomalies and the thin crust indicate a former rift zone that was active during or in the run-up to breakup between Chatham

Rise and West Antarctica before or at 90 Ma. NW-SE trending gravity and magnetic anomalies, following a prolongation of Peacock Sound between Thurston Island and Ellsworth Land, indicate the extensional southern boundary to the Bellingshausen Plate which was active between 79 and 61 Ma. However, both lineation trends, NE-SW and NW-SE, seem to be observed over broad regions. This infers stepwise and multiple rift and extension phases over a wide period of time before, during and after the break-up between New Zealand and West Antarctica.

We propose that these tectonically inherited erosional trends on the continental shelf of the Amundsen Sea Embayment have controlled the main directions of ice streams during times of an advancing West Antarctic ice-sheet.

### **The International Polar Year 2007/08: exciting activities and first results**

Karsten Gohl<sup>1</sup>, Reinhard Dietrich<sup>2</sup>, Eberhard Fahrback<sup>1</sup> and the D-IPY Commission

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<sup>2</sup>Institute for Planetary Geodesy, University of Dresden

Scientific capacities and logistics of a global scale are currently bundled for the International Polar Year (IPY) 2007/08 to further foster and focus multidisciplinary and cooperative research in the polar regions of our planet. Being faced with the presently occurring climatic and environmental change, the purpose of the IPY is to comprehensively investigate the current status as well as past changes at various time scales, but also to explore regions of previously unknown geoscientific and ecological systems. The German research institutions are participating in the IPY with a broad band of geoscientific, climatic, biological and human-sociological studies, supported by a large infrastructure and future-oriented technologies. After the first half of the IPY, we will now draw an intermediate resume in which we present the state of the organisation and activities

of IPY projects, illustrate the newly and continuously operated infrastructure and show examples of education, outreach and media activities. Scientific highlights from field work in the Arctic and in Antarctica, in which German scientists have participated in over 20 IPY projects so far, will be presented.

### **ODEN - Einblick in wissenschaftliches Arbeiten**

Dietmar Gruber

Markgrafen-Gymnasium, Karlsruhe

Im Rahmen des Projektes "Coole Klassen" des deutschen Beitrages zum Internationalen Polarjahr war die Gelegenheit gegeben, sich als Lehrer bei einer Expedition in das arktische Meer auf dem schwedischen Eisbrecher ODEN zu beteiligen. Wesentliches Ergebnis ist der Einblick in die wissenschaftliche Arbeitsweise.

Amerikanische Wissenschaftler vom Institut WHOI in Rhode Island untersuchen bei der Expedition AGAVE Hydrothermal Vents und die dabei entstehenden Organismen.

Im vorliegenden Vortrag wird neben einem Überblick über die Route und die wissenschaftlichen Ziele insbesondere der Umgang mit dem technischen Equipment beschrieben. Neben der herkömmlichen Ausrüstung wurden auch Geräte im erstmaligen Einsatz getestet. Tests, Reparaturen und Diskussion der Ergebnisse geben einen Eindruck in die Arbeitsabläufe.

Abschließend wird ein Überblick über die Umsetzung im Klassenzimmer im Rahmen des neu geschaffenen Faches Naturwissenschaft und Technik gegeben, bei dem die Faszination derartiger Reisen auf die Schüler übertragen wird.

## Large-Eddy Simulation von Wolkenstraßen in einem Kaltluftausbruch

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Wolkenstraßen sind bekanntermaßen ein typisches sichtbares Zeichen von Kaltluftausbrüchen vom polaren Meereis auf das offene Wasser hinaus. Die sie auslösende Konvektion wird durch die im Vergleich zum Meereis deutlich wärmere und feuchtere Wasseroberfläche angetrieben. Die Prozesse jedoch, die zur organisierten Struktur der Konvektionsbewegung führen, also zur Ausbildung der zellenartigen oder parallelen, bandartigen Strukturen, sind immer noch nicht vollständig bekannt. Ein Ansatz zur ihrer Untersuchung ist die Verwendung turbulenzauflösender Modelle (large eddy simulation, LES). Aufgrund der hohen räumlichen und zeitlichen Auflösung dieser Modelle sind solche Berechnungen extrem aufwändig. Zur Reduzierung des Rechenaufwands wurden daher meist kleine, mit dem Grundstrom mit bewegte Modellgebiete verwendet. Der Einsatz massiv-paralleler Rechner zusammen mit dem dafür besonders optimierten LES-Modell PALM (PARallelized LES Model) erlaubt jedoch in jüngster Zeit auch Berechnungen auf erheblich größeren Gebieten. Dadurch waren wir in der Lage, mit einem feststehenden Modellgebiet ganze polare Kaltluftausbrüche zu simulieren. Dabei konnten wir unmittelbar das Auftreten organisierter Konvektionsstrukturen im Modell beobachten.

Es hat sich in unserer Untersuchung jedoch erwiesen, dass die Simulationsergebnisse stärker als vermutet von den vorgegebenen Anfangs- und Randbedingungen abhängen. Unter Verwendung von Mess- und Satellitendaten, zur Initialisierung des Modells, konnten wir unmittelbar das Auftreten von organisierter Konvektion im Modell beobachten, sowie die hiermit einhergehenden Wolkenstraßen. Uns ist bisher keine andere Simulation bekannt, in welcher die von Satellitenbildern

bekannteren Wolkenstraßen so realistisch wiedergegeben werden.

## The Ross Ice Shelf dynamics during the Late Pliocene and the Early Pleistocene – climate conditions warmer than today?

Donata Helling<sup>1</sup>, Gerhard Kuhn<sup>1</sup>, Hilmar von Eynatten<sup>2</sup>, MIS science team members

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In Antarctica, the largest inland ice masses on Earth are stored. The growth and the retreat of ice sheets play a major role in the global ocean current system and climate. The melting and collapse of large ice shelves may cause a significant sea level rise, because of accelerated inland ice glacier surges into the ocean. The ANDRILL (Antarctic Geological Drilling) MIS deep drilling project (McMurdo Sound, NE Ross Ice Shelf, core AND-1B drilled during austral summer 2006/2007) is located in a flexural moat basin filled with glaciomarine, terrigenous, volcanic, and biogenic sediments. This basin contains a well-preserved, outstanding record of approximately 14 million years of paleoclimate history. For the first time, sediments beneath an ice shelf were drilled, which provides a unique opportunity to investigate the variability of the Ross Ice Shelf. The sediment core covers a time period much longer than any Antarctic ice core record. During the drilling phase, some major and minor chemical elements were measured directly on split cores using a non-destructive X-Ray Fluorescence Core Scanner method (XRF-CS). In addition, colour data were collected using an integrated Line Scan camera in the XRF-CS system and a Minolta 2002 handheld spectrophotometer. Furthermore wet chemical analysis like the investigation of TOC, biogenic opal, major and minor elements with ICP-MS and conventional XRF were done on core samples to

contribute to the better understanding of geochemical sediment properties. Colour data will be correlated to the XRF-CS data to receive more and higher resolved information about the sediment composition.

The interpretation of rapid paleoclimatic changes in the Antarctic realm, especially to understand the behaviour of the Ross Ice Shelf during the past million years, is one target of our study. The high-resolution data set of non-destructive XRF-core and colour scans make it possible to estimate environmental changes on small time scales that will be linked to climate changes. From the Late Pliocene a transition from diamicton to diatomites is described which implies a shifting from a retreating ice sheet to open marine conditions. In the Early Pleistocene, a number of cycles, alternating from glacial ice transported sediments to open water sedimentation, were observed. The diatomites represent time spans with high bioproductivity and reflect warmer conditions at the Antarctic margin than today.

### **Development of Environmental Management Options for Fildes Peninsula and Ardley Island (King George Island)**

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Germany

The Federal Environment Agency (Umweltbundesamt - UBA) is the German competent authority for issuing permits for activities organised in, or proceeding from Germany in the Antarctic according to the Act Implementing the Protocol of Environmental Protection to the Antarctic Treaty (AIEP). One of its tasks is Protection and Management of Areas, Historic Sites and Monuments. In course of this competence the research project "Risk assessment for the Fildes Peninsula and Ardley Island and the development of management plans for designation as Antarctic Specially Protected or Managed Area" conducted by the Institute of Ecology, University of Jena, H.-U. Peter,

S. Pfeiffer, O. Mustafa and C. Büßer (see abstract of H.-U. Peter et al.) was commissioned by the UBA.

This project showed that the most important environmental problems of the Fildes Peninsula Region are:

- (Hazardous) waste disposal and dumping, mostly legacies
- Destruction of vegetation and disturbing breeding birds and seals e.g. by using vehicles outside the roads
- Risk of introducing alien plants, animals, microbes and diseases
- Oil contamination, threat for drinking water
- Air traffic beyond air traffic zones

As a result of the research project a management plan for a possible Antarctic Specially Managed Area (ASMA) "Fildes Peninsula Region" was prepared with different Codes of Conduct for a facility zone, for scientific research and for visitors. It is considered to be a suitable tool in order to minimize the environmental impacts in the region. This project including the Management Plan is the basis for the designation of a possible ASMA which has to be agreed by each Consultative Party at the Antarctic Consultative Meeting ATCM.

In 2006 an international working group (IWG) involving government representatives of interested parties (now 16 members) was established, convened by Germany and Chile in order to discuss management approaches, possibly aiming at drafting a management plan for an ASMA covering the Fildes Peninsula Region. At the moment the participants of IWG continue their work intersessionally at a web based Discussion Forum with the aim to prepare an appropriated Management Plan for the Fildes Peninsula Region.



## Das ArchaeObsprojekt auf Kerguelen. Archäologie in der Subantarktis

Robert Holzner

LMU München

Im Südsommer 2006/07 wurde eine archäologische Begehung und teilweise Ausgrabung in der Ebene zwischen dem Stationsberg, dem Stationssee und dem Magnetberg an der Küste der Beobachtungsbucht auf der Hauptinsel der Kerguelen zur Rettung der noch vorhandenen Reste durchgeführt. Die Untersuchung diente der Erhaltung und Dokumentation der dortigen Spuren einer britischen wissenschaftlichen Expedition zur Beobachtung des Venustransits vom 8.12.1874, der Kerguelenstation der ersten deutschen Südpolar-Expedition 1901-1903 und zweier kommerzieller französischer Expeditionen von 1908 und 1912/13. Größere Widersprüche zwischen den alten Berichten der englischen und deutschen wissenschaftlichen Expeditionen einerseits und den archäologischen Funden und Befunden, die während der Grabung gemacht wurden, andererseits konnten nicht festgestellt werden. Lediglich die versuchte Zuordnung eines Gebäudes zu der zweiten französischen Expedition war nicht mit letzter Sicherheit möglich.

### Die Entwicklung des submarinen Permafrosts und die Stabilität von Gashydraten in den Schelfregionen Ostsibiriens

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Die Umweltbedingungen in den ostsibirischen Schelfgebieten und die geologischen und tektonischen Merkmale von Grabengebieten, die auf den Schelfen existieren, wurden mit Hilfe von Geländeuntersuchungen und Modellrechnungen untersucht. Für die Grabengebiete wird dabei ein tektonisches

Modell vorgeschlagen, bei dem die Eigenschaften der typischen Schelf-Sedimente berücksichtigt werden. Für die Bildung von negativen neotektonischen Strukturen in diesen Regionen wird ein paleogeographisches Szenario vorgestellt. Auf der Grundlage dieses Szenarios und dem vorgeschlagenen Modell wird die Langzeit-Dynamik der Permafrostentwicklung und der Stabilität von Gashydraten für die letzten 400.000 Jahre simuliert.

Im Zuge der Langzeit-Entwicklung von Permafrost im Bereich von Grabengebieten bildeten sich im unteren Bereich des Permafrosts taschenförmige Strukturen und offene, endogene submarine Taliks. Es wird angenommen, dass die taschenförmigen Strukturen als Fallen für Gase und Gashydrate dienen, die von unten in den Permafrost eindringen, während die offenen Taliks eine Kaminfunktion haben, die zum Entweichen von Gasen in das Meer und in die Atmosphäre dienen. Mit Hilfe der vorgestellten Untersuchungen ist es möglich, die Bildungsbedingungen und die Positionen dieser Taschen und der offenen Taliks in Bezug auf die Grabengebiete zu berechnen und ihren Bezug sowohl zu den periodischen Trockenfallen des Schelfs als auch der Transgression mit Meerwasser herzustellen.

Die Bildung von offenen Taliks in dieser Region wird durch die hohe seismische Aktivität, das Vorkommen von Strukturen mit einem höheren geothermischen Wärmefluss und die Existenz von Zonen, in denen Grundwasser wegen der Verwerfungen submarin aus dem Permafrost austritt, verursacht.

### Individual recognition in Polar Bears: Lessons and Applications from modeling short term behaviour data

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Polar bears represent an indicator species for human induced global warming. Major discussions deal with the question how we will be able to save this species over time and how we can protect the required Arctic marine ecosystem as a whole. With the polar bear being at the top of the Arctic food chain, this issue represents a crucial question where modeling can help providing answers. Adaptive management discussions and expert statements on the polar bears' future are, so far, widely based on population estimates through mark-recapture and bear movement patterns. Worldwide, a major lack for polar bear behaviour knowledge exists. Up to now, the only larger behaviour research that has been conducted focuses on the tourism-impact on polar bears.

But virtually no research has concluded on the social structure of *Ursus maritimus*. This is probably due to the inaccessibility of long term behaviour data in this species, what is also the case for many other traditional game species. However, considering social aspects is crucial for the survival of higher mammals. The Western Hudson Bay polar bear population congregates around Churchill, Manitoba, Canada in the fall due to ice-forming patterns on the Hudson Bay. Observations from Gordon Point Tower in the Churchill Wildlife Management Area were conducted during fall 2006 and 2007. Here, we use an efficient but short-term behaviour data collection scheme. Instantaneous scan sampling methodology was applied to estimate spatial proximities between individuals; continuous event sampling methodology was used to record interactions. These data are analysed with efficient data mining and modeling software. The validity of this method is assessed in the thesis by the author

(Jochum forthcoming February 2008) through the application across mammal species world-wide (howling monkeys, humpback whales, brown bears, polar bears).

A significant outcome of the study is that short-term behaviour data modeled with TreeNet (bagging and boosting) displays meaningful and very similar pattern when compared to long term data sets collected in a traditional fashion. Here, we apply for the first time the same statistical software and analysis approach (behaviour modeling) for polar bears in order to establish findings on social structure and recognition in the study population. Distinct patterns indicate social choices made by individual bears, suggesting their ability to differentiate among certain individuals through time.

### Lithostratigraphical and biogeochemical characteristics of sediments from central part of Lake El'gygytgyn, NE Siberia

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In the terrestrial Arctic a continuous record of climate variability over several glacial-interglacial cycles was missing for long time, mainly due to repeated glaciations and associated unconformities in most areas. Such a record has now been sampled from Lake El'gygytgyn. This lake fills the major part of a crater that has been formed by a meteorite impact 3.6 Myr ago. Thus the sediment fill in the crater has a high potential for reconstruction of environmental changes during the Late Pliocene and the entire Quaternary.

Lake El'gygytgyn is now target of an ICDP-Project. Following an expedition in 1998 two cores, Lz1024 and Lz1029, from the central part of Lake El'gygytgyn were recovered in 2003. Lz1024 penetrates down to about 340 ka BP. In general four depositional units, described by Melles et al. (2007), were recognised within cores Lz1024 and Lz1029 as well. They are reflecting different climate modes

representing warm, peak warm, cold-dry and cold-moist climatic condition respectively. Additionally the research on cores Lz1024 and Lz1029 turned out with new, more detailed insights into the sediment characteristics of Lake El'gygytyn:

1. The impact of turbidite-formation on the pelagic record in the central lake is now better understood.

2. Distinct evidences for short-term Dansgaard-Oeschger like climate changes are visible within the sediments settled during MIS 4, 6, 7.1, 7.4 and 9.

The sediment characteristics show rapid transitions between warm and cold climate modes in the scale of few centimetres or hundred/thousand of years respectively.

3. A more gradual border between the cold climate modes was recognised. Further on the sediments of cold climatic intervals are composed of both units, indicating cold climatic conditions.

4. The pattern of sediments deposited during warm climate stages is complicated by the formation of Redox-Layers. These dark green layers, ranging in thickness between few mm and 5 cm, were secondarily composed within the sediments at the border between oxygenated and anoxygenated deposits. Especially the susceptibility values and water contents were influenced by these layers.

References: Melles, M., Brigham-Grette, J., Glushkova, O.Yu., Minyuk, P.S., Nowaczyk, N.R., Hubberten, H.-W. (2007): Sedimentary geochemistry of core PG1351 from Lake El'gygytyn — a sensitive record of climate variability in the East Siberian Arctic during the past three glacial–interglacial cycles. *Journal of Paleolimnology*, 37, 89–104

### News from the sea-ice biological research in the Arctic and Antarctic

Rainer Kiko, A. Ershova, M. Kramer, R. Krapp, O. Preobrazhenskaya, H. Schünemann, S. Siebert, Iris Werner

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Sea ice represents a unique habitat for a specialized sympagic (=ice-associated) flora and fauna, including bacteria,

unicellular algae, proto- and metazoans. Extreme environmental conditions (T, S, light, space, food) and the pronounced seasonality exhibit strong controls on the species distribution, life cycles and adaptations to this dynamic habitat. We present new data and observations made during the last years including preliminary results from the IPY expedition SPACE with RV Polarstern to the Arctic Ocean in 2007.

Intensified sampling effort and new sampling techniques (large-volume ice samples, under-ice diving) have discovered new species to the sea-ice habitat, and thus increased our knowledge about biodiversity. In Arctic pack ice, a so far unknown hydroid, a new group of turbellarians, and living foraminiferans (*Neogloboquadrina pachyderma*) have been observed during IPY for the first time. In the Antarctic, we also found a new group of turbellarians, the pelagic ctenophore *Callianira antarctica*, the calanoid copepod *Paralabidocera antarctica* and several species of under-ice amphipods (*Eusirus spp.*, *Cheirimedon sp.*) in pack ice for the first time. The nudibranch *Tergipes antarcticus* was refound in this habitat – the occurrence of this species in Antarctic pack ice has only been mentioned in the original species description in 1903 and never since. Feeding experiments have shown that sympagic meiofauna does not graze on algae and bacteria only, but that several taxa (turbellarians, the copepod *Halectinosoma sp.*, *Callianira antarctica*, cnidarians) also prey on other meiofauna. Reproduction of several species takes place in this habitat during summer and winter, with differences in the life-cycle strategies between Arctic and Antarctic copepods.  $T < -5$  °C or corresponding salinities or volumes are limiting factors. Ice-active substances in the hemolymph of the Antarctic copepod *S. longipes* and in eggs of *T. antarcticus* show high adaptation for life in the ice. Due to global warming, the extent and thickness of Arctic sea ice has decreased and is expected to decrease further.

Both species diversity and abundances of sea-ice meio- and macrofauna are reduced in first-year as compared to multi-year ice. The reduction or loss of old ice

will mean the reduction or loss of habitat for all autochthonous sea-ice organisms which depend on the presence of ice all year round. This may result in a significant loss in biodiversity and ecosystem functioning.

### **Erste Ergebnisse von Untersuchungen zu Ursachen und Auswirkungen des Magmatismus im Bereich der Marie Byrd Seamounts (Amundsenmeer)**

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Die Marie Byrd Seamounts sind eine submarine Intraplattenvulkanprovinz, die sich im Norden des Schelfs von Marie Byrd Land über 800 km von Osten nach Westen erstreckt. Die einzelnen Seamounts sind bis zu 3000 m hoch und messen bis zu 75 x 50 km an ihrer Basis in ca. 3500 bis 4000 m Wassertiefe.

Da bisher nur wenig über diese bedeutende Vulkanprovinz, die nicht allein mit den herkömmlichen Modellen zur Entstehung von Intraplattenvulkanismus erklärt werden kann, bekannt war, wurden auf der F.S. Polarstern-Expedition ANT-XXIII/4 2006 sowohl neue bathymetrische Daten als auch erstmals magmatische Gesteine der Marie Byrd Seamounts gewonnen. Ziel der Untersuchungen an den Marie Byrd Seamounts ist es, die Magmenquellen, Petrogenese und die zeitlich-räumliche Entwicklung dieser Vulkane zu rekonstruieren. In Kombination mit geophysikalischen Modellen soll so zur Rekonstruktion der tektonischen Entwicklung des Südwestpazifiks und der Ursachen von Intraplattenvulkanismus („Great Plume Debate“) beigetragen werden. Alle kartierten großen Marie Byrd Seamounts sind Guyots, d.h. ehemalige Inselvulkane, die an der Meeresoberfläche

erodiert wurden und abgesunken sind, wobei die Absenkungsraten im Westen der Seamountprovinz mit 1600 m niedriger sind als im Osten (2400 m). Ferner zeigt die Bathymetrie mindestens 2 Aktivitätsphasen dieser Vulkane (Schildphase, Posterosionsphase). Ar/Ar-Laserdatierungen ergaben känozoische Alter (Eozänen bis Paläozän) für die Marie Byrd Seamounts, die demnach deutlich nach dem Gondwana-Aufbruch und der Ausbildung des pazifisch-antarktischen Rückens entstanden sind. Erste, vorläufige Ergebnisse der geochemischen Analytik zeigen, dass die Marie Byrd Seamounts von relativ hoch entwickelten, Si-unterstättigten Magmen (ne-normative Alkalibasalte bis hy-normative Trachybasalte) gebildet wurden. Diese wurden aus einer isotopisch angereicherten Quelle generiert, bei der wahrscheinlich eine verarmte Komponente (DUM =depleted upper mantle) und mindestens zwei angereicherte Komponenten beteiligt waren, darunter möglicherweise EMII (kontinentales Material oder Sedimente). Die heterogene Kristallinität der Magmen verweist auf Magmenmischung als wichtigen Prozess während der Magmengenese.

Insgesamt deuten die ersten Daten von den Marie Byrd Seamounts auf komplexe tektonische und magmatische Prozesse im Gebiet der südwestlichen Amundsensee während des Paläogens hin.

### **Holozäne Seesedimente Store Koldeweys, Nordost Grönland, als Archive für lokale und regionale Klima- und Umweltschwankungen**

Martin Klug<sup>1</sup>, Steffi Schmidt<sup>1</sup>, Bernd Wagner<sup>2</sup>, Martin Melles<sup>1</sup>, Ole Bennike<sup>2</sup>, Oliver Heiri<sup>3</sup>

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Seen in polaren Regionen können sensibel und hochauflösend auf Klima-

und Umweltveränderungen reagieren. Somit sind sie Bindeglied zwischen marinen Sedimentsequenzen und Eiskernen. Auf Store Koldewey, einer Insel Nordost Grönlands, wurden während einer Expedition im Sommer 2003 mehrere Seen untersucht und beprobt. Aufgrund der Lage am nordwestlichen Nordatlantik bieten diese Seen die Möglichkeit, sowohl lokale als auch regionale Veränderungen von Klima und Umwelt aufzuzeichnen.

Die Sedimente zweier Seen wurden hinsichtlich der Veränderungen von sedimentologischen, geophysikalischen und biogeochemischen Parametern untersucht. Während frühere Untersuchungen auf Store Koldewey eisfreie Gebiete während des letzten glazialen Maximums vermuten ließen, zeugen glaziale und glaziolakustrine Sedimente an der Basis beider Sedimentsequenzen gefolgt von dem Einsetzen der biogenen Produktion um 9 cal. ka BP in den Seen von einer spätpleistozänen Vereisung der Insel.

Die postglaziale Geschichte beider Seen ist durch eine homogene Sedimentationsrate, aber ausgeprägten Schwankungen der Bioproduktion gekennzeichnet, welche sich von denen ostgrönländischer Seen im Frühholozän unterscheiden. Die Sedimentsequenz aus einem der Seen von Store Koldewey zeigt während des frühholozänen Temperaturmaximums in der Region nur einen verzögerten Anstieg der Bioproduktion, was auf geringe Nährstoffverfügbarkeit zurückzuführen ist. Ausgeprägte Schwankungen der Bioproduktivität dieser Sedimentsequenz während des mittleren und späten Holozäns sind dagegen Ausdruck von wiederholten Temperaturveränderungen. Infolgedessen ist die holozäne Klimageschichte der Region nur in Teilen widerspiegelt. Im Gegensatz dazu dokumentiert der Probensatz des zweiten Sees, ausgestattet mit einem größeren Einzugsgebiet, im raschen Anstieg der Bioproduktion zu Beginn des Holozäns das Vorhandensein ausreichender Nährstoffe. Diese Sedimentsequenz zeigt während der letzten 9 ka wiederholte ausgeprägte Veränderungen der Akkumulation von organischem Kohlenstoff. Somit bietet dieser Probensatz die Möglichkeit, auch die

frühholozäne Entwicklung des Klimas zu interpretieren.

Der Vergleich beider Sedimentsequenzen hingegen erlaubt bei gemeinsamen Veränderungen der Bioproduktivität den Einfluss regionaler Klimaveränderungen herauszuarbeiten wogegen Unterschiede eher lokalen Ursprungs sind und auf seeinterne Mechanismen und Veränderungen im Einzugsgebiet hinweisen.

### **Characterization of methanogenic Archaea in submarine permafrost sediments of the Siberian Laptev Sea**

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Atmospheric methane is approximately 21 times more potent than carbon dioxide as a greenhouse gas (EPA, 2006). An important source of atmospheric methane is the methane stored in carbon-rich permafrost sediments. The shelves of the Siberian Laptev Sea are containing submarine permafrost which was created by the flooding of terrestrial permafrost as a result of the Holocene rise of the arctic sea level.

The creation of submarine permafrost which was derived from relatively warm saline sea water reshaped the system profoundly and resulted in a warming of the former terrestrial permafrost. In order to better understand the methane cycle in submarine permafrost, geochemical and molecular ecological studies on archaeal diversity have been carried out which particularly examine the role of methanogens.

In this study frozen sediments were recovered from the Laptev Sea shelf, North Eastern Siberia, which have been dated to between approximately 86,000 and 111,000 years BP. In these sediments the total organic carbon (TOC) content varied between 0.03 and 8.70 % with highest values between 53 m - 62 m depth below the sea floor. Methane concentrations varied along the core between

0 - 284 nmol CH<sub>4</sub> g<sup>-1</sup> sediment. Highest values were found in the layer with the highest amount of TOC. Extremely low δ<sup>13</sup>CH<sub>4</sub> values (-75 ‰) indicated active methanogenesis in this zone. A nested polymerase chain reaction (PCR) amplification for denaturing gradient gel electrophoresis (DGGE) was applied to the samples with low and high amount of methane in order to analyze the archaeal diversity in submarine permafrost sediments based on 16S rDNA. DNA fragments from DGGE gels were sequenced and phylogenetically analysed. Further clone library analyses and CARD FISH were conducted for obtain a more detailed account of the microbial community composition and investigate its function in the submarine ecosystem.

### Die wissenschaftlichen Ergebnisse der Grönlandüberquerung 2006

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Im Sommer 2006 hat eine sechsköpfige Expeditionsmannschaft zum zweiten Mal nach 2002 die Eiskappe Grönlands überschritten. Ziel war die Bestimmung von Höhenänderungen und damit Massenbilanzen des Inlandeises entlang eines 700 km langen Profils. Die Ergebnisse können helfen die Frage zu beantworten, wie sich die Eismassen infolge der Erwärmung des Klimas auf der Erde verändern. Außerdem können die Höhen und Höhenänderungen als Bodenkontrolldaten für Satellitenmissionen wie z.B. das Laseraltimeter des Satelliten IceSat genutzt werden.

Eine Besonderheit der Expedition war die alternative Logistik: ohne Einsatz von Hubschraubern oder anderer schwerer Technik wurde die Route auf Skiern mit selbst gezogenen Schlitten bewältigt. Diese Methode des sogenannten "man houlung" ist einerseits preiswert, andererseits ist über große Gebiete die Fortbewegung auf der im Sommer stark

angetauten Oberfläche des Grönlandeises mit schwerer Technik fast unmöglich. Die Verbindung von Ausdauersport und Wissenschaft führte so zu völlig neuen Möglichkeiten der Datengewinnung. Aus dem Vergleich der Eishöhen von 2006 und 2002 entlang des Profils kann ein durchschnittlicher jährlicher Höhenverlust der Gletscheroberfläche Grönlands (für den Bereich südlich etwa 72° N) von ca. 1 m/a abgeschätzt werden. Allein eine solche Änderung der Eismassen würde einen Beitrag von 0,3 mm/a zum globalen Meeresspiegelanstieg liefern. Begonnen hat dieser verstärkte Abnahmeprozess wahrscheinlich erst innerhalb der letzten 10 Jahre, ist also mit Pegelmessungen des Meeresspiegels noch nicht nachweisbar. Diese aktuelle Verstärkung der Abschmelzprozesse zeigt sich auch in der Geschwindigkeitsänderung des Eistroms bei Ilulissat, der heute mehr als doppelt so schnell fließt wie vor knapp einem Jahrzehnt.

### Impact of Antarctic Peninsula regional climate warming on small glacier and ice caps

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No doubt that small glacier and island ice cap dynamics can serve as an indicator of rapid Antarctic Peninsula climate change in last century. The processes similar to the Antarctic Peninsula ice shelves disintegration are observed on the small ice caps and glaciers in this region. Our research is based on recent ice cap survey and comparison this data with historical observations.

The Galindez Island and other islands on Argentina Island archipelago ice cap geomorphology monitoring is carried out using the historical data analyze, photogrammetry survey and GPS data, aerial photography, satellite image and the analyze of the bedrock height using different methods.

The objective of research are (1) to detect the shape, position, and ice velocity dynamics in order to forecast the ice cap future development within the regional climate changes on the base of precision GPS and photogrammetry measurements, (2) to carry out glacial-geomorphology monitoring of the ice cap dynamic and creation the model, (3) to produce a small glacier and island ice cap inventory of Antarctic Peninsula.

The photogrammetry and GPS measurements has been developed to study the size and form changes which has being used for the observation of the ice cap of the Argentine Islands archipelago since 2002. The process of accumulation of breakdown ice caps is accompanied by acoustic emission, which spreads in the layer of ice. The parameters of acoustic emission simply characterize intensity of process formation and breakdown of ice caps. Acoustic monitoring of glaciers allows making the dynamic picture of those destruction. Our observations are based on registration of acoustic emission by the acoustic sensors net.

Result of recent observations of the small ice cap of Galindez Island showed significant changes since 1950. Since 2000, Galindez ice cap has lost more than 2-3 % of its volume. The general surface volume of southwestern side of the Galindez ice cap shows the lost of 23000 cubic meters in 2002-2003 and 28000 cubic meters in 2003-2004. The recent data of ice cap study is discussed.

### Habitat and leaf cytogenetic characteristics of *Deschampsia antarctica* desv. in maritime Antarctic

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To understand how the Antarctic herb tundra formation develops in recently deglaciated areas it is necessary to determine factors influencing the survival of the dominating species (*D. antarctica*) in a range of varying habitats. Therefore, to study basic characteristics of the plant's environment there were established 4 study plots in homogenous environmental conditions near H. Arctowski Station (King George Island of the South Shetland Archipelago) during the 30<sup>th</sup> Polish and the 10<sup>th</sup> Ukrainian Antarctic expeditions (09.11.2005 – 09.02.2006). It is a terraced slope (5-100) of north-eastern exposure, where a glacial brook runs. The area of a plot was 1m<sup>2</sup>. Each plot has been watered for a month: the 1<sup>st</sup> one with 1 litre of fresh water from a nearby spring per day, the 2<sup>nd</sup> with 1 litre of guano solution, the 3<sup>rd</sup> with 1 litre of sea water, and the 4<sup>th</sup> was the control one. In the leaves of *D. antarctica* gathered at the plots we studied the following cytogenetic parameters: the relative DNA content stained by Feulgen and the nucleus area. The leaves were fixed at the first (14.02.05), 7<sup>th</sup> (20.12.05) and 30<sup>th</sup> (12.01.06) days of the experiment. Each parameter was estimated for 100 cells from a fragment of a clonal curtain per plot, all the distributions were compared with the corresponding control data using the Median Test to test the significant differences. In the control group, the nucleus area at the 7<sup>th</sup> and 30<sup>th</sup> days was significantly different from the initial value. It may have been induced environmentally; for example, the Austral summer was abnormally hot, and the consequent seasonal dehydration might well have influenced the plants. In the same time, there were no changes in the DNA content in control plants during the whole period.

At the 1<sup>st</sup> plot the nucleus area changed similarly to the control one. The DNA content hasn't changed significantly in the first seven days, but at the 30<sup>th</sup> day the difference was statistically significant. At the 30<sup>th</sup> day of the experiment the nucleus area changed both in the plants watered with sea water and in those watered with guano solution, while their DNA contents differed significantly from the initial value after the 7<sup>th</sup> day and not after the 30<sup>th</sup>.

### Heavy metal deposition to the Arctic during the last 16 000 years: Comparison of natural background values and recent enrichments

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Applying strict clean room techniques and sector field ICP-MS, a total of 567 ice, firn and snow samples from Devon Ice Cap, Arctic Canada, have been analysed for antimony (Sb), cadmium (Cd), lead (Pb) and Pb isotopes, silver (Ag), and thallium (Tl). Samples were selected from two ice cores and a 5 m snow pit provide a continuous record of atmospheric deposition of the elements during the last ~16,000 years.

Enrichment factors (EF) of all elements, calculated considering the site-specific natural background element/Sc ratios, revealed distinct contamination of the Arctic as early as Medieval, Roman and Greek/Phoenicians times. The Sb enrichment increased as much as 50% during the last three decades due to increased industrial use of this emerging element during recent times. The behaviour of these elements reveals some remarkable differences. Whereas Pb and Tl correlate strongly with Sc (an indicator of dust inputs) until the onset of lead mining and refining in the Iberian Peninsula (ca. 3,000 years ago), Ag and Cd are inexplicably enriched during the middle of the Holocene. The snow pit data (45 samples between 1994 and 2004) show pronounced seasonal variations,

with Pb enriched in winter samples when the air masses are predominantly from Eurasia, but Tl enriched in summer samples when the air masses are predominantly from Canada. Anthropogenic sources account for at least one third of atmospheric Cd, more than 80% of Ag and more than 90% of Pb, Sb, and Tl deposited in Arctic snow to date.

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### SAR-Beobachtungen und thermodynamische Modellierung von Meereis-Drift und Eisproduktion in der Larsen Region, Weddellmeer

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Seit dem Zerfall der Larsen-A und -B Schelfeise treten in den entstandenen Buchten regelmäßig Polynyen auf, in denen Meereis produziert und ins nordwestliche Weddellmeer exportiert wird. Wir haben die Eisdrift und den Eisexport aus den Polynyen im Winter 2006 mit Hilfe von Synthetik-Aperture Radar- (SAR-) Daten des Envisat-Satelliten sowie mit Hilfe numerischer Modellierung mit einem eindimensionalen thermodynamischen Modell bestimmt. Die Modellergebnisse wurden anhand



umfangreicher Eisdickenmessungen validiert, die während der Polarstern-Winterexpedition Ant 23/7 (WWOS: Winter Weddell Outflow Study) im Oktober 2006 im Larsen Gebiet gewonnen wurden. Eisdriftdaten und Modellergebnisse wurden kombiniert, indem das thermodynamische Modell lagrange, d.h. entlang von Eisdrifttrajektorien, betrieben wurde. Die modellierten Eisdicken stimmen gut mit den gemessenen Daten überein. Der Eisexport aus der Larsen A Region ist mit einem Betrag von  $0,70 \text{ km}^3$  in der Zeit vom 9. März bis 30. Oktober 2006 kleiner als der aus der Larsen B Region mit  $3,74 \text{ km}^3$ , da letztere eine größere Fläche abdeckt und eine höhere mittlere Driftgeschwindigkeit aufweist. Dabei wurden durch die Eisbildung in Larsen A  $6,76 \cdot 10^9 \text{ kg}$  und in Larsen B  $3,59 \cdot 10^{10} \text{ kg}$  Salz ausgeschieden, mit weitreichenden Konsequenzen für die lokale und regionale Hydrographie.

### **The first campaigns of the ANDRILL McMurdo Sound Portfolio and its future perspectives**

Gerhard Kuhn<sup>1</sup> with contributions from the ANDRILL Science Committee<sup>2</sup> and Science Management Office<sup>2</sup>

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The area of the south-western Ross Sea and its transition to the Transantarctic Mountains is one of the geologically best investigated areas of the Antarctic margin. Starting with the Dry Valley Drilling Project (DVDP), the Cenozoic Investigations of the Western Ross Sea (CIROS) Project, followed by the Cape Roberts Project (CRP), and last year by the first drillcore below the McMurdo Ice Shelf (MIS Project) within the Antarctic Drilling Project (ANDRILL), our knowledge of Cenozoic history of the Antarctic margin has increased substantially.

This season, the second ANDRILL core was taken in Southern McMurdo Sound (SMS Project) to fill a gap stratigraphically (Miocene) and on the transect from proximal coastal to distal glacial marine environments. Due to its tectonic setting, this region provides accumulation space

for sedimentary basins during the Cenozoic where glacial erosion was minor during past glacial advances and therefore it is a good quality archive for studies of the extent of Antarctica's ice margin in this region. During the SMS Project drilling, ongoing core characterization, and interpretation phases, scientists from Germany are contributing with analytical instrumentation and expertise for down-hole logging, multi-sensor core logging, and X-ray fluorescence core scanning to the international science team. These high-resolution measurements provide several physical and geochemical sediment parameters that will be supplemented with measurements on samples in the laboratory. The data set will be used to describe bulk sediment composition and interpret its genesis and past variability in response to paleo-environmental changes. In addition national colleagues will make investigations on clay mineral composition and pollen floras off ice. Future drilling is planned in the McMurdo Sound area. Seismic investigations for pre-site studies in Mackay Sea Valley, where a thick section of Holocene sediments are expected, were done just last season. Next season pre-site studies will be done offshore New Harbour (Eocene – Eocene/Oligocene boundary and late Miocene), and eventually Southern McMurdo Ice Shelf (Eocene – Miocene sediments).

A proposal for the most mature next ANDRILL project is in preparation. Drilling from the edge of the Ross Ice Shelf on the Coulman High is planned to target earliest Miocene and older sections in the western Ross Sea. International collaboration is desired to develop and implement these campaigns.

## Business as (Un)Usual: Integrated Scenario Analysis for Tourism in Antarctica

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Tourism in Antarctica has grown rapidly over the last two decades and diversified into different modes of transport and activities. Faced with these trends, stakeholders have started to express concern about the growing connections of the Antarctic region with the rest of the globe, the unbridled growth of tourism and its potential impacts.

In view of the developments in the Antarctic tourism industry, a number of academic authors and organizations argue that a more strategic and long term perspective on Antarctic tourism development and governance is needed, in order to safeguard sustainable development. Scenario analysis can support the development of such a vision. This paper applies the well-established exploratory tool of integrated scenario analysis to the case of Antarctic tourism, and presents a number of full-fledged scenarios. The material used in the scenario development was derived from stakeholder workshops, a range of expert interviews, fieldwork results from King George Island, complemented by quantitative data analysis and literature review. The diverse set of plausible scenarios makes the uncertainties visible that are inherent in future developments. Different stakeholder perspectives are presented regarding the plausibility and desirability of potential Antarctic tourism future pathways. Against this variety of plausible futures, the effectiveness of the self-regulatory regime and the formal regime of the Antarctic Treaty System are 'tested' and discussed.

## Massenbilanzstudien auf der Basis numerischer Modelle und Satellitenfernerkundungsdaten

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Die Massenbilanz und Dynamik des Antarktische Eisschildes spielen eine entscheidende Rolle im globalen Klimasystem. Veränderungen der Eismasse haben Einfluss auf den globalen Meeresspiegel und die regionale bis globale Strahlungsbilanz. Die Kryosphäre reagiert jedoch auch besonders empfindlich auf Veränderungen der klimatischen Verhältnisse. Der Massenfluss des Inlandeises über die Aufsetzlinie bzw. -zone gibt Veränderungen in der Massenbilanz des Eisschildes in besonders deutlicher Weise wieder.

Die Dynamik eines Eisschildes oder Schelfeises lässt sich durch eine Reihe von Bilanzgleichungen und eine Zustandsgleichung beschreiben. Diese nichtlinearen, partiellen Differentialgleichungen lassen sich jedoch nur durch numerische Ansätze lösen und bilden damit die Grundlage von Eisschildmodellen. Eine Lösung dieser Gleichungen erfordert die Bereitstellung von Rand- und Anfangsbedingungen, die im Falle des Antarktischen Eisschildes nur unzureichend durch Bodenmessungen abgedeckt werden. Deshalb sind Fernerkundungsdaten von besonderem Wert, denn sie liefern flächendeckend und zeitlich nicht begrenzt eine Fülle von Informationen, die als Randbedingung in die numerischen Modelle einfließen können.

In diesem Beitrag werden Ergebnisse numerischer Modellstudien des Riiser-Larsen Schelfeises und seines Einzugsbereichs in der Region des östlichen Weddellmeeres, Antarktis vorgestellt. Das Modell wurde auf einem Gitter von 2,5 km Maschenweite aufgesetzt und umfasst zehn vertikale Schichten. Die Modellgeo-

metrie wurde weitgehend auf der Grundlage von bereits veröffentlichten sowie von Fernerkundungsdaten (Satellitenaltimetrie) gewonnen. Eisfließgeschwindigkeiten als Randbedingung aber auch für die Verifikation von Modellergebnissen wurden entweder durch direkte Messungen oder aber über Ergebnisse aus der ERS-SAR Interferometrie (European Research Satellite-Synthetic Aperture Radar) bereit gestellt bzw. erarbeitet. Die auf dieser Grundlage mit Hilfe unseres numerischen Modells gewonnenen Massenflüsse über die Aufsetzzone des Riiser-Larsen Schelfeises ergeben sich zu ca.  $2 \cdot 10^{13} \text{ kg a}^{-1}$ . Dieser Wert deutet auf eine ausgeglichene Massenbilanz zwischen Zutrag und Abtrag bei heutigen Akkumulationsraten hin. Geht man jedoch von höheren Akkumulationsraten und steigenden ozeanischen Wassertemperaturen aus, wie im Fall globalen Klimawandels anzunehmen, zeigen unsere Modellergebnisse eine eindeutig negative Massenbilanz für das Riiser-Larsen Schelfeis auf.

### Coastal erosion and storminess evolution on Bykovsky Peninsula, Southern Laptev Sea, Russia

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The Bykovsky Peninsula, located in the southern Laptev Sea is a landmark in the Siberian landscape: Made mostly of ice complex, a mix of segregated ice and dramatically developed ice wedges, it is highly sensitive to wave attack and is supposedly undergoing strong erosion. Knowing the exact nature of erosion is necessary to assess the threat to the current shoreline (the Island forms a

natural harbour for the town of Tiksi) and to calculate the amount of sediments (and subsequently of carbon) released to the nearshore zone which enter the Arctic coastal carbon cycle.

We used recently declassified Corona imagery, an American spy satellite operating throughout the sixties, seventies and eighties, and modern high resolution SPOT imagery to measure coastal erosion on the Bykovsky Peninsula shoreline. Our investigation is broken down in periods to capture the temporal variability of erosion. We also analyzed the concurrent climatic records from the neighbouring town of Tiksi to draw the evolution of storminess during the same periods. We present in this paper the results from this study and draw perspectives for the broader Arctic framework, comparing our data with similar studies from the southern Beaufort Sea.

### Das internationale Bohrprogramm ANDRILL und sein Schulprojekt ARISE

Rainer Lehmann

Freie Waldorfschule Hannover-Bothfeld

ANDRILL ist die Abkürzung für ANtartic Geologic DRILLing und das Programm wird von über 50 Wissenschaftlern aus den USA, aus Italien, Neuseeland und Deutschland im Rossmeer in der Antarktis ausgeführt. Unterschiedliche Fachgruppen kümmern sich um spezielle Fragestellungen, arbeiten dabei aber Hand in Hand an der Lösung der Fragestellungen des Projekts. Ziel ist es, das Klima der letzten 20 Millionen Jahre und dabei insbesondere die Ausdehnung des Schelfeises in den jeweiligen Kalt- und Warmzeiten zu rekonstruieren.

Es gab in der Vergangenheit Phasen, in denen es auch in der Antarktis wärmer war als heute. Zentrale Frage ist, wie stark das Eis damals zurückgeschmolzen ist, um die Auswirkungen des globalen Klimawandels auf den zukünftigen Meeresspiegel besser abzuschätzen. Zwischen Anfang Oktober und Ende November wird daher ein etwa 1000 m langer Sedimentkern aus dem

Meeresboden unter dem zugefrorenen Rossmeer erbohrt. Während die Bohrarbeiten vom zugefrorenen Meereis durchgeführt werden, arbeiten die meisten Wissenschaftler im Labor der McMurdo-Station an der Ansprache, den Analysen und der Interpretation. Das didaktische Teilprojekt ARISE (ANDRILL Research Immersion for Science Educators) verfolgt neben dem rein wissenschaftlichen Aspekt von ANDRILL aber auch noch ein weiteres Ziel: Die Bedeutung der Polarregionen im globalen Klimasystem der Öffentlichkeit und insbesondere Schülern zu vermitteln. Die beteiligten neun Fachdidaktiker kommen wie die Wissenschaftler aus den Vereinigten Staaten, aus Neuseeland, Italien und Deutschland. Sie arbeiten mit den Wissenschaftlern an deren Fragestellungen in der Praxis an den Bohrkernen zusammen, entwickeln aber auch im Rahmen des ARISE-Teilprojekts verschiedene Möglichkeiten zur Umsetzung ihrer Erfahrungen und der Forschungsmethoden wie -ergebnisse in den Unterricht der Schulen in ihren Heimatländern. So werden in der McMurdo-Station regelmäßig Blogs geschrieben, Zeitungsberichte verfasst und Telefon- oder Videokonferenzen mit Schülern durchgeführt. Zudem stellen Schüler und Lehrer über Internet Fragen zur Arbeit der Wissenschaftler, aber auch der beteiligten Lehrer. Klimadaten werden übermittelt, um den Schülern die aktuellen, oft recht extremen Wetterbedingungen zu veranschaulichen. Zudem wird Filmmaterial erstellt, um im Anschluss an die Expedition Lehrmaterialien entwickeln zu können.

### **Contribution of the Alfred Wegener Institute to the International Polar Year 2007/08**

Karin Lochte, Eberhard Fahrbach, Karsten Gohl

AWI, Bremerhaven

The International Polar Year 2007/08 (IPY) represents an outstanding event for Polar Research. The Alfred Wegener Institute (AWI) adjusted its research plans in an early stage to be able to provide

outstanding contributions to the aims of IPY in international cooperation. AWI scientists were involved in more than 70 Expressions of Interest, in 25 of them as lead or co lead scientists. During the IPY, the construction of the Neumayer III Station began and the new Polar aircraft POLAR-5 went into operation providing a significant improvement of the infrastructure for German polar research. Important contributions to IPY come from „Polarstern“. However, the submitted applications exceeded the available shiptime and berths by a factor of two. To allow the accommodation of as many projects as possible, some of them had to be scheduled before the start and after the end of IPY. IPY related activities set off with a cruise to the Antarctic Peninsula where the benthic regime in the area of the recently decayed Larsen-A/B Ice Shelves was studied. Then, „Polarstern“ moved with a geosciences programme to East Antarctic waters, in particular to Prydz Bay, where the official start of IPY on 1 March 2007 was celebrated. In the following Arctic season, the first cruise to the Nordic Seas was dedicated to deep sea biology. It was followed by a multidisciplinary survey of the Arctic Ocean proper. In November 2007, „Polarstern“ returned to the Antarctic with a biological programme in the Lazarev Sea. Because of the unexpected heavy ice conditions in the area of Atka Bay, „Polarstern“ had to interrupt the research programme and prove her capability as an icebreaker by supporting the supply vessel „Naja Arctica“ to reach the ice shelf front in order to unload the material for the new station. At present „Polarstern“ operates with an programme in physical and tracer oceanography in the Atlantic sector of the Southern Ocean.

### **The Grammar of Climate Change**

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Research on climate change frequently involves communication with natives of the region under study. Oftentimes, the

preferred interview partners are Elders, people old enough to have observed changes in their lifetimes, and also people that grew up in a traditional lifestyle. In Alaska, people like this grew up speaking a language other than English: most of them either from the Eskimo-Aleut or Athabascan phylum.

From the European perspective, these languages are highly exotic and hard to learn. Nevertheless, conducting climate change interviews in these languages has distinct advantages beyond politeness. We demonstrate some of these advantages from our own fieldwork in interior Alaska. Interviews conducted in English frequently reveal the basic facts, but leave out a great deal of detail. This is mainly due to reduced fluency in English; while most speakers nowadays are perfectly able to have a general conversation, their English does not provide the level of detail that their own language does.

As an example, numerous people have told us in English that 'the lakes were frozen solid in the past'. In Upper Tanana Athabascan (the language of our study area), this would be phrased as:

(1) Mänh neltänh. lake is/was.frozen 'the lake was frozen (once)'

However, when talking freely in her own language about climate change, Mrs. Avis Sam said instead:

(2) Eliiiiiii jeet'eh ho~o~tj̄ k'inday ho~coooold it used to be a long time ago k'ahdu' xay tah nahndoogn mänh t'ee'y' k'at'ee'y neltj̄, and then in winter upstream area lakes really used to be frozen 'It used to be very cold, and in winter, the lakes out there used to be frozen solid.'

This example uses the customary super-aspect (Kari 1990:51). There is no word meaning 'used to be', this meaning component is part of the verb stem t̄j̄.

These examples show that far more intricate information can be gathered by paying close attention to what Elders say in their own language. While a language is not limited by the world around it -- any language is capable of expressing anything -- it reflects the world in which it is spoken. Meaning in language is not construed simply from the denotation of words. It also comes from the way words and other pieces of language are put

together. If we neglect the native language, we will lose valuable information.

### **Kalte Exotik – Eskimos im Blickpunkt der deutschen Ethnologie um 1880**

Cornelia Lüdecke

Arbeitskreis Geschichte der Polarforschung, München

In Deutschland wurden ethnologische Studien in der ostkanadischen Arktis hauptsächlich von zwei Expeditionsberichten beeinflusst, die beide 1881 publiziert wurden. Der böhmische Reisende Heinrich Klutschak (1848-1890) nahm als Geodät an der letzten amerikanischen Franklinsuchere Expedition (1878-1880) unter der Leitung von Friedrich Schwatka (1849-1892) teil. Sie wurden von ansässigen Eskimos geführt und lebten von den Ressourcen des Landes. Während der Überwinterung an der Westküste der Hudson Bay und der anschließenden Untersuchung des William Landes und des Adelaide Landes konnte sich Klutschak sehr gut an die Lebensweise der Eskimos anpassen. Nach der Rückkehr veröffentlichte er in seinem Buch "Als Eskimo unter Eskimos" einen detaillierten ethnologischen Bericht über die Eskimos. Die Expedition bewies, dass Europäer ohne zusätzliche Lebensmittel im Hohen Norden reisen konnten, wenn sie von einheimischen Eskimos unterstützt wurden und sich selbst an ihre Lebensweise anpassten.

Als 1880 Hagenbecks Völkerschau erstmals Eskimos nach Berlin brachte, nutzte der Ethnologe Adolf Bastian (1826-1905) die Möglichkeit für anthropologische Vermessungen dieser bisher wenig bekannten Menschenrasse aus. Auch das ethnologische Interesse des Physikers und Mathematikers Heinrich Abbes (1856-1937) aus Bremen wurde geweckt, als er während des 1. Internationalen Polarjahres (1882-1883) auf der deutschen Station am Cumberland Sund (Baffin Island) als Assistent tätig war. Die deutsche Station wurde zu einem Knotenpunkt für reisende Eskimos, die

ihre Stammesmitglieder besuchten, welche auf der Station arbeiteten und den Fremden halfen, mit den klimatischen Herausforderungen des Hohen Nordens zurecht zu kommen. Abbes interessierte sich nicht nur für ethnographische Artefakte wie Kleidung, Jagdwaffen, Zelte oder Igloos, sondern auch für Kajaks und die Sprache. Seine Skizzen, die in der populären geographischen Zeitschrift "Globus" veröffentlicht wurden, führte er sehr präzise aus. Als das von der Deutschen Kommission für das Polarjahr gecharterte Schiff "Germania" die Stationsbewohner im September 1883 vom Cumberland Sund wieder abholte, brachte es den Berliner Geographiestudenten Franz Boas (1858-1942) mit, der Baffin Island und seine Einwohner erforschen wollte. Boas' erste Studien in dieser Gegend, die auf Klutschaks und Abbes Vorarbeiten basierten, bestimmten seine weitere Karriere als Ethnologe und Gründer der amerikanischen Anthropologie.

### **High-resolution physical properties of the AND-1B sediment core – A tool for constraining the past behavior of the Ross Ice Shelf/Ice Sheet, Antarctica**

Diana Magens, Frank Niessen and MIS Science Team

AWI Bremerhaven

In austral summer 2006/07 the ANDRILL-MIS Project drilled a more than 1200 m long sediment core from a deep basin beneath the McMurdo Ice Shelf near Ross Island (Antarctica). Main goal is to study the behavior of the Ross Ice Shelf /Ice Sheet under different climate conditions during about the last 14 myrs. A powerful tool to display changes in the depositional system with respect to ice shelf extent is represented by the high-resolution whole-core physical properties record.

During on-ice work, four parameters were measured using a multi-sensor core logger (GEOTEK): acoustic velocity, wet-bulk density, non-contact electrical resistivity and magnetic susceptibility. Lithologies in

the core vary from diatomites indicating open marine conditions to thick diamictite units, which represent the presence of an ice shelf/ice sheet, as well as to different volcanic deposits. Therefore, the range of values for the different parameters is large. However, changes in the physical properties record and boundaries between lithostratigraphic units meet almost throughout. There is a general down-core trend in both velocity and density mainly related to the compaction of sediment with depth. Especially in the upper part of the core, over-consolidation as a result of ice-loading can be observed. Furthermore, in various depth intervals increased levels of cementation leave significant effects on velocity. A detailed study of rhythmic changes in the environmental system is possible for a depth interval between 140-300 mbsf where the physical properties show clearly the follow alternations of diatomite and diamictite sequences. A pattern of about 8-9 rhythmic changes between those two lithologies can be identified. Diatomite intervals are characterized by low Vp values, WBD minima and very low MS values. In contrast, diamictites represent the other end of the data range with very high Vp in single clasts and on average. WBD shows distinct broad peaks around and MS displays values higher than one magnitude greater than the diatomites. The presence of numerous glacial surfaces of erosion throughout the record may cause difficulties for a quantitative approach of describing this cyclicity. However, Milankovich and sub-Milankovich forcing seems most favorable as possible control on system dynamics with respect to ice shelf/ice-sheet extent.

## Continental drilling at Lake El'gygytgyn, NE Russia, a contribution to the IPY Projects APEX and BIPOMAC

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Lake El'gygytgyn, located in central Chukotka, NE Siberia, is a 3.6 million year old impact crater lake with a diameter of 12 km and a water depth of 170 m. During the last 8 years the sedimentary record of the lake and its surroundings has become a major focus of multi-disciplinary, multi-national paleoclimatic and paleoenvironmental research. Besides, the meteorite impact event shall be reconstructed from the breccia and brecciated volcanic bedrock expected to occur beneath the lake sediments. To address these objectives, the International Continental Scientific Drilling Program (ICDP) and national funding agencies, in particular the German Federal Ministry of Education and Research (BMBF) and the US National Science Foundation (NSF), have provided funding for deep drilling operations on the lake and in its permafrost catchment.

A pre-site survey conducted at Lake El'gygytgyn has evidenced that a full-length lake sediment core will yield a complete record of Arctic climate evolution since 3.6 million years BP, thus penetrating back one million years prior to the intensification of the Northern Hemisphere Glaciation. This makes Lake El'gygytgyn unique in the terrestrial Arctic. The drill cores promise to become key records in international research initiatives of the International Polar Year (IPY), such as „Arctic Palaeoclimate and its Extremes“ (APEX) or „Bipolar Climate Machinery“

(BIPOMAC). The longest sediment core as yet existing from the lake, recovered in 2003, is 16 m long and comprises the past 350 ka. Its continuous sedimentation excludes an ice coverage or drying of the lake during the last climate cycles, and its composition reflects the regional climatic and environmental history with a very high sensitivity. Recent results from this core are presented by Juschus et al., Wennrich et al., and Vogel et al. In the talk summarised here, we will present the current planing towards deep drilling operations to be conducted at Lake El'gygytgyn in autumn 2008 (permafrost core) and spring 2009 (lake cores), with the scientific objectives, the coming milestones and the schedule for the investigation of the core material.

## Antarctic total ozone distribution and tropopause height zonal asymmetry in connection to Antarctic Peninsula warming

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Planetary waves in the total ozone distribution in Antarctic region are studied in connection to extreme Antarctic Peninsula climate warming observed last decades. Climatology of the quasi-stationary wave (QSW) amplitude and zonal structure are analyzed using the TOMS data. The main characteristics of the zonal wave numbers 1 - 5 in the total ozone at the latitudes of 50S - 80S are calculated. The highest values of the QSW amplitude at latitude 65S in October were obtained. The asymmetry of total ozone distribution over Antarctic region during Austral spring is discussed. The planetary wave TOC minimum eastward shift about 40 degrees in longitude was found over Antarctic Peninsula - Weddell Sea area during 1979 - 2005, whereas the zonal maximum has relatively stable in position.

This displacement is discussed in connections to latest findings of the strengthening circumpolar westerlies and regional climate warming in Antarctic Peninsula. Long-term shift in the position of the total ozone minimum is confirmed by similar tendency in tropopause pressure zonal structure. However, quasi-stationary zonal anomalies in the troposphere temperature do not have a significant influence on the tropopause structure during spring months, when ozone loss in the lower stratosphere is dominant factor of the thermal regime formation above tropopause. Tropopause height anomalies over Antarctic region show seasonal change associated with total ozone losses during spring months. The higher tropopause in West Antarctica coupled with its increasing decadal trend could be involved in climate change in this region. The peculiarities of total ozone distribution and tropopause height are discussed in the connection to troposphere-stratosphere coupling mechanisms (Yang et al., 2007). Long-term ozone loss and lower stratosphere cooling cause the series of thermodynamic and dynamic processes. That provides the strengthening of meridional temperature gradient and intensification of polar stratosphere vortex. The latter caused decreasing of penetration of planetary waves to lower stratosphere, which changed meridional circulation and could change the surface wind in the studied region.

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### **Bestimmung eines regionalen Geoids für Dronning-Maud-Land aus einer Kombination von flugzeuggestützten Messungen und Satellitendaten**

Jan Müller<sup>1</sup>, Sven Riedel<sup>2</sup>, Mirko Scheinert<sup>1</sup>, Martin Horwath<sup>1</sup>, Reinhard Dietrich<sup>1</sup>, Daniel Steinhage<sup>2</sup>, Wilfried Jokat<sup>2</sup>

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Durch Kombination der Daten dedizierter Satellitenmissionen zur Vermessung des Schwerefeldes der Erde (CHAMP, GRACE, ab 2008: GOCE) mit terrestrischen Schwerebeobachtungen ist es innerhalb der letzten Dekade gelungen, globale Schwerefeldmodelle mit bisher unerreichter Genauigkeit, Homogenität und Auflösung abzuleiten.

Heutige Modelle erfassen das globale Erdschwerefeld bis hin zu Wellenlängen von 100 km, wobei noch deutlich höher aufgelöste Modelle bereits erarbeitet werden (EGM2006). Der antarktische Kontinent stellt in diesem Kontext einen Sonderfall dar: Aufgrund der teilweise fehlenden Überdeckung mit Satellitendaten (Pol-Loch) sowie der fehlenden Verfügbarkeit flächendeckender terrestrischer Daten müssen die globalen Schwerefeldmodelle hier zumindest für den mittel- und kurzwelligen Wellenlängenbereich als unsicher und fehlerhaft angesehen werden.

Um die Verfügbarkeit von terrestrischen Schweredaten zu erhöhen und um ein verbessertes antarktisches Geoid zu bestimmen, wurde das Commission Project 2.4 "Antarctic Geoid" (Vorsitz: M.Scheinert) der Internationalen Assoziation für Geodäsie (IAG) etabliert, das eng mit dem Scientific Committee on Antarctic Research (SCAR) (speziell: Projekt 3 "Physical Geodesy" der Expert Group on Geodetic Infrastructure (GIANT)) zusammenarbeitet. In Kooperation zwischen dem AWI Bremerhaven und der TU Dresden fanden zwischen 2001 und 2005 vier flugzeuggestützte Messkampagnen im westlichen und zentralen Dronning-Maud-Land im Rahmen des gemeinsamen DFG-Projektes VISA statt



(vgl. Poster Scheinert u.a.). Aus den mehr als 80.000 Profilkilometern der Befliegung mit Linienabständen zwischen 10 und 20 Kilometern wurden konsistente Datensätze für Schwere, Eisoberfläche, Eisdicke sowie, daraus abgeleitet, Felsuntergrundtopographie bestimmt. Aus diesen Datensätzen wurde mittels Remove-Restore-Technik und Kollokation nach kleinsten Quadraten ein verbessertes Geoid für das Dronning-Maud-Land generiert.

Verglichen mit aktuellen globalen Schwerefeld- bzw. Geoidmodellen zeigt das berechnete Geoid eine deutlich höhere räumliche Auflösung, was insbesondere an kleinräumigen, mit der Topographie korrelierten, Merkmalen sichtbar wird, die im globalen Modell nicht erkennbar sind. Die Unterschiede zwischen verbessertem Geoid und globalem Modell betragen im Mittel 2 bis 3 Meter, erreichen vereinzelt jedoch bis zu 5 Meter. Die Genauigkeit des verbesserten regionalen Geoids kann nach Abschätzung aller Fehlerquellen mit 15 cm angegeben werden.

### **Biological proxies as a tool for palaeoecological inferences**

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Ulrike Herzsuh<sup>1</sup>, Bernhard Diekmann<sup>1</sup>

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The reconstruction of the dynamic elements of past environments is extremely important for understanding both the present state and evolutionary trends in future climate development. Since long-term measurements on climate variability very rarely go back more than about 100 years, palaeoclimate and environmental reconstructions based on proxy indicators must be used to validate the output of global climate models. Especially important are such reconstructions in climatologically sensitive and pristine regions such as polar areas, where any small global climate change results in distinct regional variations of temperature, precipitation, and other climate-induced changes.

There are few examples of quantitative palaeoclimate studies in Siberia and these data have to be tested by quantitative studies from other sites in this region, inferred from other proxy and using regional calibration datasets and temperature models that were still lacking. At the present state of knowledge, biological indicators from aquatic and terrestrial environments are the most reliable proxies, because they react sensitively to climate change and define different aspects of environments, which should be assessed together for reliable reconstructions. The basis, however, of all quantitative reconstruction approaches are regional calibration datasets from which the empirical reconstruction model (i.e. the transfer function) will be established. Calibration datasets for reconstructing palaeoclimate variables were most effectively established along steep latitudinal temperature gradients in Northern Europe and Canada. But any application of non-regional models for reconstruction causes difficulties in their interpretation and makes results sometimes controversial. One of the premier methods for quantitative temperature reconstruction in temperate and arctic environments is by means of chironomid-climate inference models. Chironomids compose a family of true flies and are well suited as quantitative indicators of climate change. Merging together three data sets: Norwegian, Northern Ural and Central Yakutian gives us a data set and Combined Temperature model with good statistical parameters. The model can be applied to sediment cores from Northern Russia in order to obtain reliable temperature reconstructions of Holocene.

### Late Neogene climate history of the Ross Embayment: Initial results from the AND-1B core, ANDRILL McMurdo Ice Shelf Project

Frank Niessen<sup>1</sup>, T.R. Naish<sup>2</sup>, R.D. Powell<sup>3</sup>, A. Pyne<sup>2</sup> and the ANDRILL-MIS Science team<sup>4</sup>

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<sup>4</sup>see: <http://www.andrill.org/support/references/appendixc.html>

From October to December 2006 the ANDRILL Program successfully recovered a 1285m-long succession of cyclic glacial-marine sediment with interbedded volcanic deposits, in its first season of drilling from the McMurdo Ice Shelf (MIS) using drilling systems specially developed for operating through ice shelves. The MIS drillcore represents the longest and most complete (98% recovery) geological record from the Antarctic continental margin to date, and will provide a key reference record of climate and ice sheet variability through the Late Neogene (~13Ma to present).

An integrated age-depth model indicates numerous intervals of continuous accumulation (up to 0.5mm/year) separated by unconformities of 103-105 years duration. The >60 cycles of advance and retreat of the grounded ice margin preserved in the AND-1B record the evolution of the Antarctic ice sheet since a profound global cooling step in deep sea oxygen isotope records ~14 m.y. ago. A feature of particular interest is a ~90m-thick interval of diatomite deposited during the warm Pliocene, and representing an extended period (~200,000 years) of locally open water, high phytoplankton productivity and retreat of the glaciers on land. Late Pliocene (~2.6 - 2.2 Ma) glacial-interglacial cycles characterised by abrupt alternations between subglacial/ice-proximal facies and open marine diatomites imply significant WAIS dynamism, and contribution to global ice volume changes coeval with the initiation

of Northern Hemisphere glaciations. The last 1Ma is dominated by glacial deposits interrupted by periodic, small-scale retreats of the grounding line followed by re-advance and ice-sheet grounding. The latter form sharp glacial erosion surfaces and leave little to no material indicative for Pleistocene interglacial deposits like the 0.3 to 0.6 m of mud accumulated underneath the McMurdo Ice Shelf during the Holocene so far. The exception is a ~4m-thick interval of diatomaceous mudstone in the Middle Pleistocene which represents ice free conditions during an interglacial (MIS 31) which was supposed to be warmer than the Holocene.

### Two EPICA ice cores revealing 800,000 years of climate history: an overview.

Hans Oerter, EPICA team

AWI Bremerhaven

Two deep ice cores had been drilled within the European Project for Ice Coring in Antarctica (EPICA). The first core from Dome C reached a depth of 3260 m covering a time period of about 800,000 years. The second core from Dronning Maud Land (DML), drilled at Kohnen-Station, reached 2774 m depth with an estimated age of approximately 300,000 years. Measurements of stable isotopes (oxygen-18, deuterium) reveal climatic variations over 8 glacial cycles. Synchronisation with the deep Greenland ice cores was possible by using the records of methane. A general correspondence was assessed between Dansgaard-Oeschger events in the North and their smoothed Antarctic counterparts, the so-called Antarctic Isotope Maxima (AIM). This was most evident in the DML ice core, as it shows a higher temporal resolution during the past 80,000 years than the Dome C ice core.

However, such features with similar amplitude are also present in the deeper part of the dome C ice core. It is likely that the interplay between obliquity and precession accounts for the variable intensity of interglacial periods in the ice-core records.

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### Lake sediments as archives for the reconstruction of the late Quaternary environmental history of Taylor Valley, Southern Victoria Land, Antarctica

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In the unglaciated areas of Antarctica, lake sediments act as archives of the paleoenvironment and paleoclimate, but are mostly restricted to the Holocene. The Dry Valleys, in which Taylor Valley is located, remained mostly ice-free during the Last Glacial Maximum. Therefore lake sediment sequences from this area promise to provide long records. During an U.S.-American-German expedition in austral summer 2002/2003 several cores were recovered from the three major lakes in Taylor Valley, southern Victoria Land. In order to reconstruct the late Quaternary regional environmental history, sedimentological, biogeochemical, mineralogical, and chronological investigations were conducted on the sediment sequences of lakes Fryxell, Hoare, and Bonney. The lakes are not only differing in their limnology, but also in the lithology of their sediments. The mainly

clastic sediment sequences recovered from lakes Hoare and Fryxell in lower Taylor Valley provide crucial information about the environmental history of Taylor Valley back into the late Weichselian. At that time, eastern Taylor Valley was occupied by the large proglacial Lake Washburn, since the advanced Ross Sea Ice Sheet dammed the valley outlet. Lake Washburn was mainly fed by meltwater and had an oscillating lake level probably depending on climatic variations. After the final retreat of the Ross Sea Ice Sheet during the Holocene, Taylor Valley was occupied by remnants of Lake Washburn. Environmental conditions comparable to those of today, with an advanced Canada Glacier separating lakes Hoare and Fryxell, established during the middle Holocene. Additional information about the environmental history of Taylor Valley can be derived from the lake sediments recovered from Lake Bonney, which is located in the upper valley adjacent to the Taylor Glacier. The sediments are characterised by salt crusts and the occurrence of CO<sub>2</sub> gas hydrates. Variations in the composition of the sediments are likely related to environmental changes over time, but can hardly be constrained chronologically so far due to the lack of sufficient organic matter for radiocarbon dating.

### The diversity of diaspores at an Antarctic inland site – implications for ecosystem development

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Antarctic nunataks are characterised by limited ecosystem complexity. For colonisation, diaspores of different taxa must be brought in to the habitat and the environmental conditions must be suitable. There is only very scarce knowledge on the diversity of diaspores at Antarctic terrestrial habitats in general. The only more extensive research has been done in the northern maritime Antarctic mainly on Signy Island, South Orkney Islands.

The results presented are the first of an Antarctic inland site. The site, Coal Nunatak, is situated in the south of Alexander Island (72° 03'S 68° 31'W). The Nunatak is characterised by a striking scarce colonisation by lichens and mosses. We investigated the diversity of diaspores which are brought in by wind in the duration of two years. Numerous samples have been taken after 3 weeks, 6 weeks and two times after a year. The diaspores have been identified using molecular approach of the cultured organisms and TGGE directly from the filters.

Organisms from numerous taxa could be identified (bacteria, cyanobacteria, chlorophyta, bryophytes, basidiomycetes, ascomycetes). The highest number of diaspores has been found in the group of ascomycetes. Despite the high number of diaspores of different taxa identified only exceptionally these organisms colonise the habitat at Coal Nunatak which might primarily depend on the severe environmental conditions.

### **Sedimentary Fluxes of Mercury and Pyrolysable Organic Carbon as a Potential Paleo-thermometer for Arctic Aquatic Systems**

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An observed effect of recent Arctic climate warming is increased primary productivity in lakes, which has been attributed to longer ice-free growing seasons. Here, we report sediment geochemistry data for the last millennium for two lakes in the Canadian High Arctic (at ca. 75 degN), which suggest the possibility of developing a combined approach to paleo-temperature reconstruction using the down-core concentrations and flux patterns of Hg and specific types of organic carbon (OC). Organic carbon can be separated into several categories based on their thermal degradation during RockEval® analysis:

volatile free hydrocarbons ("S1" released during pyrolysis up to 300OC), higher molecular weight hydrocarbons ("S2" - pyrolysis at 300-650 degC), and residual OC ("RC" - oxidized at 850 degC). S1 and S2 carbons are believed to include soluble, amorphous compounds comprising lipids, oils, fatty acids, pigments and aliphatic hydrocarbons. RockEval is also informative about the source of carbon (aquatic vs terrestrial) and the degree of diagenesis. Analysis of the sediments confirmed that virtually all OC came from within-lake algal productivity, and that it was well preserved over the millenium. Down-core [S1] and [S2] were highly correlated ( $r^2 = 0.7 - 0.9$ ) with [Hg] in both lakes, and showed similarities to previous reconstructions of past Arctic temperatures, including an increase during the Medieval Warm Period. S1 and S2 data showed too that the 20<sup>th</sup> Century warming period is the most productive of the past 1,200 years. OC flux patterns between study lakes were strongly correlated, indicating a common driver of aquatic productivity, and the patterns appear to correspond to the limited instrumented temperature record for the High Arctic.

We suggest that in High Arctic lakes, which mostly lack terrestrial carbon inputs that might confound aquatic productivity patterns, S2 carbon can be used to infer a temperature record for the Holocene and perhaps longer, because it is abundant in algal matter and relatively resistant to degradation and diagenesis. Mercury also seems to be a good paleo-thermometer because its accumulation rate is tightly controlled by within-lake productivity and, by extension, the seasonal duration of ice-cover. This Hg-OC approach may be applicable to the reconstruction of sea-ice cover using marine sediments, if sea-ice cover has been an equally important factor controlling marine algal productivity.

## Geologische Interpretation von Inkohlungsdaten aus tertiären und deren liegenden Schichten des Ujandina- und Indigirka-Zyrjanka Beckens (Zacha/Jakutien in Nordost-Russland)

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Während der CASE-3 Expedition („Correlation of Alpine Structural Events“ in the Arctic) wurden Aufschlüsse im Ujandina-Becken entlang des Flusses Inach und die im Indigirka-Zyrjanka-Becken entlang des Mjatis' geologisch detailliert im Gelände untersucht und 93 Proben für Inkohlungsuntersuchungen genommen, deren Auswertung zur Tagung vorgelegt werden soll.

Das Ujandina-Becken ist ein intramontanes Pull-apart-Becken, welches nur Extensionsstrukturen zeigt und zum Moma-Rift-System gerechnet werden kann. Endogen bedingte Pressungsstrukturen fehlen. Der Inkohlungsgrad liegt unter 0.3 % Vitrinitreflektion (Rr), wodurch eine geringe Versenkungstiefe belegt wird. Dagegen zeigen die Aufschlüsse am Fluss Mjatis' im Indigirka-Zyrjanka Becken Kompressionsstrukturen, wie z.B. intensive Steilstellung und Überschiebungen. Sie sind ein Hinweis auf sehr junge Kollision von Kontinentalplatten, denn die Einengungsdeformation schloss sogar unterste pliozäne Schichtenfolgen in die Steilstellung ein. Diese tertiären Folgen und ihr Liegendes des Indigirka-Zyrjanka-Beckens gehören in ihrer Position zum Verkhojan-Cherskij-Faltengürtel. Sie zeigen, dass dieses Becken viele gemeinsame Züge mit Vortiefen aufweist, wie die Asymmetrie in der Mächtigkeitsverteilung und dem Tiefgang der Depression. Die Vergenz der tektonischen Strukturen ist nach außen gerichtet. Der Inkohlungsgrad (Vitrinitreflektion Rr) in der Senke variiert zwischen 0.25 % bis mehr als 5 %. Er zeigt deutliche Hinweise auf die Korrelation zwischen geothermaler Entwicklungsgeschichte einerseits zur Absenkung und andererseits zur Intensität der tektonischen Deformationen. Je höher

die Deformation, angezeigt z.B. durch beginnende Schieferungsbildung, desto höher der Inkohlungsgrad.

Bei Berücksichtigung großräumiger regionalgeologischer Beobachtungen einschließlich zugänglicher Bohrdaten fällt der weit verbreitete Hiatus an der Wende Kreide zum Tertiär auf, der für eine Zeit hoher tektonischer Mobilität spricht. Aller Wahrscheinlichkeit nach kann ein Wandern der Faltung in der Vortiefe seit der Späten Kreidezeit bis ins Pliozän von innen nach außen angenommen werden.

## Raubmöwen - Wanderer zwischen den Polen

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Raubmöwen (*Catharacta spec.*) sind mit nahe verwandten Arten auf der Nord- und Südhalbkugel verbreitet und überwintern auf den Ozeanen. Da die Arten im Winterhalbjahr auf dem Meer relativ schwierig zu unterscheiden sind, fehlen insbesondere für die küstenfernen Gebiet verlässliche Daten über den zeitlichen und räumlichen Verlauf des Zuges und des Aufenthalts im Winterquartier.

Der Vortrag liefert unter Anwendung verschiedener Methoden einen Beitrag zu dieser Fragestellung. Seit 1984 wurden von den Autoren auf Fildes bzw. Potter Peninsula, King George Island, Antarktis, mehr als 2000 Raubmöwen, d.h. Südpolarskuas (*Catharacta maccormicki*), Braune Skuas (*C. antarctica lonnbergi*) und Hybride (*C.a.lonnbergi* x *C.maccormicki* bzw. *C. maccormicki* x *C.chilensis*) beringt, teilweise nicht nur mit Metall-, sondern zusätzlich auch mit Plastik-Kennringen. Während dieser Zeit wurden nur wenige Vögel außerhalb der Antarktis tot wiedergefunden bzw. beobachtet. Bemerkenswert sind ein Totfund eines Hybrid-Vogels nach 3 ½ Jahren am Flemmish Cap im Nordatlantik 12.264 km N vom Beringungsort entfernt,

sowie in der gleichen Region die Beobachtung einer zusatzberingten Südpolar-skuas am Cape Cod, Massachusetts, 2 Jahre nach der Beringung. Sämtliche Wiederfunde von Braunen Skuas stammen dagegen von Küsten und Inseln im Südatlantik.

Um eine Vorstellung über den räumlichen und zeitlichen Verlauf der Zugweg zu erhalten, wurden beide Skua-Arten mit Satellitensendern versehen. Nur zwei Südpolar-skuas sendeten außerhalb des Brutgebietes Daten. Ein Vogel zog im Atlantik nordwärts, wobei der Sender schon nördlich von Südgeorgien nicht mehr arbeitete. Umso überraschender waren die Daten, die ein zweiter Vogel sendete, der sich im Südwinter zwischen Japan und den Aleuten aufhielt, mehr als 15 000 km entfernt vom Brutgebiet! Da diese Methode extrem kostenaufwändig ist, wurden nach anderen Möglichkeiten gesucht. Zu diesem Zweck wurden in der Antarktissaison 2006/07 Braune und Südpolar-skuas mit leichten GLS-Loggern versehen, die die Vögel weit weniger beeinflussen, da sie an einem zusätzlichen Ring am Fuß angebracht werden können. Im Dezember 2007 und Januar 2008 werden die GLS-Logger entfernt und ausgelesen. Dann wird sich zeigen, ob die Arbeitshypothesen, dass sich Südpolar-skuas sowohl im Nordatlantik als auch im Nordpazifik aufhalten, während Braune Skuas den Südatlantik bevorzugen, stimmen.

### **Permafrostböden und Klimaerwärmung: 11 Thesen zu Folgen der klimabedingten Permafrost-Degradation**

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Ungefähr 25 % der terrestrischen Landoberfläche unserer Erde ist von Permafrost unterlagert. Die Böden der Permafrost beeinflussten Landschaften speichern etwa ein Drittel des globalen terrestrischen organischen Kohlenstoffs.

Im Zuge der globalen Klimaerwärmung, die in den nördlichen Breiten zu den stärksten Veränderungen führt, wird mit einem drastischen Abtauen des Permafrostes und mit einer verstärkten Freisetzung von klimarelevanten Spurengasen wie Methan und Kohlenstoff aus dem Permafrost gerechnet. Permafrostböden reagieren sehr sensibel auf Temperaturerhöhung und technologische Veränderungen. Vorhersagen über den Umfang des Permafrost-Rückgangs und den damit verbundenen Gefährdungen sind sehr unsicher, da bisher unbekannt ist, wie die steuernden Prozesse im Permafrost auf die schnelle Klimaerwärmung reagieren. Obwohl in Russland die weltweit größten Permafrostgebiete (ca. 65 % der Fläche) liegen, gibt es bisher keine Abschätzungen zu den Folgen einer prognostizierten Permafrost-Zerstörung. Es werden 11 Folgen der erwarteten Permafrost-Degradation diskutiert:

1. Gravierende Bodenverluste in Folge kryogener Prozesse wie Thermokarst, Thermoerosion, Thermoabrasion und Massenumlagerungen am Hang – Verlust künftiger Siedlungs- und Produktionsräume?
2. Zerstörungen an Gebäuden und Infrastruktur: Mehr als 75% aller Konstruktionen basieren auf einem stabilen, sicheren Permafrost-Untergrund. Der Anstieg der Permafrost-Temperaturen führt zu einer Abnahme der Untergrundstabilität und Tragfähigkeit für Gebäude?
3. Abtauen des Permafrostes legt die Fundamente frei und führt zur verstärkten Frostverwitterung und Zerstörung der Untergrundkonstruktionen?
4. Deformation von Straßen, Bahntrassen und anderen Transportinfrastrukturen – Aufgabe von Siedlungsräumen und Zerstörung der geodätischen Netzwerke?
5. Zerstörungen von Hafenanlagen und veränderten Küstenlinien – Gefährdung der Hafeninfrastruktur des nördlichen Seeweges über die eisfreie Nord-Ost Passage?
6. Permafrostböden werden großflächig als Deponieflächen für feste und flüssige Abfälle, einschließlich nuklearer und hoch toxischer Stoffe, genutzt. Der Anstieg der Permafrost-Temperaturen wird zur verstärkten Kontamination von Böden,

Flüssen, Seen, arktisches Meer etc. führen?

7. Anstieg der Wassertemperaturen in den Flüssen der nördlichen Breiten führt zur Erwärmung und Abtauen der submarinen Permafrosts mit der Folge der Destabilisierung von Küstenräumen?

8. Freisetzung von im Permafrost konservierter Viren und Bakterien aus früheren Zeiten – ein Abschmelzen führt zur Gefährdung von Mensch und Tier durch mögliche Schadorganismen?

9. Tauender Permafrost führt zu erhöhten Sedimentfrachten in Seen und Flüssen sowie zur Abnahme der Boden- und Wasserqualität mit negativen Effekten für die indigene Bevölkerung?

10. Abtauen des eisreichen Permafrosts trägt zum Meeresspiegelanstieg bei?

11. Verstärkte CH<sub>4</sub> und CO<sub>2</sub> Freisetzung aus Permafrostböden wird zur Zunahme von Treibhausgasen in der Atmosphäre führen und die Erderwärmung weiter vorantreiben?

Um Erkenntnislücken aufzuzeigen und Vorhersagen über Klimaänderungen im Permafrost zu verbessern, werden Schlussfolgerungen für die künftige Bodenforschung im Permafrost gezogen.

### **Korrelation der Sedimentbecken und tektonischen Ereignisse der vergangenen 650 Millionen Jahre auf dem Barentsschelf (Svalbard) und Nord-Grönland/Ellesmere Island (kanadische Arktis)**

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Der Vergleich der großen Sedimentbecken und der tektonischen Ereignisse auf (i) Pearya, einem Terrane im äußersten Norden von Ellesmere Island, (ii) auf Ellesmere Island, (iii) in Nord-Grönland und (iv) auf Spitzbergen zeigt exemplarisch die Abfolge der verschiedenen Phasen getrennter und gemeinsamer Entwicklung der beteiligten Kontinentabschnitte vom jüngeren Neo-Proterozoikum bis heute.

Das obere Neo-Proterozoikum und Alt-Paläozoikum sind durch eine enge Verwandtschaft Pearyas (i) und Spitzbergens (iv) gekennzeichnet, die durch die vendischen Diamiktite (Tillite) und die Auswirkungen der kaledonischen Orogenese im Ordovizium/Silur gestützt wird. Eine weitere Gemeinsamkeit sind Intrusionen post-tektonischer Granite im Devon. Im Gegensatz dazu bilden Ellesmere Island (ii) und Nord-Grönland (iii) vom Neo-Proterozoikum bis ins Devons hinein den passiven nördlichen Kontinentalrand Laurentias mit mehrere 1000 m mächtigen feinklastischen Becken- und klastischen und karbonatischen Schelfablagerungen des Franklin-Beckens. An der Grenze Oberdevon/Unterkarbon erfassen die Bewegungen der ellesmerischen bzw. svalbardischen Deformation alle Gebiete (i-iv). Auf Ellesmere Island (ii) und in Nord-Grönland (iii) werden die Sedimente des Franklin-Beckens stellenweise metamorph überprägt und über bedeutenden Abscherhorizonten im kilometer-Maßstab verfaultet. In Spitzbergen (i) werden sowohl das kaledonische Grundgebirge als auch das post-kaledonische Old Red-Molassebecken intensiv deformiert. Nach der ellesmerischen Deformation und der Kollision Spitzbergens/Pearyas (i, iv) und dem Nordrand Laurentias (ii, iii) verläuft die Entwicklung in allen Gebieten identisch: ab dem Visé (Unterkarbon) werden im Sverdrup Becken (i, ii), im Wandel-See Becken (iii) und im Spitzbergen Becken (iv) tektonische Gräben angelegt und Red-Beds und Evaporiten verfüllt. Im Oberkarbon setzt arktisweit eine karbonatische Sedimentation ein, die bis ins Perm hinein andauert. Das Mesozoikum wird in allen Bereichen (i-iv) von klastischen, teils terrestrischen, teils flachmarinen Sedimenten gekennzeichnet. Mit der plattentektonischen Umstrukturierung während des Zerfalls Laurasias und der Öffnung des Arktischen Ozeans und des Nordatlantiks erfassen die Auswirkungen der Eureka-Deformation alle Gebiete (i-iv). Seit dem Ende dieser Deformation im ausgehenden Eozän laufen die Entwicklungen in Pearya, auf der Ellesmere-Insel und Nord-Grönland (i-iii)

einerseits und Spitzbergen (iv) andererseits getrennt ab.

### Sea Ice Thickness Measurements in the Trans Polar Drift in 2007, Another Year of Minimum Arctic Sea Ice Extent

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A good knowledge about the Arctic sea ice thickness distribution and inter annual variability is necessary for predictions of a future climate change. Most of the actual knowledge comes from model results which need to be proven by measurements with e.g. helicopter or submarines. Since 1991 the Alfred Wegener Institute (AWI) conducts late summer sea ice thickness measurements in the Trans Polar Drift (TPD) in irregular intervals. Most of the former results were acquired by the method of ground based electromagnetic (EM) induction and the later results with helicopter borne EM measurements. The latest measurements were done in the same region around the North Pole in August and September 2007 during the "Polarstern" cruise ARKXXII/2 with an helicopter EM instrument. These measurements show how the minimum sea ice extent of approximately 3.8 square kilometers is reflected in the thickness distribution. From 1991 to 2001 the mean sea ice thickness in the TPD decreased by 22.5 % from 3.11 m to 2.41 m. In 2007 the mean sea ice thickness in the TPD was approximately 1.20 m, which is a decrease by another 50 % compared to 2001. Over the complete study region of approximately 1.5 million square kilometers the distribution function of the ice thickness was quite similar, with a maximum at 0.9 m, which reflects the thermodynamical driven level ice thickness. Satellite scatterometer and drifting buoy measurements suggest that > 90 % of the late summer sea ice in the TPD was first year ice.

### New observations of glacier acceleration at the Antarctic Peninsula observed by TerraSAR-X

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Accelerated retreat and break-up of the northern sections of the Larsen Ice Shelf on the Weddell coast of the Antarctic Peninsula has been observed over the last three decades. In connection with the break-up events the role of the buttressing ice shelves on the stability of grounded ice upstream is of particular interest. Retreat and acceleration were observed for the glaciers above the previous Larsen-A and Prince Gustav Channel ice shelves after the collapse in January 1995 by means of interferometric analysis of 24 hour repeat pass ERS-1/ERS-2 tandem SAR data. After the end of the tandem mission in early 2000 InSAR could not be used any more for these glaciers, because repeat pass SAR data were available only over longer time intervals, resulting in complete decorrelation of the InSAR signal. Motion mapping by Envisat-ASAR amplitude image correlation could be applied only over the terminal parts of a few large glaciers, such as the Hektor-Green-Evans glaciers above the Larsen-B ice shelf that disintegrated in March 2002. Ice motion of fast flowing, narrow ice streams and deformation in shear zones could not be observed because comparatively large image templates are needed for applying the correlation technique. The launch of the German TerraSAR-X satellite in June 2007 opened up excellent new opportunities for mapping and monitoring flow fields and deformation of glaciers. We applied image correlation of 11-day TerraSAR-X repeat pass data of summer and autumn 2007, acquired in strip-map mode with 3m x 3m nominal resolution, to mapping the ice velocities of glaciers above the previous Larsen-A and Larsen-B ice shelves. The high spatial resolution of TerraSAR-X provides significant improvements over lower resolution



systems, on one hand because the accuracy of retrieved velocity is related to spatial resolution, on the other hand because X-band data are more sensitive to snow and ice structural properties than lower radar frequencies.

The retrieved velocity maps of the Antarctic Peninsula glaciers reveal unprecedented details of ice motion and deformation, including also fast flowing glaciers that could not be mapped by lower resolution SAR data. This analysis reveals further acceleration since the disintegration of the Larsen-A and Larsen-B ice shelves, indicating significant increase of ice export from the Antarctic Peninsula.

### Dynamics of the ice cap of King George Island, Antarctica

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King George Island, the largest of the South Shetland Islands, is located at the northern tip of the Antarctic Peninsula. It is largely governed by maritime climatic conditions. The mainly temperate and partly more than 300m thick ice cap has a mean annual temperature of -2.4°C and is regarded as most sensitive to changing climatic conditions. Global warming would therefore have impacts on the dynamics and the mass balance of the ice cap.

During several field expeditions of the University of Münster and the University of Bonn an extensive database for the ice geometry, surface ice velocities and accumulation rates were carried out.

These dataset are used as input and validation parameters for a three-dimensional, numerical, higher-order model. The model is implemented in the commercial finite element code COMSOL, a high performance FE Solver for stationary and non-stationary nonlinear systems. The model is tested with the

proposed ISMIP-HOM Benchmark (ice sheet model intercomparison project for higher order models).

Here we present the modelled and measured ice dynamics. In the numerical model we take into account that in contrary to large cold ice bodies, such as Antarctica and Greenland, the ice temperature is at the pressure melting point. Therefore, a non-negligible water content exists in warmer ice bodies and effects the ice flow behaviour, e.g. basal sliding.

### The changing Arctic Ocean - observations during IPY

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In recent decades large variations in water mass characteristics of the Arctic Ocean have been observed. These changes have largely been advected to the Arctic Ocean from the North Atlantic.

The Eurasian Basin, through its connections with the Nordic Seas via Fram Strait and the Barents Sea, is the most ventilated of the Arctic Ocean basins but also the part of the Arctic Ocean where the most profound transformations in water mass properties occur. The fact that temperature and salinity anomalies, entering the Arctic Ocean through Fram Strait, now can be identified in the different basins and traced through different circulation loops suggests that the strength of the water mass transformation in the Arctic Ocean has weakened, the cause being mainly higher atmospheric temperature, implying less cooling, and to a smaller degree a larger atmospheric freshwater transport to the Arctic. This reduces the dense water production on the

shelves and thus the ventilation of the deeper layers of the Arctic Ocean. This could signal a larger change, where the deep water formation in the Arctic Mediterranean Sea eventually ceases, and the circulation shifts from one strongly affected by thermohaline processes on the shelves to one dominated by the wind field.

Observations, especially from the last 10-15 years, are used to examine the variations in the water mass characteristics, mainly in the Eurasian Basin, to determine if such changes in the water mass transformations have taken place.

### **Gravimetrische Langzeitregistrierung in der argentinischen Antarktisstation Belgrano II als Beitrag zum IPY-Projekt POLENET**

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Im Rahmen eines bilateralen Forschungsprojektes wurde Anfang Februar 2007 eine gravimetrische Beobachtungsstation in der argentinischen Antarktisstation Belgrano II eingerichtet. Am südlichen Rand der Vahsel-Bucht im südöstlichen Weddell-Meer gelegen, bietet Belgrano II eine weit nach Süden vorgeschobene Lokation für eine langfristige gravimetrische Registrierung, die so in dieser Region bisher nicht erhoben wurde. Mit Hilfe der gravimetrischen Zeitreihe lassen sich die Gezeiten der festen Erde analysieren sowie der Einfluß der Ozeangezeiten validieren. Erste Ergebnisse der Gezeitenanalyse der Ende 2007 abgeschlossenen Registrierung sollen vorgestellt werden.

Zusammen mit den Resultaten einer dreitägigen GPS-Messung auf dem schwimmenden Gletscher der Vahsel-Bucht läßt sich der Einfluß der Ozeangezeiten quantifizieren und diskutieren. Diese Messungen bilden einen Beitrag

zum IPY-Projekt POLENET, in dessen Rahmen geodätische und geophysikalische Permanentbeobachtungen eingerichtet und durchgeführt werden (u.a. GPS und Seismologie).

Die Gezeitengravimetrie liefert wertvolle Ergebnisse, die für weitergehende Untersuchungen angewendet werden, z.B. in der Ableitung von zeitlich variablen Schwerefeldern der Antarktis bei der Reduktion des Einflusses der Ozeangezeiten.

### **Physical properties, climate signals, and structural features of Tertiary sediments in the Southern McMurdo Sound (Antarctica) derived from downhole logging in the ANDRILL-SMS project**

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In the framework of the international ANtarctic DRILLing program (ANDRILL) a 1000 m deep core drilling will be sunk in south McMurdo Sound (Ross Sea) in October and November 2007. The investigations of Antarctic Neogene ice sheet variations, of long-term climate evolutions and of the tectonic history of McMurdo Sound represent the main project aims. The extensive geophysical logging of his borehole delivers a main basis for answering a lot of questions in the scope of the whole project consisting of about 70 scientists. Interpreting the downhole logging data permits among other things to establish a complete lithological log, to characterize the drilled sediments petrophysically, to determine sedimentary structures and to get evidence about palaeoclimatic conditions during up to 14 Mio years. Seismic experiments in the borehole allow linking detailed geological information with shipborne seismic sections. This way, local results can be transformed into spatial information thus providing an important contribution to the understanding of the tectonic structure of Ross Sea. First results will be shown.

## Evidence of a long-range transport of coarse particles to NE-Greenland

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Coarse particle concentration was measured at NE Greenland over a period of nearly 15 years. The sampling was conducted along with a long-term observation of lemming cycles within the Karupelv Valley Project running since 1988. The sampling site was located on Traill Island, in the NE Greenland National Park at about 72°30' north and 24° west. Particles were weekly collected since 1991, every year except in 2000/2001 from June till August by means of the passive sampling device Sigma-2 (VDI 2119-4, 1997).

The collected samples were microscopically analysed with an automated image processing system. Optical analysis provided size and mean grey value for particles between 3 µm to 100 µm diameter. Assuming spherical shape and unit density, and approximating particle deposition velocity by Stokes's settling velocity, a particle concentration was calculated from measured deposition rate. Additionally, sulphate deposition was analysed by ion-chromatography.

Temporal analysis showed an obvious trend of collected particles, in particular for the black component and for sulphate. Both start on a high level in the years 1991 to 1993, continuously decreasing from then on till 1997 and at least remaining on the achieved level till 2006. This trend became particularly visible by the black particle fraction between 3 and 10 µm particle diameter. At first, it seemed to be obvious that the high particle level in the summer months 1991 to 93 and the subsequent decrease, could be attributed to two big volcano eruptions (Hekla, January 1991, and Pinatubo, June 1991). However, chemical analysis questioned this origin because of detected heavy

metals, such as Cu, Zn, Fe, Sb etc. These elements are of typical anthropogenic origin. The detected trend can be explained by the well documented drastic reduction of anthropogenic emissions in the former Eastern Bloc in the first half of the 1990's. Backward trajectories calculated with the NOAA hysplit model, additionally supported this assumption. Irrespective of involved sources, the results surprisingly demonstrate the suitability of this simple, cost-effective sampling technique for a monitoring of a particle input in remote areas resulting from a long-range transport. It is planned to continue the monitoring at five additional sampling sites around Greenland, in cooperation with the Danish Meteorological Institute (DMI). Single particle analysis will be focussed on bioaerosols and anthropogenic particles.

## Current state of *Poa annua* maritime Antarctic population

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Today, the one and only vascular plant that penetrated not only all the Sub-antarctic archipelagos (Frenot, 2005), but also the Maritime Antarctic (King George Island), is *Poa annua* (Poaceae), where the population was initially reported in 1985 (the plants were found in the hollows of metal grids in front of the entrances of the living quarters of the Henryk Arctowski Polish Station) (Olech, 2003). Some characteristics of the population's stability (age structure, number of specimens and individual viability of generative plants) are scarcely studied (Frenot, 1999, 2005).

We established 2 plots in the two most dense localities near the Polish Station during the 30<sup>th</sup> Polish and the 10<sup>th</sup> Ukrainian Antarctic expeditions. A plot area was 4 m<sup>2</sup>. The 1<sup>st</sup> one was situated on a steep slope (30°) of the northern exposure (1 m high artificial embankment), the distance to seashore appr. 154 m, the 2<sup>nd</sup> one near a puddle on the eastern slope of a path to a freshwater lake, the distance

to seashore about 133 m. Both seemed quite advantageous as snow accommodates on the slopes and prevents plants and seeds from winterkilling. There was also a moderate influx of organic fertilizers from guano of *Catharacta maccormiki* and *Larus dominicanus*, which is probably why the localities are the most dense. *P. annua* coexists with native species of Briophyta, algae and vascular plants: at the 1<sup>st</sup> plot total plant cover was 16% (*P. annua* – 10%; *Colobanthus quitensis* – 3%, *Deschampsia antarctica* – 3%), at the 2<sup>nd</sup> one – 41% (*P. annua* – 5%; *C. quitensis* – 1%; *D. antarctica* – 5%; Briophyta and algae – 30%). Notably, *P. annua* was higher at the 1st plot ( $8,9 \pm 0,31/1,97$  against  $4,2 \pm 0,19/0,72$ ), and the average number of flowers per inflorescence was greater at the 2<sup>nd</sup> one ( $6,9 \pm 0,34/2,26$  and  $9,6 \pm 0,49/4,78$ ); the width and length of leaves didn't differ significantly. Some specimens of the grass haven't entered the generative state during the season. Obviously, *P. annua* takes advantage of human alteration of environment here. We suggest that instead of its extermination it is more sensible to survey the development of compound Antarctic cenoses to determine whether the native ecosystem would be depressed by the invasive species.

### **Überarbeitete und erweiterte Datensätze der Eismächtigkeitsverteilung und des Untergrundreliefs in Dronning Maud Land, Antarktis**

Daniel Steinhage

AWI Bremerhaven

Seit dem Südsommer 1994/95 führt das Alfred-Wegener-Institut für Polar- und Meeresforschung in der Helmholtz-Gemeinschaft (AWI) Messflüge zur Bestimmung der Eismächtigkeit und der inneren Struktur des Eisschild in Dronning Maud Land, Antarktis, mit seinem Polarforschungsflugzeug POLAR 2, einer Dornier DO228-101, durch. Die POLAR 2 wurde für diese Messflüge mit einem speziell von der Technischen Universität Hamburg-Harburg nach Vorgaben des

AWI entwickelten Radarsystem ausgestattet. Die Apparatur mit einer Sendeleistung von 1,6 kW und einer Trägerfrequenz von 150 MHz und kann zwei Pulse von 60 ns und 600 ns aussenden und damit eine vertikale Auflösung von etwa 6 m, bzw. 50 m erreichen. Die horizontale Auflösung bei der üblichen Messfluggeschwindigkeit von 130 kn und einer Messrate von 20 Hz beträgt 3,35 m. Die aufgezeichneten Spuren sind nach einer Überarbeitung der Empfangselektronik sind zur Verbesserung des Signal-Rausch-Verhältnisses bereits 992fach gestapelt.

Die 1998 im Rahmen der EPICA-Vorerkundung erstellten Datensätze der Eismächtigkeitsverteilung und des Untergrundreliefs konnten durch weitere Messflüge verdichtet und mittels zahlreicher Messflüge, die für die Projekte SEAL und VISA durchgeführt wurden, ausgeweitet werden. Das Untersuchungsgebiet reicht nun vom Mündungsbereich des Bailey Ice Stream und Slessor Glacier in das Filcher-Schelfeis im Westen bis etwa 20° östlicher Länge, östlich der Schirmmacher Oase sowie von der Küsten bis zum Inlandeisplateau bei 79° - 80° südlicher Breite. Insgesamt wurden rund 200 Messflüge in 9 Südsommern durchgeführt und dabei mehr als 190000 Profilkilometer gemessen werden und dabei eine Fläche von mehr als 1100000 km<sup>2</sup> kartiert. Der Profilaabstand beträgt in der Regel 10 km, kann aber im Westen auf bis zu 40 km anwachsen.

### **POLAR 5 – ein neues Polarforschungsflugzeug**

Daniel Steinhage, Andreas Herber

AWI, Bremerhaven

Das Alfred-Wegener-Institut für Polar- und Meeresforschung in der Helmholtz-Gemeinschaft (AWI) unterhält seit 1983 zwei mit Skifahrwerk ausgerüstete Polarforschungsflugzeuge für die deutsche Wissenschaft. Nach dem im Januar 2005 eines davon, die POLAR 4, bei einer harten Landung irreparabel beschädigt wurde, konnte 2006 ein neues Flugzeug,

eine Basler BT-67, erworben und 2007 als POLAR 5 indienstgestellt werden.

Neben der seit über 20 Jahren genutzten POLAR 2, eine Dornier Do228-101, steht nun mit POLAR 5 ein größeres und ebenfalls ausgerüstet mit wissenschaftlicher Instrumentierung sowohl in der Kabine wie auch unter den Tragflächen, für Untersuchungen der Lithosphäre, der Atmosphäre, der Kryosphäre und ihrer Wechselwirkungen in der Arktis und Antarktis zur Verfügung. POLAR 5 wird auch für die Logistik zwischen den entlegenen Forschungsstationen in der Antarktis eingesetzt. Wie schon in der Vergangenheit bereits praktiziert, werden die beiden Forschungsflugzeuge mit Hilfe externer Partner betrieben.

Im Vergleich zu den Dornier Polarflugzeugen, besitzt die POLAR 5 mit 2500 kg über eine Distanz von 900 km über eine deutlich höhere Transportkapazität. Mit der Möglichkeit in Höhen über 3800 m mit Skifahrwerk zu starten, ist POLAR 5 in der Lage an jedem Punkt des antarktischen Eisschildes zu landen und zu starten. Auch die Reichweite im wissenschaftlichen Messbetrieb ist größer geworden. Da die deutlich größere Kabine und auch die stärkeren Generatoren der Basler BT-67 eine umfangreichere Instrumentierung zulassen und auch die Instrumentierung für die jeweilige Fragestellung angepasst wird, muss die Reichweite für die jeweilige Konfiguration separat ermittelt werden. Für die geophysikalische Instrumentierung mit Eisdickenradar, Magnetometern, Gravimeter, Laseraltimetern und GPS dürfte sich die Reichweite um ca. 500 km erhöhen.

Die erste wissenschaftliche Einsatz der POLAR 5 erfolgt im Südsommer 2007/08 in der Antarktis mit den beiden geophysikalisch/glaziologischen Missionen CryoVEx Ant und DoCo/VISA vom Flugfeld Novo nahe der russischen Überwinterungsstation Novolazarevskaya. Neben den wissenschaftlichen Einsätzen wird POLAR 5 für Transportflüge von Ausrüstung, Technikern und Wissenschaftlern im Rahmen des Dronning Maud Land Air Network (DROMLAN).

## **Antarctic Earth System Science during IPY: Exploring Linkages between Tectonic, Glaciologic and Biologic Processes in Central East Antarctica with Geophysical Methods**

Michael Studinger

Lamont-Doherty Earth Observatory of  
Columbia University, USA

Exploring the history of the East Antarctic ice sheet and lithospheric structure of the Gamburtsev Subglacial Mountains are primary goals of the International Polar Year (IPY). Scientists from several nations are currently working together to launch a flagship program to explore a major mountain range buried by a large continental ice sheet and bounded by numerous subglacial lakes.

In the last decade our picture of East Antarctica has been radically altered. The discovery of a complex pattern of ice flow, extending deep into the interior of East Antarctica, challenges the view that the Antarctic Plateau is a slow-moving, homogeneous region. More than 150 subglacial lakes are buried beneath several kilometers of ice ranging in size from Lake Ontario to Manhattan. Together these lakes form a subglacial hydrosphere that provides a unique habitat for microbial ecosystems. Acting as a lubricant the network of subglacial lakes and streams is a crucial component in the long-term stability and dynamic behavior of the overlying ice sheet. The flow of water between these lakes on timescales of several years indicates an active dynamic environment beneath that East Antarctic ice sheet. Identifying and quantifying the complex tectonic, glaciologic, and hydrologic processes that constitute the subglacial environment remains one of the biggest challenges during the International Polar Year and beyond.

The combined projects under the AGAP partnership are multi-national and multi-disciplinary and include aerogeophysics, traverse programs, passive seismic experiments and ice core and bedrock drilling. Currently, scientists from Germany, China, the United Kingdom, Australia, the United States and several

other nations contribute with active projects to AGAP. The combined AGAP geophysical surveys are targeted at understanding the tectonic origin of these enigmatic mountains to provide crucial new inputs into ice sheet and climate models and provide key site survey support for the ice and bedrock drilling efforts.

### **Moho topography of the West Antarctic Rift System from inversion of aerogravity data: ramifications for geothermal heat flux and ice streaming**

Michael Studinger

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Columbia University, USA

The West Antarctic rift system, a region of thinned continental crust, dominates the lithospheric structure of the Ross Embayment in West Antarctica. It has long been hypothesized that the lithospheric structure beneath the West Antarctic Ice Sheet is a major influence on the formation, nature and dynamics of the ice sheet. The structure of the crust-mantle boundary is a fundamental geophysical parameter for understanding lithospheric processes and for geodynamic interpretation. In this paper, we use aerogravity data to derive a map of the crust/mantle boundary beneath the West Antarctic Ice Sheet and to reveal the impact of relative changes in thickness of the crust and lithosphere on surface heat flow and ice streaming.

### **Isochrones, Raymond-bumps, watertable, and firn structure of the ice cap of King George Island**

Sonja Suckro<sup>1</sup>, Norbert Blindow<sup>1</sup>, Martin Rückamp<sup>1</sup>, Matthias Braun<sup>2</sup>, Albert Moll<sup>2</sup>, Manfred A. Lange<sup>3</sup>

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The internal structure of the ice cap of King George Island is revealed by GPR-measurements. These were undertaken by the Institute for Geophysics of the University of Muenster in early 2007 at center frequencies of 25 MHz and 150 MHz. The profiles are located around the center of the ice cap with a total length of more than 300 km.

Over the whole surveyed area a water saturated layer can be traced in an average depth of 33 m. This clearly indicates the high temperature of the ice cap of King George Island. The change of this layer's depth with altitude can be used to determine average accumulation rates and temperatures with altitude. Most profiles show reflections of internal layers, agreed to be isochrones. These are variable in amplitude and number, possibly originating from different volcanic eruptions. A comparison with dated volcanic events in the area of the Antarctic Peninsular can be used to determine accumulation rates as well. Another feature is the uparching of isochrones beneath the ice divide ("Raymond-bumps"). The apexes of the arches are shifted in different directions relative to today's divide, indicating the complex dynamics of the ice cap and the difficulty of probing an undisturbed stratigraphy.

The accumulation rates found in literature for King George Island vary significantly. In areas above 600 m a.s.l. rates of 2000 mm we/a as well as 590 mm we/a can be found. The evaluation of the depth to the watertable and to the volcanic isochrones indicates values around 600 mm we/a.

## **Polarforschung am Ende des 19. Jahrhunderts: die Forschungsreisen des Baron Eduard Toll**

Erki Tammiksaar

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Mit dem Namen Baron Eduard Toll (1858–1902) verbinden Polarforscher zuerst sein tragisches Ende während „Sarja“-Expedition (1900–02) nach der Suche des mythischen „Sannikov-Landes“. Sein Reisetagebuch, das seine Witwe 1909 unter dem Titel „Die Russische Polarfahrt der „Sarja“ 1900–1902“ in Reimers Verlag (Berlin) herausgegeben hatte, weckte großes Interesse und beeinflusste viele Forscher wie z.B. den Ethnologen Oskar Iden-Zeller oder die Geologen Paul Wittenburg und Vasili S. Krivenko. In Estland und auch in Russland wird Toll nach dem Antarktisentdecker Fabian Gottlieb von Bellingshausen oft als einer der bedeutendsten russischen Polarforscher angesehen. Erst 1959 wurde sein Tagebuch ins Russische übersetzt und seit kurzem liegt auch eine englischsprachige Übersetzung vor.

Mit Tolls Leben und seiner wissenschaftlichen Tätigkeit haben sich hauptsächlich Paul Wittenburg, Professor für Geologie der Universität Leningrad/St. Petersburg, und der Polarhistoriker William Barr aus Calgary (Kanada) beschäftigt. Obwohl Wittenburg sich in seiner Biographie (1960) sehr ausführlich mit Tolls geologischer Tätigkeit auseinandersetzte und Barr für den englischen Leser einen Überblick über Tolls Leben und Werk zeichnete, bleibt Tolls Persönlichkeit immer ein Rätsel. So liegt noch keine befriedigende wissenschaftliche Biographie über Toll vor.

Welches waren seine persönliche Eigenschaften und sein Charakter? Hatten diese Eigenschaften seine wissenschaftliche Tätigkeit und Entscheidungen während seiner drei Reisen in die Arktis (1885–86, 1893, 1900–02) beeinflusst? Spielten Tolls Charakterzüge eine Rolle bei seinem Verschwinden? Welche wissenschaftlichen Probleme außer der Geologie der Nordpolargebiete bewegten Toll? Wie weit hatten seine Forschungen

die russische Polarforschung beeinflusst? In welchen Beziehungen stand er zu seinen zeitgenössischen Polarforschern, wie z.B. Erich von Drygalski und Robert Falcon Scott, oder Fridtjof Nansen?

In meinem Vortrag möchte ich mich erstmals ausführlich mit der Bedeutung von Tolls Polarreisen und deren Einfluss auf die Entwicklung der russischen Polarforschung auseinandersetzen. Auf Grund verschiedener Archivquellen, die zerstreut in Deutschland, Estland und Russland aufbewahrt werden, wird auch mehr Licht auf das Innenleben von Toll geworfen und gezeigt, dass seine bisher wenig bekannt gewordenen Charakterzüge sein Schicksal entscheidend beeinflusst hatten.

## **Kontinentale Transform Störungen: ein plattentektonischer Vergleich**

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Der sogenannte Jordan-Graben ist eine langgestreckte schmale Depression, die vom Roten Meer abzweigt und sich über den Golf von Aqaba, das Tote Meer und das Jordantal bis hin zu den Zagrosketten des Irans erstreckt. Die Ähnlichkeit mit dem Oberrheingraben oder dem ostafrikanischen Rift ist besonders zwischen Libanon und Antilibanongebirge sehr ausgeprägt. Nach gründlicher plattentektonischer Analyse handelt es sich aber bei dieser Struktur um keinen Zerrungsgraben, sondern um die Spur einer sinistralen Blattverschiebung, an der die arabische Platte nach links (Norden) verschoben wird. Die Bewegungen der Platten in der Region und die resultierenden geologischen, geophysikalischen und geomorphologischen Ausprägungen sind gut untersucht. Deshalb kann das System hervorragend zum Vergleich mit ähnlichen, weniger gut bekannten, Großstrukturen der Erdkruste herangezogen werden. Die Bildung der Nares Straße, einer Meerenge zwischen Grönland und Kanada, ist gekoppelt an

eine ähnliche sinistrale Transform-Verschiebung, die Wegener Störung, die vor ca. 60 Millionen Jahren aktiv war. Diese Störung verband die tiefe Baffin Bay über den Küstenbereich von Ellesmere Island und die Lincoln See mit dem Arktischen Ozean. Wie die Jordan-Struktur verläuft ein Teil der Wegener Störung unter dem Meer, ein Teil aber auch an Land auf der kanadischen Seite. Großtektonische Strukturen sowie resultierende Erscheinungen wie z.B. Faltenstrukturen, Bruchbecken, Sedimentationsvorgänge, Vulkanismus, abflusslose Seen, Seismizität beider Strukturen werden miteinander verglichen.

### Das Projekt Coole Klassen

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Ein wichtiges Ziel des Internationalen Polarjahrs ist die Einbindung von Jugend und Öffentlichkeit und Wissenstransfer auf breiter Basis. In den Schulen werden die Polargebiete trotz ihrer Bedeutung für das globale Klimasystem zu wenig thematisiert. Schüler kennen teilweise elementare Unterschiede zwischen Arktis und Antarktis nicht, sie nehmen die Polargebiete normalerweise nur bedingt und nicht ihrer Bedeutung gemäß wahr. Deshalb sollen Lehrer als Mittler in wissenschaftliche Programme integriert werden und Methoden, Erfahrungen und Begeisterung an ihre Schüler weitergeben. Im Projekt „Coole Klassen“ haben sich bisher 130 Lehrer zu diesem Zweck in Deutschland selbst organisiert. Die gezielte Auswahl der Teilnehmer erfolgt nach einem Standardverfahren. Neben der Verbindung Geowissenschaften/Geographie sind auch die Kombinationen Ozeanographie/Physik-Chemie, Meteorologie/Physik sowie Biowissenschaften/Biologie geplant. Die Schnittstelle zur Wissenschaft liegt organisatorisch bei der deutschen IPY Kommission, die hilft, Plätze auf deutschen wissenschaftlichen Projekten bereit zu stellen.

Die ersten integrierten Lehrerprojekte in der Arktis und der Antarktis sind inzwischen erfolgreich durchgeführt worden. In den folgenden Beiträgen werden Teilnehmer an polaren wissenschaftlichen Expeditionen über ihre Erfahrungen berichten.

In der Folgezeit wollen die „Coole Klassen“-Lehrer verstärkt über Ideen und Projekte diskutieren, wie die Erfahrungen am besten an die Schüler weitergegeben werden können. Langfristiges Ziel des Projekts ist es, durch die Ausarbeitung von Arbeitsmaterialien, Schulbuchinhalten und Themenheften sowie durch die Beeinflussung der Curricula und Lehrpläne eine nachhaltige Wirkung in der deutschen Bildungslandschaft zu hinterlassen.

Die Aktivitäten im Rahmen von „Coole Klassen“ werden durch die Robert-Bosch-Stiftung, das Alfred-Wegener-Institut für Polar- und Meeresforschung und die Deutsche Gesellschaft für Polarforschung unterstützt. Die gleichzeitig durch das European Polar Board geplanten europäischen Lehrerprojekte im IPY stagnieren derzeit.

### Subglacial Lakes in Antarctica: Numerical modelling of flow regime and accreted basal ice

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Antarctic subglacial lakes are isolated from direct exchange with the atmosphere by several kilometers of ice for millions of years. They provide unique environments for potential life forms. The inaccessibility of these lakes raises the importance of numerical models to investigate their physical conditions. Hydrodynamical considerations reveal that the high pressure within the lake leads to convective flow, if the ice thickness above the lake exceeds about 1500 m. Using a three dimensional numerical model and the best available geometry, we analyse the flow regime and the basal mass



balance within two Antarctic subglacial lakes, Lake Vostok in East Antarctica and Lake Concordia in West Antarctica. Both lakes are target of near future probing, which demands a good knowledge of potential in situ conditions. Both lakes show a permanent mass gain from melting ice. Together with observed ice velocities we are able to calculate the thickness of accreted ice at the ice-lake boundaries which can be measured by, e.g., ground penetrating radar and yields validation of the modelling results.

### **Initiation of Magmatism within the Ferrar Large Igneous Province, southern North Victoria Land, Antarctica**

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Field data gathered during GANOVEX IX (2005/2006) in southern North Victoria Land, Antarctica, indicate that volcanoclastic deposits of phreatomagmatic eruptions (so-called Exposure Hill Type events) are intercalated with fluvial deposits of Upper Triassic to Lower Jurassic biostratigraphic age at two levels. Breccia-filled diatremes, from which volcanoclastic deposits were sourced, are rooted in sills which intruded wet sediments. Scoriaceous spatter (locally welded) indicates a hawaiian/strombolian component. The deposits are thus subaerial expressions of the initial Ferrar magmatism starting as intrusions of multiple shallow-level (< 300 m below surface) sills. All igneous components in the volcanoclastic deposits are andesitic in composition, as also are the chilled margins of the sills. They are more differentiated than the basaltic andesites of the effusive section of Kirkpatrick plateau lavas. As the latter is equivalent in composition to the sills in Tasmania and northern North Victoria Land we assume a northward propagation of magma emplacement within the Ferrar Large Igneous Province.

The effusive section of the Ferrar magmatism started in southern North Victoria Land with pillow lavas and lava

flows from "normal-sized" volcanic necks known from small volume intraplate volcanic fields. On the contrary, the eruptive sources of the following massive plateau-forming phase of the Kirkpatrick lavas may have been of more elongated character, only one of which may have been identified as huge dike-like structure. However, aeromagnetic data indicate that the Mesa Range could be underlain by a N-S trending dike with a length of at least 60 km.

### **Fourier transform infrared spectroscopy (FTIRS), a fast and cost effective tool for quantitative and semi-quantitative analysis of biogeochemical properties in sediments from Lake El'gygytyn, NE Siberia**

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Measurements of Fourier transform infrared spectroscopy (FTIRS) in the mid-infrared (MIR) region were conducted on sedimentary records from Lake El'gygytyn (cores PG1351, Lz1024), NE Siberia. The MIR region is sensitive to organogenic as well as minerogenic sediment components and thus spectral variation in this particular region can be used to identify important changes in sediment composition. To obtain direct information on variations in sediment composition, using complex FTIR-spectral data, principal component analysis (PCA) is applied.

PCA not only gives a simplified impression on important variations in sediment composition it also sheds light on the specific spectral region affected by these variations and thus on varying concentrations of certain minerogenic and organogenic constituents. For example, the region around 1100 cm<sup>-1</sup> shows strong variations in sediment cores PG1351 and

Lz1024 connected to varying opal concentrations.

This spectral variation in turn seems to be strongly correlated to other marine and terrestrial climate records during the past 340 ka. For simultaneous, quantitative analysis of numerous biogeochemical properties using FTIR spectral information, calibration models relating biogeochemical property concentrations and FTIR spectra are established using partial least squares regression (PLSR).

These calibration models enable quantitative analysis of multiple biogeochemical properties in extant sediment cores from the same lake basin and/or high-resolution analysis of important time segments using FTIR spectral information. Calibration models relating FTIR spectral information to biogeochemical property concentrations showed good statistical performance for total organic carbon (TOC), total nitrogen (TN), and biogenic silica (opal) in the sediment records from Lake El'gygytyn.

The results, in combination with the small amount of sample material needed, negligible sample pre-treatments, and low costs of analysis, demonstrate that FTIRS is a promising, cost-effective tool for high-resolution paleolimnological studies.

### **Methane Generation in Holocene Permafrost Deposits of the Lena Delta, and its implication for the Global Methane Budget**

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Permafrost environments within the Siberian Arctic are natural sources of the climate relevant trace gas methane. In order to improve our understanding of the present and future carbon dynamics in high latitudes, we studied the methane concentration, the quantity and quality of organic matter, and the activity and biomass of the methanogenic community in permafrost deposits.

For these investigations a permafrost core of Holocene age was drilled in the Lena Delta (72°22' N, 126°28' E). The organic carbon of the permafrost sediments varied between 0.6% and 4.9% and was characterized by an increasing humification index with permafrost depth.

A high CH<sub>4</sub> concentration was found in the upper 4 m of the deposits, which correlates well with the methanogenic activity and archaeal biomass (expressed as PLEL concentration). Even the incubation of core material at -3 and -6°C with and without substrates showed a significant CH<sub>4</sub> production (range: 0.04 – 0.78 nmol CH<sub>4</sub> h<sup>-1</sup> g<sup>-1</sup>).

The results indicated that the methane in Holocene permafrost deposits of the Lena Delta originated from modern methanogenesis by cold-adapted methanogenic archaea. Microbial generated methane in permafrost sediments is so far an underestimated factor for the future climate development.

### **High resolution structural and elemental analyses of sediments of Lake El'gygytyn, NE Siberia**

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Lake El'gygytyn, a 3.6 Ma old crater lake in NE Siberia, most likely comprises a continuous and undisturbed sediment record since the Pliocene. In previous works, classical X-ray Fluorescence Analysis (XRF) as a highly accurate method of inorganic geochemistry was used to investigate the element content of Lake El'gygytyn sediments. The inorganic geochemistry of its sediments was shown to well reflect variations in sedimentation, weathering, lake hydrology and bioproductivity, mostly triggered by millennia scale climate changes (Minyuk et al., 2007).

However, the high material and time consumption of classical XRF avoid this method of analyzing geochemical

variations on a decadal to centennial scale. High resolution structural and element analyses of several Lake El'gygytyn core sequences, covering at least the last 300 ka, were conducted using an ITRAX XRF core scanner (Cox Analytical Systems, Sweden). The ITRAX is an automated multi-functional core-scanning system to perform non-destructive optical, radiographic and elemental analyses of up to 1.8m-long sediment cores. The use of a 0.2 x 20 mm flat and intense micro-X-ray beam in combination with a 3kW X-ray generator enable the system to perform semi-quantitative XRF analyses of elements from Al to U with a spatial resolution down to 200  $\mu\text{m}$  (Croudace et al., 2006). Detection limits of the ITRAX range between 2.2% for Al and 5ppm for heavier elements like Sr or Rb. Furthermore, the use of the flat X-ray beam provide the possibility of very high resolution X-radiography of half cores with a minimal resolution of 20 $\mu\text{m}$ . The radiographic images of the El'gygytyn sequences show significant variations, caused by major and minor sediment structures, like redox layers, tephra beds, turbidites or clay clasts. Most of these structures, visible in the radiographic images, coincide with major changes in the element composition of the scanned core sections. Furthermore, even within finely laminated horizons, typical for cold climatic conditions, distinct variations in several elements, e.g. Ti, could be observed.

The comparison of the ITRAX data with the results of element analyses by classical XRF demonstrates the enhanced resolution of the scanner analyses and the high information gain.

### **Warming up of the European Arctic – more biodiversity, less wildlife**

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The food and foraging strategy of seabirds and sea mammals from two high Arctic

fjords (Svalbard archipelago) were analysed. One of the fjords, Kongsfjord, is strongly influenced by warm waters from the Atlantic, while Hornsund is of a more Arctic character. Prey species in the Atlantic waters were more diverse (82 species) compared to those of Arctic waters (67 prey species). The consumption of top predators from Hornsund in the peak season of July was estimated at  $2.86 \cdot 10^6$  Mega Joules, while that in Kongsfjord was  $1.35 \cdot 10^6$  MJ. For the analysed function of the ecosystem (the transfer of energy to the top trophic levels), the specific character of prey species is of key importance and not the diversity, abundance or biomass *per se*. Lower species diversity and biomass in Arctic waters is compensated for by the occurrence of larger individuals of these species, which permits top predators to prey directly on lower trophic levels. Thus, the increasing inflow of Atlantic waters brings more biodiversity to European Arctic, and consequently, the more complicated food web dissipates more energy, and leads to the difficulty in large animals predation on diverse, but small prey.

### **Systemsteuernde Prozesse in der Laptev-See: Atmosphäre und Meereis**

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Die zirkumpolaren Polynjen der Arktis spielen bei den prognostizierten tiefgreifenden Umweltveränderungen in den sibirischen Schelfmeeren eine besondere Rolle. Vor diesem Hintergrund sollen ozeanische Fronten und Polynjensysteme in der Laptev-See im Rahmen des BMBF-geförderten Verbundprojektes "Eurasische Schelfmeere im Umbruch" (2007-2010) untersucht werden.

In einem Teilprojekt dieses Gesamtvorhabens untersucht das Fach Umweltmeteorologie and der Universität Trier die Änderungen der systemsteuernden Prozesse in dieser Region. Ein grundlegendes Ziel ist dabei die

Verbesserung des Verständnisses und die Quantifizierung des Einflusses der Laptev-See Polynja auf Prozesse des Atmosphäre-Ozean-Meereis-Systems. Dabei werden mit Hilfe von SSM/I, MODIS und SeaWiFS-Satellitendaten die Langzeitvariabilität der Polynjaaktivität und Phytoplanktonproduktion in den Polynjagebieten untersucht. Die Meereisverteilung aus den Satellitendaten dient zur Validierung der beim AWI vorhandenen Simulationen mit einem Eis-Ozean-Modell. Die Untersuchung der Atmosphäre-Meereis-Kopplung erfolgt mit einem hochauflösenden dreidimensionalen Modell. Dabei wird eine an die Arktis angepasste Version des COSMO-Modells des Deutschen Wetterdienstes mit dem Meereis-Ozeanmodell FESOM des AWI gekoppelt. Der Schwerpunkt liegt auf der Simulation von Polynjaprozessen und der Bestimmung des Einflusses der Polynjen auf die atmosphärischen Kreisläufe von Energie und Wasser in der Region der Laptev-See. Die Ergebnisse des Teilprojektes sind relevant für Fragestellungen der Entwicklung des arktischen Klimasystems unter dem Einfluss der globalen Klimaänderung.

### **ANDEEP-SYSTCO: Trophodynamics of Southern Ocean benthic isopods: an approach to abyssal ecology**

Laura Würzberg, Angelika Brandt

University of Hamburg, Biocentrum Grindel and Zoological Museum

The deep sea is the biggest environment on earth, but despite this fact, its ecology is still poorly understood. The ANDEEP-expeditions provided first insights into biodiversity and biogeography of the Southern Ocean abyssal fauna. Distribution and abundance patterns of isopod species as well as biomass and production estimates allow first assumptions about trophic interactions in this ecosystem. Isopoda is one of the most important macrobenthic taxa what makes them a good model group. Specific isopod

species or functional groups adopt a key position in the benthic system. Different feeding strategies and niche partitioning might be the clue in explaining the high biodiversity of the SO deep-sea isopod fauna. Morphological investigations as well as gut content analyses help to find potential explanations for this high diversity, the pattern of rare and abundant species and the degree of endemism. Additional material will be collected during the Polarstern cruise ANT XXIV/2 (November 28<sup>th</sup>, 2007 to February 4<sup>th</sup>, 2008) in the frame of the IPY Core-Project SYSTCO (SYSTEM Coupling in the Southern Ocean). These samples will be used for biochemical analyses to round of the obtained data on deep-sea isopod ecology. Ample methods will be applied:

- (1) biomass and production estimates,
- (2) stomach content analyses (light and SEM microscopy),
- (3) functional morphology of gut and mouthparts,
- (4) biochemical analyses (fatty acids, stable isotopes, RNA:DNA ratios).

# **POSTERKURZFASSUNGEN**

- alphabetisch nach Name des/der Erstautors/in sortiert -

**Timing of a major transgression:  
From a terrestrial environment to a  
shallow marine carbonate platform  
(Upper Carboniferous, Malte  
Brunfjellet Formation, central  
Spitsbergen)**

Karin Behrend<sup>1</sup>, Christian Scheibner<sup>1</sup>,  
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In the late Carboniferous to early Permian, the mixed siliciclastic-calcareous sediments of the Gipsdalen Group (Serpukhovian-Artinskian) comprise terrestrial red beds, which laterally and vertically grade into warm-water, shallow-marine carbonates (carbonate platform of the Wordiekammen Formation, see also poster of Scheibner et al.) and marginal-marine evaporites (sabkha sequences of the Gipshuken Formation).

This poster is the result of a Bachelor thesis and is embedded in the larger study of Sedimentary and Climatic evolution of the Arctic during the Late Palaeozoic (SCALP, see also Blomeier et al., Forke et al. and Scheibner et al.). It displays the environmental changes during a major transgression during the Bashkirian to Moscovian. On Spitsbergen, this time period is represented by the Malte Brunfjellet Formation, which forms the lowermost part of the Gipsdalen Group.

The interpretation of large-scale sedimentary structures combined with microfacies studies of a vertical section revealed the following results: While the lower part of the Malte Brunfjellet Formation is mainly composed of interbedded red shales to sandstones, the upper part is composed of an alternating terrestrial sequence of Caliche and siliciclastic deposits (sandstones and breccia) with marine intervals. The siliciclastic deposits were probably deposited within a fluvial system and the principal components are quartz, feldspar and mica, a mixture indicating a granitic origin. The Caliche intervals are characterised by pisoids, laminated crusts and *Microcodium*. The marine intervals occur at the base and at the top of the

upper part of the formation. The transition to the overlying shallow-marine water deposits of the Wordiekammen Formation is gradual, indicating a continuous transgression. As biostratigraphic investigation in the Malte Brunfjellet Formation has been scarce until now, it has been tentatively assigned to the Moscovian. Microfacies analysis and biostratigraphy of small benthic foraminifers in the marine interval at the base of the upper part of the formation revealed that this interval can be assigned possibly to the Bashkirian.

**The Late Palaeozoic, marine shelf  
strata of east and central  
Spitsbergen: Warm-water platform  
versus cool-water ramp deposits**

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During the Late Palaeozoic the depositional area of the nowadays Arctic archipelago of Svalbard (Spitsbergen) was located at the northern margin of the super-continent Pangaea, drifting from around 25<sup>th</sup> to 35<sup>th</sup> northern latitude. The landscape was marked by a terrestrial, rugged host-and-trough-topography, which was repeatedly transgressed and gradually developed into a stable marine shelf.

In central and eastern Spitsbergen the Late Palaeozoic sedimentary strata consist of basal terrestrial red beds, which laterally and vertically grade into warm-water, shallow-marine carbonate platform (Ny Friesland Platform of the Wordiekammen Formation) and evaporitic basin deposits. These in turn are overlain by marine sediments of the Kapp Starostin Formation, representing a mixed siliciclastic/carbonate ramp.

The cyclic Ny Friesland platform strata predominantly comprise fossiliferous carbonates (limestones, dolostones), showing highly diverse biotic associations consisting of rugose and tabulate corals, various calcareous algae, bryozoans and

a variety of foraminifers (photozoan biotic associations).

The sediments represent a low-energy, warm-water carbonate platform, comprising shallow, open-marine, muddy to sandy flats to more restricted, peritidal, wave- and tide-agitated nearshore sandy shoals, lagoons or tidal flats.

The strata are arranged into stacked parasequences (shallowing-upwards cycles) of up to some meters thickness, separated by subaerial exposure surfaces, which show that the platform was subaerially emerged at the top of each individual cycle, when a low-relief sabkha prevailed.

In contrary, the strata of the overlaying cool-water ramp mainly consist of claystones, cherts, partly silicified carbonates and glauconitic sandstones to siltstones, which also show a cyclic appearance due to sea-level fluctuations.

The marine biota is represented mainly by brachiopods, bryozoans, siliceous sponges and varied trace fossil associations (heterozoan biotic associations), indicating a palaeo-waterdepth related occurrence.

The strata also reflect an open-marine, low-relief shelf, but which was continually submerged, thus representing a complete sedimentary record without any hiatus.

During sea-level highstands, quiet-water conditions prevailed and the sea floor was populated by siliceous sponges and filigree bryozoans. During sea-level lowstands, the sea bed was characterised by sand shoals and shell banks (coquinas and lumachelles) mainly from brachiopods, which were permanently reworked due to wave action.

### Oxygen isotope micro analysis of diatom silica from El'gygytyn Crater Lake, NE Russia

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The analysis of oxygen isotopes from diatom silica in sediment cores has reached importance for reconstructing the paleoclimate and is especially valuable in non-carbonate lakes of cold regions, where no other bioindicators are present. A new approach for samples in sub-mg range has been developed to provide a better chronological resolution and to expand the method to periods where less biogenic silica is available.

Sample material from Lake El'gygytyn will be analysed and a  $\delta^{18}\text{O}$  curve of the last 280.000 years will be generated to add a strong climate proxy to the various analysis performed so far. The Lake lies inside a meteorite impact crater of about 18 km in diameter which was formed approximately 3.6 million years ago. 50 streams are draining into this cold, oligotrophic lake from within the crater rim whereas only one outlet stream is present. As the sediment record is undisturbed and well-stratified the lake offers a unique option to fill the spatial gap of locations in the Arctic where paleoclimate reconstructions are rare. Former drilling operations show that the lake could contain the longest, most continuous terrestrial record of past climate change in the entire Arctic back to the time of impact (Brigham-Grette, 2006). The analysis aims on the planktonic *Cyclotella ocellata*-complex which is persistent through a variety of climate conditions and present throughout the core (Cherapanova, 2006). Another goal is to examine a possible species-dependent fractionation by comparing the mentioned complex with *Pliocaenicus costatus* var. *Sibiricus* in the holocene. After extracting the diatoms from sediment cores with various preparation steps a minimum of ~700µg fine material from 5 g

of wet sample is required. A bead is melted and reacted with a CO<sub>2</sub> laser under BrF<sub>5</sub> atmosphere. The oxygen is then transferred to the mass spectrometer and compared with a reference standard of known isotopic composition. Specially designed software and a video camera are used to survey and record the process in the reaction chamber and allow an automatised, remote operation. Tests on standard material (NBS 28, Campolungo) showed a standard deviation <0.2‰.

First results will be presented at the meeting. The expected results will be the base for studying the climate history using stable isotopes in lacustrine diatoms of the whole 300 m sedimentary sequence on sediment cores at Lake El'gygytgyn to be drilled within the frame of the ICDP in 2009.

### **Simulating the Antarctic Ice Sheet with a coupled Atmosphere-Ice Sheet model approach**

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The Antarctic ice sheet exerts one of the major controls on the climate of the Southern hemisphere. It is therefore of large interest because changes in its elevation and extension have an important role in global atmospheric and oceanographic fluctuations which contribute to world-wide sea level.

The formation of the Antarctic ice sheet is here investigated using a 3-dimensional dynamically ice sheet model. The model incorporates grounded ice dynamics, basal sliding and isostatic bed adjustment and it has a full coupling between thermal field and ice flow. The geometry of the ice sheet is generated in response to environmental conditions. The model is first run with accumulation rate and surface temperature given by parameterization. The modelled total elevation is then used as orographic setting to run an atmospheric GCM (ECHAM5) under present day boundary conditions.

The resulting accumulation rate and temperature are used to drive the ice sheet model again. This iterative repetition of the procedure reaches a quasi steady state to get the representation of Antarctica's present day conditions. Ice dynamics, mass balance and the ice sheet shape are assessed. Such like dynamic coupling of the atmosphere and ice sheet models yields a better understanding of the development of the Antarctic ice sheet with changing boundary conditions (e.g. climate warming) or for different climate states (e.g. Eocene – Oligocene transition).

### **"Nebel, Licht & Eis" - Schülerprojekt zum IPY 2007/2008**

Maria Dewey

Geschwister-Scholl-Gymnasium Löbau

Inhalt des Posters soll das dem IPY als Schülerprojekt gewidmete Buch "Nebel, Licht & Eis" sein. Das Buch umfasst 223 Seiten sowie 461 Fotografien und Grafiken und entstand auf der Grundlage mehrerer Reisen in die Arktis und Antarktis, aktuell nach einer Grönland- und Kanadareise im Sommer 2006.

Die Begebenheiten dieser Fahrt, ergänzt durch eine Vielzahl notwendiger Informationen, sind im ersten Teil des Buches zusammengefasst. Historische Hintergründe, lokale und politische Besonderheiten, die Sonderstellung Grönlands bezüglich der Jagd indigener Tierarten stehen dabei ebenso im Mittelpunkt wie die Kultur der Eskimo, deren Eigenheiten und Rechte. Im Anhang komplettieren Wettermessungen, Kartographie arktischer Vögel und Pflanzenlistungen den Bericht.

Der zweite Teil des Buches ist dem Klimawandel gewidmet. Hierbei wird v.a. die Rolle der Polargebiete auf gegenwärtige und zukünftige Wetter- und Klimageschehen unseres Planeten dargestellt und interpretiert. Der Bericht umfasst Erläuterungen zu vergangenem Klima, Klimaindikatoren (Treibhauseffekt, Ozonloch, Aerosole, Albedo), globale Ausmaße des Klimawandels und dessen mögliche oder bereits vorhandene Folgen



(Gletscher-, Meereis-, Permafrostbodenschmelze, Meeresspiegelerhöhungen, Meeresströmungen, El Niño, Dürren, Überschwemmungen, tropische Wirbelstürme, Jahreszeitenverschiebungen, Biologie, Versauerung der Meere, Krankheiten, Armut und Gewalt).

Es schließen sich Informationen zu aktuellen Forschungsarbeiten (Sequestrierung, Bohrkerne), zum zukünftigen Klima sowie zu notwendigen Maßnahmen gegen den Klimawandel (Industrie und Wirtschaft, Politik, alternative Energien) an. Das Buch ist durch zahlreiche eigene Fotografien illustriert. Neben gewonnenen Erfahrungen fanden Recherchen v.a. aktueller Fachliteratur, im Internet und der Austausch mit Experten auf den jeweiligen Gebieten Eingang in das Buch.

Ziel soll die Aufklärung des Lesers zu Fragen des Klimawandels sein, seine Motivation wecken, Maßnahmen gegen die Folgen der globalen Veränderung zu ergreifen und zu unterstützen. „Nebel, Licht & Eis“ dient als Besondere Lernleistung für das Abitur der Autorin 2008, keinen kommerziellen Zwecken und ist nicht veröffentlicht.

### **International Polar Year 2007/08 – A Unique Opportunity for Science Communication**

Susanne Diederich, Margarete Pauls

AWI Bremerhaven

Everyone is talking about climate change. However, how many people know about the science necessary to develop likely scenarios? And will the interest in science decrease once the media is fed up with climate themes? If we want people to stay interested and informed we need to present science as a fascinating topic that is important and comprehensible for everyone.

The International Polar Year (IPY) with thousands of scientists from more than 60 countries investigating the Polar Regions is a unique opportunity to communicate science to different audiences. We want stakeholders to spend more money on research projects, we would like young people to pursue careers in science and

we want the general public to be informed and responsible. IPY will give us the opportunity to share our experiences worldwide and to develop communication means that will work across national borders. The international IPY website as well as the Polar Days are only two examples for international PR in context with IPY.

Most information is transferred via media, such as T.V., radio, newspapers and magazines. Websites, press releases, press conferences and seminars are the way to make cutting edge research available to editors. However, not all audiences respond to science articles. Involving artists is a different way to show the beauty of snow and ice and to raise awareness. Touring photo and painting exhibitions are examples for this type of communication. To address the youth, we involve teachers in IPY. "Coole Klassen" is a program that integrates teachers in research projects. By involving teachers in expeditions we want to motivate and inform them so that they will be able to bring their fascination and knowledge to their classrooms. Several local evening schools, museums, institutions and societies are currently presenting talks, events and exhibitions on polar and/or climate science. It is our responsibility as scientists, universities and research institutes not only to share our knowledge and to provide information for all those interested in IPY, but also to actively promote current research topics. Bringing all the different players – scientists, communication experts, media, artists, museums and teachers – together, is one of the main goals and an important legacy of IPY outreach efforts.

### DNA polymorphism in penguin *pygoscelis papua* populations

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*Pygoscelis papua* - Gentoo - is one of the species-indicator for the evaluation of the impact of global environmental changes in the Antarctic ecosystem. Genetic diversity of Gentoo penguin populations and telomere length as bioindicator in investigation of Gentoo populations in relation to Antarctica environmental state have been analyzed in the present paper. RAPD-analysis revealed the levels of polymorphism in Gentoo at Petermann Island (from 23.5 to 42.9%) and from Livingston Island (from 52.9 to 57.1%). The high level of relationship between two Gentoo populations with a lack of significant genetic differentiation between them ( $F_{st} = 0.069$ ) was demonstrated, despite substantial levels of genetic variation. We could confirm that these two populations belong to the same subspecies (*Pygoscelis papua ellsworthi*). Sex identification of Gentoo penguins by PCR technique with specific primers has been carried out. Female/male indexes (proportion of female) were estimated: 0.336 for population of Petermann Island and 0.398 for Livingston Island. Interestingly, Fisher's hypothesis was not satisfied (we found significant deviation from a predicted binomial distribution ( $\chi^2=4.1$ ,  $df=1$ ,  $p=0.04$  ( $p < 0.05$ )) and perhaps the determined sex ratio was under Trivers and Willard's and Charnov's models.

AM12 and RM6 microsatellite loci in populations of Gentoo penguins were absolutely monomorphic with only one allele in both populations. RM3 demonstrated two alleles presented in this locus – 221 b.p. and the new allele - 217 b.p., which has not been described for RM3 to date. We also could confirm that these two populations belong to the same

subspecies (*Pygoscelis papua ellsworthi*),  $F_{st} < 0.04$ .

The average observed telomere length of Gentoo penguins was  $5950 \pm 1537$  b.p. for adult specimens and  $8100 \pm 949.1$  b.p. for chicks ( $p < 0.0001$ ). The maximum telomere length for adult specimens was 8000 b.p., the minimum – 3100 b.p. The maximum telomere length of Gentoo chicks was approximately 9000 b.p., the minimum – 6200 b.p. Thus we can draw a conclusion that the telomere length of 9000 b.p. is the maximum for the specimens of this species (in Adelie penguins the maximum observed telomere length was 9500 bp.). Accordingly to obtain results, telomere length ("population age") could be used as appropriate bioindicators in research of Gentoo populations in relation to Antarctica environmental state in monitoring programs of Antarctica ecosystems.

### Das Nationale Polarprobenarchiv – ein Beitrag der BGR zum Internationalen Polarjahr

Solveig Estrada

Bundesanstalt für Geowissenschaften und  
Rohstoffe (BGR), Hannover

Auf Bitte des Landesausschusses SCAR wird an der BGR ein Nationales Polarprobenarchiv eingerichtet, in dem Gesteinsproben von universitären geowissenschaftlichen Antarktis-Projekten langfristig untergebracht werden können. Durch Ruhestand der beteiligten Professoren und/oder Umstrukturierung der Universitäten können diese Proben dort nicht ständig aufbewahrt werden. Das bei teuren Antarktis-Expeditionen gewonnene Material muss jedoch für weitere wissenschaftliche Verwendung erhalten bleiben. Die Idee für ein zentrales Probenarchiv entstand beim Treffen des Arbeitskreises "Geologie der Polargebiete" der DGP 2004 in Hannover auf eine Anregung von Gerhard Spaeth (Aachen). Der Standort des Probenarchivs ist vorerst im Dienstbereich Berlin-Spandau, Wilhelmstr. 25-30, wo ein 65 m<sup>2</sup> großer, mit 35 Sammlungsschränken bestückter Lagerraum eingerichtet wurde.

Die Antarktis-Gesteinsprobensammlungen der Uni Aachen (Sammlung Spaeth und Bauer) mit ca. 1300 Proben und der Uni Frankfurt (Sammlung Kleinschmidt einschließlich Doktoranden) mit über 3000 Proben wurden bereits an die BGR übergeben. Die Proben, die aus verschiedenen Gebieten der Antarktis stammen (Viktorialand, Dronning-Maud-Land, Shackleton Range, Marie-Byrd-Land), sind in einer Access-Datenbank erfasst und in Aufschlusskarten dokumentiert. In Zukunft soll auch eine Recherche über das Internet ermöglicht werden.

Damit wird der deutschen terrestrischen Polarforschung ein zentraler Fundus zur Verfügung stehen, auf den für weitere universitäre Projekte zugegriffen werden kann.

### **Notes from a small island in the western Canadian Arctic – a joint approach using sedimentary and stable isotope records gives insights into postglacial permafrost history**

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Herschel Island – about 70 km east of the Yukon-Alaska border – occurs as the only major elevation on the Yukon Coastal Plain facing the Southern Beaufort Sea and represents the likely westernmost edge of Wisconsin Glaciation in northwestern Canada. Being accumulated as a terminal moraine during the Early to Middle Wisconsin the island has been intensively affected by periglacial processes for at least the last 50 ka BP.

Multi-proxy analyses on sediments and stable isotope analyses on ground ice samples have been performed to unravel postglacial processes towards sedimentary history, permafrost aggradation and

degradation through time as well as to link these processes to distinct periods of climate change.

Sediments generally consist of clayey diamicton and sandy silts with varying amounts of pebbles, cobbles and organic remains. However, stratigraphic appraisals are difficult due to the deformed nature of Herschel Island sediments by glacial ice thrusting, subsequent cryoturbation and recent mass wasting. Nevertheless, radiocarbon dated peat suggests that until 8.4 ka BP bioproductivity was inhibited due to continuous harsh climate conditions. During the following Holocene Thermal Maximum (HTM) thaw lakes developed and a rapid accumulation of peat followed on degrading polygonal ground. An extensive active layer thickening is recorded by a widespread thaw unconformity along the island's coast at depths between 1.2 to 2 m below surface. Different types of ground ice recovered range widely regarding their isotopic composition, thus reflecting different types of water and strongly variable climatic conditions during ground ice development. Two presumably Holocene ice wedges lie immediately below the recent active layer. Their oxygen isotopic signature varies between -20 to -24 ‰ VSMOW, which generally agrees with the supposition that recent temperatures are supposed to produce  $\delta^{18}\text{O}$  values of about -20‰ in the study area. In contrast, a relict wedge truncated at 1.5 m below surface revealed oxygen isotopic values ranging from -27 to -30‰. This leads to the assumption that Herschel Island comprises ice wedges that formed likely prior to the Holocene Thermal Maximum (HTM) and afterwards. The isotopic composition of intrasedimental ice recovered from sediment profiles vary between -17 to -27 ‰ and mostly decrease with depth, indicating that ground ice in different depths preserves paleo-temperatures during the aggradation of permafrost sequences.

**Murmansk – Dudinka – Norilsk -  
Novy Port - Tiksi/Samoilov:  
Individualreisen im Norden der  
Russischen Föderation und die  
mögliche Einbindung in den  
Unterricht**

Hans-Martin Garche

Auhagen

Die Murmansk Shipping Company, deren Frachtschiffe u.a. im Containerverkehr Murmansk – Dudinka (Nickelerze, Metalle) eingesetzt werden ermöglichte im August 2001 die mehrtägige Mitfahrt auf dieser Route. Südlich der Insel Novaja Zemlya tauchte am Horizont Eisblink auf; nachfolgend immer dichteres Treibeis und schließlich Packeis. Der Einsatz eines atomgetriebenen Eisbrechers machte die Passage eines Frachtschiffkonvois möglich. Karasee und Mündung des Jenissei waren eisfrei. Dudinka ist wie das 80 km östlich gelegene Norilsk seit Herbst 2001 eine gesperrte Stadt und nur mit einer Sondergenehmigung zu besuchen. Zwischen Dudinka und Norilsk besteht Güterschienenverkehr (Nickel-Erztransport). Die Norilsk-Region ist durch Linienbusse erschlossen. Individuelle Erkundungen der umfangreichen Nickel-Halden (aufgelassene Betriebsgelände) waren im August 2001 noch möglich. Das Ausmaß der Emissionsschäden lässt sich nahezu überall ermessen (abgestorbene Vegetation, Emissionsfahnen mit stechenden Gerüchen). Seit 1993 bildet das vormalige Norilsker Nickelkombinat einen Kernbestandteil des Konzerns MMC Norilsk Nickel, der etwa 80% aller Arbeitnehmer in der Region beschäftigt.

Das im Sommer 2000 besuchte Novy Port ist auf der Halbinsel Jamal (Erdgasressourcen, Permafrost, Tundravegetation, Lebensraum der Nenzen/Rentiernomaden) gelegen. Der mehrtägige Aufenthalt bei einer russischen Familie gab Einblicke in den Alltag im Leben der Einwohner. Die Siedlung ist im Sommer mit Schiffen und Helikoptern und im Winter mit Flugzeugen erreichbar, heutzutage allerdings nur mit einer Sondergenehmigung.

Tiksi war 2004 Ziel einer Reise, die mit logistischer Unterstützung des AWI in Potsdam möglich wurde. Vor Ort konnte ein kleines Forschungsschiff gechartert werden. Moschusochsen, Erosion und Sedimentation, Tundravegetation gehörten u.a. zu den interessanten Eindrücken auf der Fahrt zur AWI-Forschungsstation auf Samoilov, einer ca. 4 km<sup>2</sup> großen Sedimentationsinsel im Lena-Delta.

Seit 1998 werden im Lena-Delta langfristige Untersuchungen der Kohlenstoffflüsse durchgeführt.

Die Methanflüsse in den Niederungen der Polygon-Moore sind erheblich größer als jener Methantransport, der auf den Erhebungen am Rand der Polygone stattfindet. Neben den Untersuchungen zur Geomikrobiologie gibt es langfristige hydrobiologische Untersuchungen, Untersuchungen zur Entwicklung der Kryosphäre, zum Energie- und Wasserhaushalt der Tundra sowie geomorphologische Studien.

Im Gymnasium bieten sich eine Vielzahl von Unterrichtsbezügen an, so z.B. die Erschließung des subarktischen Lebensraumes (Bezug Norilsk Nickel, Erdgasressourcen auf Jamal, Nutzungskonflikte zwischen indigenen Nenzen und der Erdgasexploration auf Jamal), Zusammenhänge zwischen Mikro- und Makroklima (Bezug Methangasfreisetzung in Permafrostgebieten, z.B. Samoilov), Bedeutung der Wasser- und Stoffeinträge über Flüsse in den Arktischen Ozean (Bezug Laptevsee im Bereich des Lena-Deltas), die Bedeutung der Erschließung neuer Transportwege (Bezug Nordost-Passage Murmansk – Dudinka – Tiksi – Wladiwostok).

**Oligocene-Miocene paleoclimate  
and paleontology of King George  
Island, West Antarctica**

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King George Island, the largest of the South Shetland Islands arc provides evidence for cryosphere development and

biota evolution during the crucial Oligocene-Miocene time interval. Highly fossiliferous glaciomarine sequences recognized on the island extend from the Oligocene Polonez Cove Formation to the Miocene Cape Melville Formation. The Polonez Cove Fm consists of glaciomarine strata formed during the Polonez Glaciation. The marine paleoenvironment controlled by calving ice-sheets hosted a cold-water invertebrate fauna. The pectinid lumachelles, which are common here, are especially rich in fossils of sessile and vagile benthos. In addition to pectinid (*Austrochlamys*) coquinas the biota includes calcareous nannoplankton (partly recycled), diatoms, benthic and planktonic foraminifera, polychaete worms, bryozoans, brachiopods, gastropods, ostracods and echinoderms.

The occurrence of such, often graded, coquinoid beds, interbedded with shales and fine-grained sandstones, indicates frequent, sudden changes from low- to high-energy environments and these beds may be interpreted as proximal shelly tempestites. This sequence can be dated as Early Oligocene on the basis of a suite of planktonic foraminifera including *Globigerina angiporoides* and *Chiloguembelina cubensis* as well as calcareous nannoplankton (*Reticulofenestra umbilica* and *Chiasmolithus altus*). The Polonez Cove Fm indicate favourable conditions for life in shallow marine environment during the Paleogene cryosphere development in West Antarctica.

The Miocene glaciomarine strata of the Cape Melville Fm contain a rich and predominantly invertebrate fauna. Microfossils include abundant diatoms, silicoflagellates, chryomonad cysts, calcareous (*Globobulimina*) and arenaceous (*Cyclammina*) foraminifers, sponge spicules and polychaete jaws. Macrofossils are represented by solitary corals (*Flabellum*), usually occurring in life orientation, abundant infaunal bivalves, gastropods, as well as homolodromiid crabs, nephropid lobsters, bryozoans, brachiopods, echinoderms and numerous trace fossils. Vertebrates are represented by fish fragments.

The fossil and trace fossil assemblages have a relatively deep-water, outer-shelf character, making it one of the most

significant Miocene biotas known from Antarctica. Isolation and cooling of Antarctica in the Cenozoic were most probably responsible for taxonomic diversification of the fossil and the modern-day Antarctic biota.

### **Circum-Antarctic continent-ocean transition zones**

Karsten Gohl

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Antarctica was a center piece of the Gondwana supercontinent. About 85 percent of Antarctica's 10000 km long continental margins are of a rifted divergent type, and about 1200 km have been converted from a subduction-type to a passive margin after ridge-trench collision along the Pacific side of the Antarctic Peninsula.

The separation of South America, Africa, India, Australia and New Zealand from Antarctica and the creation of a continuous Southern Ocean began in the Jurassic and continued until the mid Tertiary.

In recent years, the amount of geophysical data along the continental margin of Antarctica has increased substantially, which allows to differentiate the crustal characteristics of its continent-ocean boundaries and transitional zones (COB/COT).

The data and geodynamic modelling indicate that the cause, style and process of breakup and separation were quite different along the Antarctic margin. A circum-Antarctic map will show the crustal styles of the margin and the location and geophysical characteristics of the COT. About 70 percent of the rifted passive margins contain extended continental crust stretching more than 50 km oceanwards of the shelf edge. Most of these extended margins have a continent-ocean transition with a width of more than 100 km, in many cases up to 300 km. The total area of extended continental crust on the shelf and oceanwards of the shelf edge, including COTs with substantial syn-rift magmatic-volcanic accretion, can be estimated to be about  $2.9 \times 10^6 \text{ km}^2$ .

This has implications for improved plate-kinematic and paleobathymetric reconstructions and provides new constraints for accurate calculations of isostatic responses along the Antarctic margin.

### Der Geologische Kalender 2008

Monika Huch

Adelheidsdorf

Der Geologische Kalender 2008 ist ein Beitrag zum Internationalen Polarjahr 2007-2009. Auf insgesamt 14 Blättern zeigt er Landschaften, Expeditionen und Phänomene aus der Arktis und der Antarktis sowie Karten der Arktis und Antarktis. Auf jeder Kalenderblatt-Rückseite werden die Phänomene und Landschaften leicht verständlich erklärt. Auf der Rückseite des Deckblatts wird beschrieben, wie der Globus im Tertiär zu einem Kühlhaus wurde. Zusätzlich gibt es auf den Monatsblatt-Rückseiten Beispiele für Polare Philatelie. Das Poster stellt die einzelnen Seiten vor.

### A comparative modeling study of the Brunt Ice Shelf - Stancomb-Wills Ice Tongue System

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Two diagnostic, dynamic ice-shelf models are applied to the Brunt Ice Shelf - Stancomb Wills Ice Tongue System (BIS-SWIT), located off Caird Coast, Oates Land, Antarctica. The BIS-SWIT is characterized as a thin, unbounded ice shelf with an untypical and highly heterogeneous structure. In contrast to other ice shelves, the composite mass of

its south-western region consists of icebergs that calved at the grounding line and are frozen into fast ice (sea ice).

We perform numerical simulations of the present flow regime of the ice shelf that results from the ice-thickness distribution and the inflow at the grounding line. We then compare the model results with measured flow velocities from the British Antarctic Survey.

Our high resolution ice-thickness distribution, estimated from ICESat GLAS surface elevation data and the assumption of hydrostatic equilibrium, illustrates the heterogeneity of the Brunt Ice Shelf and leads to the possibility of very detailed simulations. The two models have incorporated two observed features (a rift and a shear margin) in different ways and we demonstrate the effects on the simulated velocity field of variations in numerical values for the shear strength and viscosity in these zones.

### Polarjugend.de – Eine IPJ Bildungsinitiative von APECS Deutschland

Bettina Kaiser<sup>1</sup>, Robyn Schofield<sup>2</sup>, Hugues Lantuit<sup>2</sup>, Torsten Sachs<sup>2</sup>, Astrid Richter<sup>2</sup>, Laura Würzberg<sup>3</sup>, Daniela Haase<sup>4</sup>

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Das online Netzwerk „Polarjugend.de“ ist Bestandteil der Initiative APECS Deutschland (Association of Polar Early Career Scientist) und entstanden in Zusammenarbeit mit der Planungsgruppe Education & Outreach des internationalen Polarjahres (IPJ).

Zwei Ziele sind entscheidend für die Arbeit von APECS Deutschland. Es soll ein interdisziplinäres Netzwerk von angehenden Polarforschern in Deutschland geschaffen werden, um die themenübergreifende Zusammenarbeit unter ihnen zu fördern. Darüberhinaus werden Mitglieder des Netzwerkes in Bildungsprojekte zu den Polarregionen einbezogen. Um diese

zwei Schwerpunkte umzusetzen, hat APECS Deutschland eine online Plattform in deutscher Sprache geschaffen, die den Informationsaustausch zwischen Schülern, Lehrern und jungen Polarforschern im und außerhalb des Klassenraums unterstützt. APECS Deutschland koordiniert Präsentationen und Diskussionsrunden an Schulen in Deutschland, indem Lehrer und Forscher miteinander in Kontakt gebracht werden. Auf [www.polarjugend.de](http://www.polarjugend.de) finden sich kurze online Präsentationen zur aktuellen Polarforschung, bereitgestellt zur weiteren Nutzung an den Schulen. Ein Kalender informiert alle Mitglieder über themenrelevante Konferenzen, Lesungen, Sendungen und Ausstellungen. Ein Diskussionsforum widmet sich Fragen von Schülern. Die Seite stellt weiterhin eine Sammlung von Links zu deutschsprachigen Unterrichtsmitteln zur Verfügung. Das Projekt zielt darauf ab, die Sprachbarrieren, die mit Bildungsarbeit zu den Polarregionen in Deutschland verbunden sind, zu verringern. Informationen und weitere Kommunikationsmittel werden in Deutsch zur Verfügung gestellt. Das Projekt wird auch nach dem Ende des internationalen Polarjahres bestehen und soll nachhaltig die Problematiken der Polarregionen in der Bildungslandschaft Deutschland integrieren.

### **Formation of solar radiation, thermal and dissolved oxygen structures of antarctic lakes during the ice cover**

Enn Kaup

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Discussed will be the changes in photosynthetically active radiation (PAR), water temperature and dissolved oxygen (DO) concentrations which were observed in the lakes of Schirmacher and Thala Hills oases in East Antarctica. The external and internal conditions of formation of the solar radiation regime in lakes will be discussed as well. Certain characteristics of lakes' solar radiation regime bring about specific features of thermal regime of antarctic lakes such as autumn and early spring

warming and spring mixing in ice-covered lakes. The freezeout of oxygen from the rapidly growing ice cover combined with limited oxygen consumption by bottom sediments are the processes that result in high, often strongly supersaturated winter DO levels in lake waters. Bottom algal mats that produce oxygen by photosynthesis are contributing significantly to high DO levels during the light part of the year.

### **A higher-order thermo-mechanical ice-flow model applied to grounding-line simulations**

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Despite recent advances in the understanding of polar ice sheets, their current mass balance is still not known. The mass balance of ice-sheet/ice-shelf systems is controlled by the dynamics of a small number of key components, namely the grounding line zones, outlet glaciers and ice streams. The major obstacle for mass budget studies is the lack of sufficient in-situ measurements of e. g. the three-dimensional velocity distribution.

Numerical models represent powerful tools for cryospheric studies, because analytical solutions for the ice-flow in such studies are only feasible for special geometries and/or by applying significant physical simplifications. In order to derive realistic model simulations, it is decisive to include all relevant physical processes for ice-sheet flow, ice-shelf flow and grounding line migrations as well as for the thermo-mechanical coupling between ice-sheet and ice-shelf. Only a few numerical models exist that deal with the explicit treatment of ice flow across the grounding line.

Here we present a three-dimensional, numerical, higher-order, ice-flow model to solve the relevant equations with the method of finite differences on a regular, time-independent grid. Results of commonly used geometrically simplified

grounding line models are presented. We also demonstrate the importance of the numerical ice-sheet/ice-shelf coupling method through comparisons with our former flow-model, which is based on Blatter's shooting algorithm and coupled to an ice-shelf model.

### Geomagnetische Profilmessungen während ANT XXIII/9

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Während der Expedition ANT XXIII/9 wurden geomagnetische Messungen auf dem FS „Polarstern“ mit dem 3 Komponenten Bordmagnetometer durchgeführt. In der Prydz Bay (Antarktis) wurde ein engmaschiger magnetischer Survey mit dem Hubschrauber und einem Cäsium Magnetometer geflogen. Damit war eine gute Gelegenheit gegeben, beide Messsysteme in der Praxis zu vergleichen bei der Vermessung von Meeresbodenanomalien. Es bestand die Möglichkeit, beide Magnetometersysteme auf dem gleichen Messprofil einzusetzen. Empfindlichkeit und Auflösung der gewonnen magnetischen Daten sollen verglichen werden, um die Grenzen beider Systeme auszuloten. Dazu ist es notwendig, transiente Störungen aus Magnetosphäre und Ionosphäre, sowie temporäre, induzierte und remanente Schiffseffekte aus den Messungen weitestgehend zu entfernen und die geomagnetische Lotkomponente möglichst fehlerfrei zu bestimmen. Diese Ergebnisse sollen hier diskutiert werden.

### Distribution agents for Antarctic vascular plants

Oksana Kozeretska, Ivan Parnikoza, Denis Evgen

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For the last 50 years it has been noted that the climate of Antarctic Peninsula gradually warmed. Also, native Antarctic vascular plants *Deschampsia antarctica* and *Colobanthus quitensis* permeated previously unoccupied territories, partly due to transfer by birds and wind. Still, what exactly is necessary for their survival in new conditions is scarcely studied.

Therefore, during the 30<sup>th</sup> Polish and the 10<sup>th</sup> Ukrainian Antarctic expeditions (09.11.2005 – 09.02.2006) we attempted three transfers of *D. antarctica* and two – of *C. quitensis* at the Polish Henric Arctowski Station (King George Island of the South Shetland Archipelago). Each transfer to a certain habitat was repeated three times. The places were chosen to represent the various factors of the Maritime Antarctica influencing vascular plants: guano supplement, human impact, water availability (both the fresh water and the sea) and the distance to the glacier. Notably, the austral summer 05-06 was extremely hot in the region. The only successful attempt was that near the Ecology glacier (both for *D. antarctica* and *C. quitensis*). In all other plots the plants died sooner or later after being transferred. The results confirm that the factor limiting the vascular plants accidental distribution in the region is the fresh water: only at the plot near the glacier that has been watered sufficiently during all the austral summer did the plants survived (all of them). The authors thank Iryna Kozeretska who participated in both expeditions and granted the data for analysis.



### Monitoring dynamics and sea-ice export of the southern West New Siberian polynya, using model and remote sensing data

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Polynya processes in the south-eastern Laptev Sea between January and June 2004 have been studied by means of satellite Synthetic Aperture Radar (SAR) imagery and a simple polynya ice flux model based on the Haarpaintner approach. The polynya model was forced by meteorological data recorded at a nearby weather station, and calibrated using satellite observations of the southern West New Siberian (SWNS) polynya.

The good correspondence between the modelled polynya evolution and SAR observations as well as between the calculated salinity increase of the water column and long-term salinity records suggests that the Haarpaintner model is a suitable tool to investigate dynamics and export rates of flaw polynyas. A total of 66 km<sup>3</sup> of ice in both thin-ice and open-water zones was produced from January to June 2004 in the southern 195-km wide segment of the WNS polynya. Due to generally calm wind conditions in the Laptev region, the development of large open-water zones is restricted, and ice growth takes mainly place under the large areas of new thin-ice. Therefore, the resulting salt flux is not high enough to destabilize the generally strongly stratified water column, which supports observations by Dmitrenko et al. [2005].

To evaluate the importance of the observed ice and salt fluxes in the entire WSN polynya for the local circulation system and the interaction with the hydrography of the Arctic Ocean, coincident in-situ observations of ice and water properties should be performed. In particular, we will obtain continuous observations of water temperature and salinity and ice thickness by means of seafloor-moored instruments in the polynya region in coming years.

### The level of chromosome instability in South Polar Skua (*Catharacta maccormicki*), Brown Skua (*C. lonbergi*) and their hybrids

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South Polar Skua (*Catharacta maccormicki*) and Brown Skua (*Catharacta antarctica lonnbergi*, Charadriiformes, Aves) are the two seabird species that inhabit Antarctica. There is a zone of hybridization between these two species in the region of the Antarctic Peninsula. The stability and viability of hybrid forms depend from both of their genotype and environment. They can be better or worth fitted than parental species and one of the fitness indicators may be manifestations of genome instability.

The aim of our work was comparative study of different manifestations of genome instability of the two Skua species and their hybrids. Blood samples from 89 *C. maccormicki* (72 adults, 17 chicks), 70 *C. a. lonbergi* (57 adults, 13 chicks), and 22 hybrids (9 adults, 13 chicks) were collected on region of King George Island (62°11' S, 59°00' W; Argentine Archipelago, Antarctica) during the Australian summer of 2006/07.

The used methods of genome instability evaluation were the micronuclei test and the nuclear anomaly test of blood smears, which are enough convenient and informative in field research of birds. The measured parameters of genome instability were frequencies of micronuclei (MN), and three most frequent nuclear anomalies - "budding nucleus", "two-lobe nucleus" and "tailed nucleus" per 10 000 mature erythrocytes for each bird. Different types of other anomalies were analysed separately and together as a sum of nuclear anomalies (NA).

The various types of NA were found approximately equal for all birds. For chicks of all studied groups no significant differences were found between average levels of neither MN nor NA. The level of

NA in chicks was significantly lower than in adult birds of both species and hybrids ( $p < 0.001$ ). For adult birds the average frequencies of NA were  $0.51 \pm 0.09$  for *C. maccormicki*,  $0.63 \pm 0.11$  for *C. a. lonbergi*, and  $1.22 \pm 0.60$  for hybrids. The NA rate variance of adult hybrids was higher than that of both species ( $F = 5.15$ ,  $p < 0.01$ ).

The data obtained let us suggest that adult hybrids have increased level of chromosome instability than parent species. However, due to the little number of inspected hybrid birds we have carefully to treat these results conclusions.

### **Magnetische Anomalien nordöstlich von Cape Adare und ihre Beziehung zu tektonischen Strukturen in Nord-Victoria-Land (Antarktis)**

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Die BGR-Expedition GANOVEX IX (2005/06) beinhaltete eine aeromagnetische Kampagne über dem Südpazifik nordöstlich von Cape Adare im Nord-Victoria-Land der Antarktis. Parallel dazu wurden strukturgeologische und thermochronologische Untersuchungen in der Region zwischen Pennell Coast und dem Tucker-Gletscher durchgeführt. Die magnetischen Anomalien zeigen zwei fast orthogonal aufeinander stehende Richtungen. NNW-SSE streichende Anomalien nordöstlich von Cape Adare weisen auf ozeanische Spreizungsmuster innerhalb des Adare-Trogs hin. Eine Verbindung dieser Anomalien mit dem Northern Basin des Rossmeeres kann jedoch basierend auf unseren Daten nicht belegt werden. Störungen im Nord-Victoria-Land lassen sich relativ gut mit magnetischen Anomalien im ozeanischen Bereich parallelisieren. Die Hauptrichtungen dieser Störungen sind NW-SE bis NNW-SSE und NE-SW bis NNE-SSW. NNW-SSE orientierte dextral-transtensionale bis extensionale Störungen verlaufen

parallel zur Adare Peninsula und zum Adare-Trog. NE-SW streichende Abschiebungen scheinen dabei die entlang der Rossmeer-Küste aufgeschlossenen Hallett-Vulkanitkörper in einzelne Blöcke zu segmentieren.

### **Tethered Balloon Measurements on the North Pole Drifting Ice Station NP-35 - The Arctic Planetary Boundary Layer and Coupling with Cyclones**

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Recent observations and climate modelling results have highlighted the Arctic as a region of particular vulnerability to global climate change. To arrive on credible present-day Arctic simulations and estimates of future Arctic climate changes, an

improved understanding of Arctic climate processes is necessary. The complex interactions among atmosphere, sea ice, ocean and land surface are highly relevant but poorly understood. Planetary boundary layer (PBL) processes -like the exchange of momentum, heat and moisture between the surface and the lower atmosphere- have been identified to be of major importance. In our project, we intend to analyse the connection between the Arctic planetary boundary layer with mesoscale cyclones and stormtracks by a complex analysis of coordinated meteorological, aerological (radiosondes and tethered sondes), and radiation measurements, in combination with qualitative synoptic analysis and regional climate modelling.

In the frame of the International Polar Year, we participate in the Russian North Pole Drifting Ice Station NP-35. Besides regular ozone soundings, our main effort are multi-level measurements of meteorological parameters in the Arctic boundary layer over the Arctic ocean by a tethered balloon system. The characterization of the state of the boundary layer will also be proceeded by other/earlier

aerological soundings (radiosondes, tethered balloons) and lidar measurements from earlier drifting stations and the AWIPEV base in Ny-Ålesund, Spitsbergen, respectively.

The interpretation of the observations will be supported by simulations with the regional climate model HIRHAM that will deliver mesoscale six hourly pressure-, temperature-, and wind fields. From these, (anti)cyclones will be analyzed and tracked. The connection between the atmospheric- and surface conditions (e.g., sea ice concentration, polynia) and the development of (anti)cyclones will be investigated. Measures of atmospheric vertical stability will be calculated (e.g., Brunt-Vaisala frequency or lability energy CAPE). The objectives are to advance the understanding of atmospheric processes responsible for the development, intensification, and decay of mesoscale cyclones over the Arctic ocean and to explore the interactions between mesoscale cyclones and surface conditions via boundary layer processes.

### **Surface sediments of the Antarctic plain-tundra: moving and stable terrains**

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The Antarctic stony tundra surfaces are typical periglacial areas. The plain terrains – plateaus, former abrasional terraces – have polygonal pattern, or patternless desert-like surfaces.

During our work in the oases of the King George Island – searching for sediment movement, mixing processes – geomorphologically-sedimentologically we separated these surfaces. In the sediments of the patternless terrain artificial radionuclides were searched for to detect the deposits of the nuclear peaks of the 50-60's. Using the <sup>137</sup>Cs-method for

the whole core-samples (and the 239/240Pu-method for cross-checking) the searched materials precipitated from the atmosphere were found only in the surface layer (0 - 5 cm). The lower sediments are older, without any current mixing and migration with the surface layers. The patterned surfaces have wide range of polygonal forms with active mixing processes. Studied polygons are divided into two bigger groups on the basis of textural properties of their fine sediments ( $d < 2000 \mu\text{m}$ ). Grain size distribution curves of the first type sediments do not have characteristic modus. The grain size distribution of second main group of sediments includes one or more peaks. Textural properties of sediments [practically the shape of the grain size curve, presence (or absence) of these peaks and the modus-median chart] could refer to age of these forms. The proportion of fine sediments in the youngest ones is very low (less than 1-3%), while the oldest (screened) ones could have more peaks in the finer range. Changes occurring in textural properties of polygon sediments can be a quick process. At the basement (at the depths of 50-180 cm, midsummer) of the patterned (moving) and the patternless (stable) terrains permafrost were found.

According to our hypothesis, the reason for the lack of sediment mixing is the meltwater saturation of the stable terrains' active layer during the summer period.

### Long term changes of climate, environment and aerosols in the Central Russian Arctic – A 1500 year ice core record of Akademii Nauk ice cap (Severnaya Zemlya)

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Ice cores are one of the best archives for climate and environmental changes. A new 724 m deep ice core was drilled on Akademii Nauk ice cap (Severnaya Zemlya) between 1999 and 2001 to gain high resolution proxy data from the Central Russian Arctic.

The Akademii Nauk ice core contains significant proxy data for the reconstruction of climate and environmental changes, although the ice cap is affected by summerly melting and infiltration processes, resulting in alteration of the original isotopic and chemical signals. Here we present overview data (bag mean values: 0.3-1.0 m) of stable water isotopes ( $\delta^{18}\text{O}$ , d) and major ions of the uppermost 530 m as well as high resolution data for some special sections. Dating of this ice core is based on reference layers (nuclear weapon tests, volcanoes) and on counting of annual cycles of stable isotopes and electrical conductivity.

The age model yielded an age of about 1500 years for the core section viewed here.  $\delta^{18}\text{O}$  data reflect Eurasian Arctic surface air temperature (SAT) changes and show a generally decreasing trend, culminating in the absolute SAT minimum around 1800. Thereafter the values increased strongly to the absolute maximum around 1930. The decreasing isotopic trend is at least partly caused by the growth of Akademii Nauk ice cap. This is also reflected in the annual layer thickness data and a decreasing overall trend of sea salt ions, which reached their lowest values also around 1800. In contrast, there is no clear trend in

ammonium and nitrate observable. After 1800 almost all ions show increasing concentrations until the mid-20th century, followed by a repeated decline in the last decades. The 20th century record is superimposed by the anthropogenic pollution of the Arctic, mainly visible in strong increasing levels of sulphate and nitrate after World War II with highest concentration from the 1960ies to the 1980ies and again decreasing values thereafter. Some of the sharp sulphate peaks could be attributed to certain volcanic eruptions, e.g. Laki/Iceland (1783) and Bezymianny/Kamchatka (1956).

### Antarctic herb tundra colonisation zones in the context of an ecological gradient of glacial retreat

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It is possible to suggest that higher plants of Maritime Antarctic form different kinds of Antarctic herb tundra formation due to the heterogeneous environment now developing gradually between the ocean coast and the melting glacier. The variability of cenoses may well coincide with colonization history.

To test this, we studied the specifics of the Antarctic herb tundra formation in the context of environmental gradient formed by the melting icesheet near the Henric Arctowski Station (King George Island of the South Shetland Archipelago). During the 30<sup>th</sup> Polish and the 10<sup>th</sup> Ukrainian Antarctic expeditions (09.11.2005 – 09.02.2006) we monitored 10 stationary plots that represented approximately the whole spectre of environmental variability of the ice-freed territory. Analysis of total plant cover of both vascular plant species and the specific variability of higher plants in general allowed us to determine three distinct colonization zones. Probably, zone I (coastal localities) is the initial one, whereas zone II (approximately equidistant from the ocean and the glacier)

is the optimal one for the vascular plants now. Zone III (the nearest to the edge of the melting glacier) is where the tundra advances on recently deglaciated territory. At the same time, colonization and optimum zones are severely affected by accidental nitrification influencing the cover and the morphometric parameters of *D. antarctica* and *C. quitensis*, as well as the distribution of other plants. The heterogeneity within a zone arises, among other reasons, from the patchiness of organic influx from birds and sea mammals.

### **Fildes Peninsula und Ardley Island (King George Island, South Shetland Islands) – ein schützenswertes Gebiet der Antarktis?**

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Die Fildes Peninsula Region als logistisches Zentrum von King George Island weist einen Flughafen sowie eine hohe Dichte an Forschungsstationen bzw. Feldhütten auf. Im Gebiet kommt es zu Überschneidungen verschiedener Interessen: Wissenschaft, Schutz von Flora, Fauna, geologischer und historischer Werte, Stationsbetrieb und Transportlogistik und Tourismus.

Das Ziel der vorgestellten Studie bestand in der Schaffung einer wissenschaftlichen Datenbasis, um mittels biotischer und weiterer Daten die menschlichen Aktivitäten und Umweltproblemen in der Fildes Region zu quantifizieren. Dazu gehörten Flächenverbrauch, Infrastruktur, Bauaktivitäten, Müllverbreitung und, Emission von Gasen und Lärm, zeitliche und räumliche Verteilung des Land-, Luft- und Seeverkehrs, Vorkommen von Fossilien sowie eine Umfrage unter den Mitgliedern aller Stationen.

Im Vortrag werden insbesondere auch Daten zur Flora und Fauna des Gebietes als wesentliche Grundlage für eine Risikoanalyse vorgelegt. Die Brutpaar-

zahlen der Pinguine (*Pygoscelis antarctica*, *P. papua*, *P. adeliae*) auf Ardley Island, aber auch der Bruterfolg dieser drei Arten unterliegen starken jährlichen Unterschieden, die sowohl mit lokalen anthropogenen Einflüssen zu erklären sind, als auch (z.B. beim Adeliepinguin) im Zusammenhang mit der relativ schnellen Klimaänderung und der damit verbundenen Eissituation im Winter im Bereich der westlichen Antarktischen Halbinsel zusammenhängen.

Ein geeigneter Indikator für anthropogene Umwelteinflüsse ist der Südliche Riesensturmvogel (*Macronectes giganteus*), dessen Brutpaarzahlen nach dem Bau neuer Stationen in den 1980er Jahren zurückging und sich erst in den letzten Jahren erholten.

Ausgehend von dieser Analyse werden Vorschläge zur Verminderung von Konflikten zwischen den verschiedenen Interessen des Natur- und Umweltschutzes, der Wissenschaft, der Logistik und des Tourismus vorgelegt. Als beste Lösung zur Verbesserung der aktuellen Situation und der wirksamen Einführung von Managementinstrumenten wird die Ausweisung der Fildes Peninsula Region als ein „Besonderes antarktisches Verwaltungsgebiet“ (ASMA) angesehen (s. auch nachfolgender Vortrag). (im Auftrag des Umweltbundesamtes Dessau, FKZ UFOPLAN 203 13 124)

### **Sediment lamination in the southeastern Weddell Sea, Antarctica: a high-resolution study**

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Sediment sites from the Southeastern Weddell Sea contain a detailed record of glacial environmental variability (25-19 ka). We studied three gravity cores that provided insight into glacial ice-sheet dynamics at millennial-to-seasonal resolution. The sites are located on sedimentary ridges and received fine-grained, silty-to-muddy material from

contourite currents. For the most part, sediments are finely laminated, with minor interceptions of bioturbated intervals. So naturally, the question arose whether or not the lamination indicates a seasonal process that produced a summer and a winter layer?

To address this question, we used a number of high-resolution, non-destructive tools to obtain maximum spatial data, and by that, temporal resolution. First, we studied digital x-radiographs by developing the so-called BMPix-Tool to read out gray values at pixel resolution along a pre-defined profile line perpendicular to stratification. Thereby, we generated roughly 12 measurements per mm. For 15 m long core PS1789, for instance, the analysis resulted in roughly 170.000 determinations. Then, we implemented the so-called PEAK-Tool for layer counting. From previous work (Weber et al., 1994), we used AMS14C-dates for stratigraphic comparison.

For site PS1789, the age difference between 2 m and 12 m core depth is 2690 ( $\pm 150$ ) years. Over that interval, we counted 2430 peaks (4860 layers), i.e., roughly 90% of the required age difference. Accordingly, we conclude that the lamination indeed represents inter-annual variability. The fact that sites containing thicker bioturbated intervals (e.g., PS1599) show less layers, i.e., show a larger discrepancy between counted and expected layers, indicates that bioturbated sections contain more time.

As a working hypothesis, bioturbated intervals are interpreted as interstadial periods, whereas laminated sections represent stadials. Taking our results together, the sites from the sediment ridges in the southeastern Weddell Sea contain an extremely valuable climate archive for ultrahigh-resolution studies of glacial climate variability in high southern latitudes.

### **Patriot Hills-South Pole traverse: gravity data processing and interpretation**

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The Centro de Estudios Científicos (CECS) in Valdivia in corporation with the Chilean army performed in December 2004 a tractor traverse from Patriot Hills to the South Pole, covering a distance of more than 1100 km. Gravity measurement every 10 km as well as concomitant GPS and ice thickness determinations almost continuously were part of the scientific program. Special considerations were necessary to reasonably calculate the drift of the gravimeter used, as conventional loop measurements within reasonable short-term intervals were not possible. Drift determinations during short standstill periods of the platoon helped in reconstructing the behaviour of the instrument. Free Air gravity is heavily dominated by short wave length anomalies caused by the strong changes in ice thickness. Bouguer and ice layer corrections, necessary for removing these disturbing interferences, were accomplished by two-dimensional model calculations: ice and rock layers were approximated by an ensemble of thin vertical prisms whose upper edges are defined by the surface topography and their lower edges by the subice topography.

The resulting complete Bouguer anomaly oscillates around zero along the northern section of the profile and starts to decrease 200 to 300 km before entering the East-Antarctic craton where it stabilizes at about -130 mGal. Isostatic modelling yields a positive residual anomaly of about 70 mGal over East-Antarctica. It can be explained by additional masses in the crust, e.g. assuming an increased density in the lower crust. Alternative models which incorporate lighter sediments in West-

Antarctica or which are isostatically unbalanced are also conceivable.

### **Airborne lidar observations of mixed-phase clouds in the Arctic**

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The ASTAR (Arctic Study on Tropospheric Aerosol, Clouds and Radiation) 2007 campaign took place around Svalbard from March to April 2007.

The aim of the campaign was to investigate the influence of aerosols and clouds on the radiation budget and to determine interactions with a combination of airborne instruments. Lidar remote sensing, in situ cloud particle measurements, and spectral measurements of cloud top reflectance were performed on flights with the Polar 2 aircraft.

This contribution shows the structure of the spring time mixed-phase clouds observed with a depolarization lidar (532 nm and 355 nm) in nadir or zenith looking configuration. Mixed-phase clouds were observed during 5 out of a total of 14 lidar flights. The cloud top height in these cases varied between 0.5 to 5 km above ground, including low level and midlevel clouds. We found that the top of the ice clouds often consisted of a layer of liquid particles of 50-100 m thickness.

Although multiple scattering occurred in thick clouds, the combination with the other instruments showed that we were able to determine the cloud phase of the cloud top layer with the lidar instrument correctly. The measurements are important for further understanding of the formation of mixed-phase clouds and improving the cloud parameterization in regional scale models.

### **Analysis of forest fire aerosol with the Koldewey Aerosol Raman Lidar (KARL)**

Christoph Ritter, A. Hoffmann, Astrid Richter, R. Neuber

AWI Potsdam

In the summer months of recent years occasionally long-range transport of aerosol has been observed in Ny Ålesund, Spitsbergen, which originates from forest fires in Siberia or Canada. These aerosol events are about as frequent as Arctic Haze occurrences in springtime, hence they cannot be neglected for the direct and indirect influence of aerosol on climate.

With the Koldewey Aerosol Raman Lidar (KARL) not only the vertical distribution of these particles can be determined but also, thanks to the wavelengths dependence of the scattering properties, an index of refraction and a size distribution estimated.

In this presentation a case study of Siberian forest fires which arrived over Spitsbergen on June 17<sup>th</sup>, 2007 in the lower free troposphere is given. Air trajectories were calculated using the NOAA hysplit model. A photometer confirms the increased optical thickness, especially at wavelengths lower than 550 nm. The Lidar data containing 3 different backscatter coefficients (at 355 nm, 532 nm and 1064 nm), extinction coefficients at 355 nm and 532 nm and the volume depolarisation are given. An inversion of the microphysical aerosol parameters is performed.

This case study is shortly compared to previous forest fire aerosol events from 2003 and 2001 which occurred at the high troposphere and the low stratosphere, respectively. Hence these aerosols can occur in very different altitudes demonstrating the need of vertical sounding.

### Cycles and stratigraphic correlation during the Late Carboniferous on NE Svalbard (Spitsbergen)

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During the Early Carboniferous terrestrial deposits (alluvial fans, fluvial, lacustrine and coal-bearing-swamp deposits) of the Billefjorden Group (Tournaisian-Viséan) formed under a humid equatorial climate. In the Late Carboniferous, the transition to a semi-arid climate was accompanied by a general sea-level rise and the onset of extensional tectonics. The mixed siliciclastic-calcareous sediments of the Gipsdalen Group (Serpukhovian-Artinskian) comprise terrestrial red beds, which laterally and vertically grade into marginal-marine evaporites (sabkha sequences) and warm-water, shallow-marine carbonates rich in larger foraminifera (fusulinids), corals, brachiopods and gastropods. In connection with the progressive transgression, faulted margins of positive areas were submerged and carbonate platform sequences were deposited with an unconformity directly upon basement rocks. The warm-water, shallow-marine deposits of the Wordiekammen Formation dominated the succession up to the Lower Artinskian. After a short hiatus, the sediments of the Tempelfjorden Group (Artinskian-Kazanian) were deposited during a large-scale transgression, accompanied by a transition to temperate climates, resulting in a major facies change to cool-water carbonates, cherts and siliciclastics (see poster of Blomeier et al.).

This study is embedded in the larger study of sedimentary and climatic evolution of the Arctic during the Late Paleozoic (Scalp) and here we will concentrate on the cyclicity and stratigraphic correlation of the carbonate sediments of the shallow-marine Wordiekammen Formation in less

known areas in Svalbard (NE Spitsbergen) during the Late Carboniferous (Moscovian-Kasimovian). These areas display significant changes in the paleoenvironment compared with the well-investigated central parts (Billefjord area) of Spitsbergen. Altogether 10 sections have been sampled in a ca. 50 km long N-S transect, from the northern part of the Lomfjorden (Hinlopenstreet) to the Malte Brunfjellet in the South. However, some of the sections are intersected by Mesozoic dikes of various thickness, which affect (dolomitization) the carbonate sediments below and above the dike and hamper the microfacies analyses. But most sections display a distinct cyclicity, formed by vertically stacked parasequences of several meters in thickness, which show a typical microfacies succession. The cyclic character of the sediments is also reflected by the larger foraminifera (fusulinoidean) fauna.

### Die Kombination von bodengebundenen, flugzeuggestützten und Satellitendaten zur Bestimmung von Schwerefeld, Magnetfeld, Eismassenhaushalt und Krustenstruktur im Dronning-Maud-Land, Antarktis - Ergebnisse des Forschungsprojektes VISA

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Im Rahmen des DFG-Programms "Geotechnologien" haben die TU Dresden und das AWI Bremerhaven gemeinsam das Forschungsprojekt VISA durchgeführt. Die Zielstellung dieses Projektes umfasste die Validierung, Verdichtung und Interpretation von Satellitendaten zur Bestimmung von Magnetfeld, Schwerefeld, Eismassenhaushalt und Krusten-



struktur mit Hilfe von bodengebundenen und flugzeuggestützten Messungen.

Dazu wurden in den Antarktissaisons 2003/04 bzw. 2004/05 umfangreiche terrestrische Arbeiten im zentralen Dronning-Maud-Land (Region Schirmacheroase) bzw. westliches Dronning-Maud-Land (Region Heimefrontfjella) durchgeführt. Aero-geophysikalische Kampagnen fanden in den Jahren 2001 bis 2005 statt.

Die Ergebnisse dieser Arbeiten sollen in einer Zusammenschau vorgestellt werden. Die angewendeten geodätischen, geophysikalischen und glaziologischen Methoden werden kurz beschrieben. Eine wichtige Zielgröße ist der Massenhaushalt im betrachteten Gebiet, der nur durch Kombination der verschiedenen Methoden abgeleitet werden kann. Außerdem werden die erhaltenen Aussagen zur Erfassung von Höhen, Schwerefeld, Akkumulationsmuster sowie der Krustenstruktur diskutiert.

### **Chironomids as indicator for the Holocene climatic and environmental history, a comparison from Duck and Hjort Lake of Store Koldewey of NE-Greenland**

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A 290 cm and a 252 cm long sediment record from two high arctic lakes (Duck and Hjort Lake) on Store Koldewey, an island off North East Greenland, were investigated for fossil chironomid assemblages, chronology, and biochemistry. Throughout the Holocene, a total of 18 and 21 chironomid taxa were identified in the sediment sequence from Duck Lake and Hjort Lake, respectively.

The fossil chironomid assemblages in the lakes on Store Koldewey differ markedly from lakes in other neighbouring arctic regions, such as Svalbard or West Greenland. First chironomids appear in

Hjort Lake at 9500 cal. yr BP at 9000 cal. yr BP in Duck Lake. For this period, a significant warming is supposed to have occurred in East Greenland. However, the abundance and diversity of chironomids remained low during the early Holocene in both lakes.

A possible reason could be the low amount of organic matter and nutrients during this period. An increase in organic matter accumulation in Hjort Sø at ca. 7500 cal. yr BP and in Duck Lake at 6000 cal. yr BP, respectively, correlates with an increase of chironomid abundance and diversity in both lakes. However, despite much lower amounts of organic matter in Hjort Sø sediments, chironomid abundances are not significantly higher in comparison with Duck Lake sediments. Possible reasons are differing sedimentation rates due to different clastic matter input. Distinctly lower chironomid abundances from ca. 3000 cal. yr BP are presumably the result of less nutrient availability and cooler conditions.

The differences between the known Holocene climate history of East Greenland and the abundances and diversities of the fossil chironomid assemblages in both lakes on Store Koldewey implies that is the occurrence of chironomids is more controlled by nutrient availability and oxygen conditions in the water column than by temperature changes. The chironomid records from Store Koldewey are the first such from Northeast Greenland and therefore provide a first information on the use of chironomids as climate proxies for such high arctic environments.

### **Vergleich zwischen geodätisch bestimmtem Strain und Eisdickenänderung**

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Im Rahmen eines seit 1991 bestehenden Forschungsprojektes werden die Höhenänderung, die Fließgeschwindigkeit und die Deformation des grönländischen Inlandeises am Untersuchungsgebiet

Swiss Camp bestimmt. Zur Deformationsanalyse dient ein mit 4 Pegeln vermarktes Netz (Dreieck mit Zentralpunkt, Ausdehnung etwa  $2 \text{ km}^2$ ), dessen Lagekoordinaten zwischen je zwei Kampagnen zu vergleichen sind. Im Falle homogenen Strains ist die Verzerrung dieses Netzes durch eine Affin-Transformation beschreibbar, aus deren Transformationskonstanten sich die Hauptverzerrungsraten  $e'_1$  und  $e'_2$  [ppm/a] sowie deren Azimut berechnen lassen.

Diese an der Eisoberfläche ermittelten Strairaten werden nun dazu benutzt, um unter Einbeziehung der Inkompensibilitätsbedingung  $e'_1 + e'_2 + e'_3 = 0$  die Strainrate in vertikaler Richtung zu berechnen aus  $e'_3 = -(e'_1 + e'_2)$  [ppm/a]. Damit lässt sich dann bei bekannter Eisdicke  $H$  die gesamte Höhenänderung  $\Delta H$  des Eiskörpers angeben zu  $\Delta H_e = e'_3 \cdot H$ . In diesem vereinfachten Modell wird allerdings angenommen, dass die an der Eisoberfläche auftretenden Strainraten entlang der gesamten Lotlinie konstant bleiben.

Zur weiteren Untersuchung wird nun die Tiefenabhängigkeit der Strainraten abgeschätzt. Da Strain auf Geschwindigkeitsunterschieden beruht, ist zunächst die Tiefenabhängigkeit der Fließgeschwindigkeit zu modellieren. Hierzu wird vom allgemein für Eisschilde akzeptierten GLEN'schen Fließgesetz ausgegangen. Des weiteren wird vereinfachend angenommen, dass sich in Anhängigkeit der Tiefe die Strainraten, und somit  $e'_3$ , proportional zur Horizontalgeschwindigkeit ändern. Als Ergebnis wird gezeigt, dass die Berücksichtigung der vertikalen Änderung von  $e'_3$  über die gesamte Eisdicke ( $H = 1100 \text{ m}$ ) nur  $-12\%$  (bei Eistemperatur  $T = -10^\circ\text{C}$ ) bzw.  $-7\%$  (bei  $T = -15^\circ\text{C}$ ) bewirkt. Dies wird durch den Reduktionsfaktor  $F = 0,88$  ( $T = -10^\circ\text{C}$ ) bzw.  $F = 0,93$  ( $T = -15^\circ\text{C}$ ) erreicht und man erhält die strainbedingte zeitliche Höhenänderung aus

$\Delta H_e = (\partial H/\partial t)_e = +F \cdot H \cdot e'_3$ . Dem gegenüber steht die mit GPS direkt gemessene Höhenänderung der Eisoberfläche, die auch die Akkumulation oder Ablation (b) enthält, also  $(\partial H/\partial t)_{\text{GPS}} = b + F \cdot H \cdot e'_3 = b + (\partial H/\partial t)_e$  oder  $b = (\partial H/\partial t)_{\text{GPS}} - F \cdot H \cdot e'_3$ .

Als Beispiel seien hier die Epochen 1994 – 2002 genannt. Hierfür ergeben sich:

$$(\partial H/\partial t)_{\text{GPS}} = -0,25 \text{ m/a,}$$

$$(\partial H/\partial t)_e = -0,25 \text{ m/a, reduziert}$$

$$F \cdot (\partial H/\partial t)_e = -0,23 \text{ m/a und damit}$$

$$b = -0,02 \text{ m/a (Ablation).}$$

## Compromises instead of rivalry – the prehistory of the organisation of the first international Polar Year

Erki Tammiksaar

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The First International Polar Year (1882–83) initiated by Carl Weyprecht is justifiably considered the first international research project. The beginning of such collaboration was not easy. Compromises had to be achieved at different levels – persons, groups of those interested and states. In the poster, I would like to draw attention to the three most important compromises out of many.

1. The resolutions of the International Congress of Meteorology in Rom versus Weyprecht (22 April 1879);
2. Differences in the views of Heinrich Wild and Georg von Neumayer concerning the responsibilities and subordination relations of the International Polar Commission and the International Meteorological Committee at the preparation of the polar year (winter-spring 1880);
3. The complaisance of Weyprecht to Wild and Russian government proceeding from the interests of the organization of the polar year as a result of which the Austro-Hungarian expedition went to Jan Mayen (spring 1881) instead of Nowaya Zemlya.

### Impact in Glacier-Ice near Muenster (Nordrhein-Westfalen)

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Between the hills of the Baumberge and Altenberg, 20 km west of the town of Muenster, near Bösensell, a crater circle with a diameter of 850 m and a depth of 13 m is carved into Campanian marls of the Upper Cretaceous, partly covered by glacial drift of the Saale-1-Glacial. A 100 - 200 m wide ring at the outside, between geographic contour lines 79 - 70 m, dips with 7 to 9 % to the inside and surrounds a nearly horizontal field, which sinks at the centre 1 - 2 m deeper than the water level. An artificial ditch drains the inner part, which has no natural outflow.

Only a large explosion on the Earth surface could form the excellent central symmetry of this flat crater. There are no volcanic traces at all, so the impact of a cosmic body must have excavated it. This crater is the bottom of a larger one, whose steep sidewall loomed up outside the ring upon the surface of today in a material, which disappeared completely without leaving a trace. Only ice has this quality. Large glaciers covered Bösensell in the marine isotope stages 22, 16 and 12 of the Pleistocene, the impact happened at the end of stage 12 = Saale-1-Glacial, about 300.000 years ago. Local extensions in the outer ring point on different firmness of the glacier in different directions, they add to the central a lateral symmetry. The long axis marks the direction of the greatest firmness: NW-SE. It is the direction of glacier flow near Bösensell; less firm are directions oblique and across to it, apparently caused by water filled crevasses.

Typical shock wave breccias are not yet identified, but on "Beltmanns Hill" (SW-sector), crushed limestone crops out in old pits. There industrial stone production failed, perhaps because the beds already were broken by the impact. Properties of the glacier become recognizable by features of the crater: Glacier movement had slowed down, following thinning by melting. Thickness differences between

the maximal ice extension and the time of impact confirm this. Crater and ice-push-ridges, visible in the surface of today, were formed short before the glacier disappeared. It was the end of the last strong erosion period in the Muensterland.

### Differences in ice retreat across Pine Island Bay, West Antarctica, since the Last Glacial Maximum: Indications from multichannel seismic reflection data

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An understanding of the glacial history of Pine Island Bay (PIB) is essential for refining models of the future stability of the West Antarctic Ice Sheet (WAIS).

New multichannel seismic reflection data from inner PIB are interpreted in context of previously published reconstructions for the retreat history in this area since the Last Glacial Maximum. Differences in the behavior of the ice sheet during deglaciation are shown to exist for the western and eastern parts of PIB.

While we can identify only a thin veneer of sedimentary deposits in western PIB, eastern PIB shows sedimentary layers  $\leq$  400 msTWT. This is interpreted as a result of differences in ice retreat: a fast ice retreat in western PIB accompanied by rapid basal melting led to production of large meltwater streams, a slower ice retreat in eastern PIB is most probably the result of smaller drainage basins resulting in less meltwater production.

## Genome instability of three Antarctic fish species

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The cytogenetic indexes of genome instability of three fish species (*Notothenia coriiceps*, *Trematomus bernacchii* and *Chaenocephalus aceratus*) were studied in this work. Antarctic fishes (*Notothenia coriiceps* - 135 specimens, *Trematomus bernacchii* - 20 spec. and *Chaenocephalus aceratus* - 10 spec.), were caught during wintering 2004-2005 at Galindez Island (Argentine Archipelago, Antarctica).

As cytogenetic parameters of instability of genome the rate of micronucleus and frequency of nuclear anomalies were chosen. According to published data, the micronuclei frequency in fish erythrocytes is about 0.14 – 6.8 ‰ (Al Sabti, 1991). The average rate of micronuclei in studied fishes was  $1.17 \pm 0.03\%$  for *Notothenia coriiceps*,  $2.30 \pm 0.13\%$  for *Chaenocephalus aceratus* and  $1.06 \pm 0.06\%$  for *Trematomus bernacchii*.

The frequencies of other nuclear anomalies were as follow. Most often were met "nucleus with a cave": the mean value of this trait varied from  $9.40 \pm 0.85\%$  for *Chaenocephalus aceratus* to  $7.08 \pm 0.52\%$  for *Trematomus bernacchii*. The rate of "budding nucleus" was high as well: from  $6.32 \pm 0.39\%$  for *Chaenocephalus aceratus* to  $4.03 \pm 0.39\%$  for *Trematomus bernacchii*. The frequencies of "two-lobe nucleus" was in limits  $1.05 \pm 0.20\%$  for *Trematomus bernacchii* and  $1.98 \pm 0.39\%$  for *Chaenocephalus aceratus*. The "tailed nucleus" rate varied from  $1.13 \pm 0.21\%$  for *Trematomus bernacchii* to  $2.40 \pm 0.43\%$  for *Chaenocephalus aceratus*. Among the three studied species the highest level of different deviations from normal nuclear morphology was found for *Chaenocephalus aceratus*. The least level was featured for *Trematomus bernacchii*;

*Notothenia coriiceps* was in the middle among the other two species.

The obtained data may be useful for estimation of influencing of changes of factors of environment on Antarctic ecosystem.

## Chemistry of an Antarctic Subglacial Environment – The role of subglacial geochemical processes in global biogeochemical cycles and quantifying subglacial hydrological processes

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It is well known that subglacial environments especially the availability of basal water plays an important role for the dynamic of ice sheets. Hydrological processes however are far from being understood as direct observations are hampered through kilometer thick ice. Over the past years, it also has become more and more evident that despite the cold and isolation wet subglacial environments provide a viable habitat for life. Geochemical and biogeochemical processes in the sub ice environment not only can create and release chemical compounds, which can be used as natural tracers helpful in elucidating and quantifying subglacial hydrological processes, subglacial bio/geochemical processes may also play an important role in global geochemical cycles, like the global carbon cycle, or the cycling of iron and fertilization of the oceans.

Here we present the first geochemical measurements of the geochemical composition of basal water and pore water from beneath the West Antarctic Ice Sheet. Our results point towards an oxygen depleted environment in the Upstream C area (Kamb Ice Stream). Geochemical water and sediment also

indicate the removal of inorganic carbon potentially constituting a significant flux and release of inorganic carbon across the ice sheet grounding zone into the sub ice shelf cavity.

Our results also point out that subglacial environments are far from being understood and that sample recovery and insitu observations will be crucial for understanding subglacial environments and their role for ice sheet dynamic, the interaction between ice sheets, the underlying lithosphere and the oceans as well as the impact of subglacial processes on global geochemical cycles.

### **Pleistocene glaciation history of the Eurasian continental margin: Evidence from ODP holes on Yermak Plateau (Arctic Ocean)**

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In the past decade, terrestrial and marine sequences in Eurasia and the adjacent Arctic Ocean have been extensively studied in the frame of the ESF programme QUEEN (Quaternary Environments of the Eurasian North) leading to a comprehensive reconstruction of the timing and extent of major glaciations along the Eurasian continental margin in the past 200.000 years.

In contrast, the Early to Middle Pleistocene glaciation history is virtually unknown due to rather fragmentary terrestrial sequences and the lack of well-dated marine sediment cores. In this context, ODP Leg 151 Holes 910A and 911A are exceptional records because both comprise a complete sequence of the paleoenvironmental evolution in the Eastern Arctic Ocean in the Pleistocene.

These holes have been studied by a multi-parameter approach at a high resolution

using various sedimentological, mineralogical, micropaleontological and geochemical methods. Non-destructive measurements additionally provide continuous records of the variability in depositional conditions. Major steps in the long-term development of glaciations on the Northern Hemisphere such as the Mid-Pleistocene transition are reflected in the records from the Yermak Plateau. In particular, the northern Barents Sea Ice Sheet showed fluctuations obviously coeval with other segments of the Northern Hemisphere Ice Sheets. Mineralogical parameters indicate that the individual Eurasian ice sheets reacted differently to global cooling. Apparently, long-term centers of glaciations shifted from the Kara Sea to the Barents Sea since the early Pleistocene. Fluctuations in ice sheet extents obviously occurred on various time scales, and were partly related to stronger inflow of Atlantic waters into the Arctic Ocean. Superimposed on the long-term paleoenvironmental evolution, distinct short-term variability is reflected in various proxies. Spectral analyses revealed frequencies close to those of orbital variations, suggesting that Eurasian ice sheets are sensitive region to decipher climate change.

### **Ice-sheet variations as depicted in seismic records of the Amundsen Sea Embayment, West Antarctica**

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The dynamics of ice-sheets in response to climate changes becomes increasingly a focus of research. In this regard the glacial history of the Amundsen Sea sector of the West Antarctic Ice-Sheet (WAIS) is of particular interest. A potential deglaciation and collapse of the Thwaites and Pine Island glacier drainage basins alone would result in a global sea level rise of approximately 1.5 m. New multichannel seismic reflection data of high-resolution offer a record of the glacial development and processes in this area. We present a

first interpretation of five seismic profiles collected in the western Amundsen Sea Embayment as part of the RV Polarstern cruise ANT-XXIII/4 (2006). The sea-floor morphology of the observed area is highly variable. Close to the present coast, a rough topography includes several troughs with a depth of almost 2000 m which were probably formed by paleo-icestreams cut through the shelf. Here, the seismic lines reveal hardly any sediments. Only a thin sedimentary cover or some sediment pockets ( $< 80$  ms TWT  $\sim 60$  m) on and in between these steep and rugged structures can be identified. On the northern shelf and outside the troughs, the topography is generally smooth and shows only small surface undulations. Northwest-dipping reflectors are striking features in the seismic lines and indicate well pronounced sedimentary sequences of more than 1 s TWT thickness ( $> 800$  m). We suggest for this region a much quieter deposition realm, which was not much affected by melt water streams. These older and dipping layers form an unconformity with the young sedimentary cover running parallel to the seafloor. Only this uppermost cover is interrupted by small scale roughness features of a few meters height. At some locations, shallow and about 10 km wide channel-like structures cut through the upper sedimentary cover. They may be an indication for the activity of recent melt-water streams.

### **Höhenmodell der gegründeten Eiszungen im Umfeld der deutschen Überwinterungsstation Neumayer, Antarktis**

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Die Oberflächentopographie der Eisschilde ist von großer Bedeutung für exakte Berechnungen von Massenbilanzen und Modellierungen der Eisdynamik. Aus diesen Studien kann der Beitrag der Eisschilde im Hinblick auf die globalen Veränderungen des Meeres-

spiegels ermittelt werden. Es ist jedoch notwendig, hierfür ein möglichst genaues Höhenmodell einzusetzen. Die Küstenregionen des antarktischen Eisschildes spielen dabei eine wichtige Rolle, da sie die Übergangszone zwischen gegründetem und schwimmendem Eis bilden. Bereits vorhandene Höhenmodelle zeigen in diesen Regionen abweichende Höhen und besitzen oft nicht die nötige Genauigkeit um genaue Berechnungen zu ermöglichen.

Im Rahmen der CryoSat Cal/Val-Aktivitäten (CryoVEx) und der „International Partnerships in Ice Core Sciences“ (IPICS) Vorerkundung, wurden Anfang 2007 im Umkreis der deutschen Neumayer-Station bodengebundene kinematische GPS Messungen vorgenommen. Das Untersuchungsgebiet erstreckt sich von  $5^\circ$  bis  $11^\circ$  W und  $70^\circ$  bis  $72^\circ$  S. Im Fokus stehen die beiden das Ekstrømissen umgebenden gegründeten Eiszungen Halvfarryggen und Søråsen. Die kinematischen GPS Messungen sind um lokale GPS Referenzstationen zentriert, was zu einer Minimierung der systematischen Fehler bei der Post-Prozessierung führt. Jedoch sind diese GPS Messungen nur sehr kleinräumig, weshalb sie mit weiteren Datensätzen ergänzt werden. Hierfür wurden Laseraltimeterdaten über den Eisschilden des ICESat, GLAS12 Release 28, verwendet. Um eine noch höhere Datendichte zu erreichen, wurden flugzeuggestützte Radaraltimeterdaten (RA) bzw. Eisradardaten genutzt. Der neue Topographiedatensatz beruht auf der Kombination dieser Daten. Da das kinematische GPS weder von Wolken, noch durch die Hangneigung beeinflusst wird, wurden diese Daten als Referenz genommen. Alle weiteren Datensätze wurden hinsichtlich ihrer Höhenunterschiede zum GPS untersucht und ggf. korrigiert. Der neue Datensatz basiert auf korrigierten Datensätzen, die mittels dem „Ordinary Kriging“ Algorithmus auf ein  $1 \text{ km} \times 1 \text{ km}$  Raster interpoliert wurde. Durch die Kombination der bodengebundenen GPS Messungen mit Flugzeug- und Satellitenaltimetrie wurde ein sehr genaues Höhenmodell der Region um das Ekstrømissen erstellt. Ältere Topographiedatensätze, welche ohne Bodenreferenz-

messungen erstellt wurden, weisen deutliche Höhendifferenzen von bis zu 400 m gegenüber dem hier vorgestellten neuen Modell auf.

### **The effect of leads in the marginal sea-ice zone on the antarctic atmospheric boundary layer**

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The energy exchange between ocean and atmosphere in the arctic and antarctic marginal sea-ice zone is strongly influenced by the extent of sea-ice cover. While ice sheets have an isolating effect, areas with open water or thin new ice generate strong convection and turbulence due to the large temperature difference between air and water, especially in winter. This implies large vertical heat fluxes which significantly modify the structure of the polar atmospheric boundary layer.

Open water areas in the sea-ice zone are called leads and polynyas respectively.

Polynyas are large open water areas with diameters up to 200 km and more. In contrast to the lake-like polynyas, leads resemble channels in the sea-ice and have a width of several meters up to several kilometers. As leads and polynyas are observed during the whole year in the entire sea-ice zone, they have a significant effect on the polar climate which is still insufficiently considered in weather and climate models. Results of the LES model PALM and new helicopter based observations of turbulence over leads will be used to (further) develop parameterizations of the lead effect which can be used in models with different grid sizes ranging from microscale non eddy resolving models to weather forecast and regional climate models.

The parameterizations are tested in the nonhydrostatic mesoscale model METRAS. Shown are the results of LES parameter studies of antarctic leads, concerning different lead sizes, horizontal wind speeds and thermal stratifications. In addition, high-resolution simulations were carried out, featuring grid sizes down to 0.25 m. Therewith it is possible to resolve the turbulence not only behind but also directly above the lead, where the height of the convective boundary layer is only a few meters.





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- 2000/1 GEOLOGY 2000.** Geologische Vereinigung e.V., 90<sup>th</sup> Annual Meeting. Geological Society of Austria. Vienna, April 14-17, 2000. – 152 S. – *Verkaufspreis: € 11,50*
- 2000/2 4. Geochemie-Tagung.** Zusammenfassungen der Tagungsbeiträge. 31. Mai – 3. Juni 2000, GFZ Potsdam. – 138 S. – *Verkaufspreis: € 11,50*
- 2000/3 70. Jahrestagung der Paläontologischen Gesellschaft. Vorträge und Poster.** 24.–30. September 2000 in Coburg. – 184 S. – *Verkaufspreis: € 16,-*
- 2000/4 70. Jahrestagung der Paläontologischen Gesellschaft. Exkursionsführer.** 24.–30. September 2000 in Coburg. – 158 S. – *Verkaufspreis € 14,-*
- 2000/5 8. Symposium "Tektonik, Struktur- und Kristallingeologie".** Tagungsprogramm und Zusammenfassungen der Tagungsbeiträge. 4.–6. Oktober 2000, Freiburg i. Br. – 68 S. – *Verkaufspreis: € 11,50* **vergriffen**
- 2000/6 International Maar Conference 2000.** Program and Abstracts. Daun, Vulkaneifel (Germany) August 20-23, 2000. – 549 S. – *Verkaufspreis: € 22,-* **vergriffen**
- 2000/7 The Record of Human/Climate Interactions in Lake Sediments.** 5<sup>th</sup> Workshop of the European Lake Drilling Programme ELDP. October 7-12, 2000, Pallanza, Italy. – 157 S. – *Verkaufspreis: € 11,50*
- 2000/8 Sixth Workshop on Russian-German Cooperation: Laptev Sea System.** Program and Abstracts. St. Petersburg, Russia, October 12–14, 2000. – 81 S. – *Verkaufspreis: € 9,-*
- 2000/9 Erstes Erdwissenschaftliches Symposium.** Geotectonic Activities and Climate Change in the Baikalian region. 1<sup>st</sup> BAIKAL-SED International Workshop. Abstracts. November 18-22, 1999, Gesellschaft für Erdkunde zu Berlin. – 254 S. – *Verkaufspreis: € 14,50*
- 2000/10 From Secular Variation to Paleomagnetism.** A New View of the Dynamic Geomagnetic Field. Abstracts. November 9-12, 2000, GFZ Potsdam, Germany. – 121 S. – *Verkaufspreis: € 11,50*
- 2001/1 20. Internationale Polartagung der Deutschen Gesellschaft für Polarforschung.** Programm und Zusammenfassungen der Tagungsbeiträge. 26.-30. März 2001, Dresden. – 80 S. – *Verkaufspreis: € 6,-*
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