Helmholtz Climate Initiative

Regional Climate Change

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1 AWI

1A young Investigator sparc

2 Helmholtz-Zentrum Geesthacht, Zentrum für Material- und Küstenforschung

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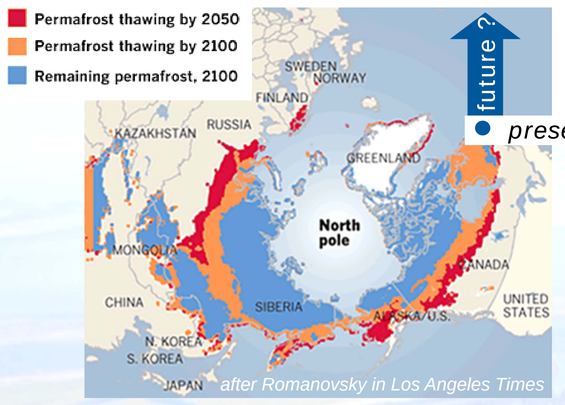
T3.2 Northern High Latitudes - Permafrost

Evaluation of Permafrost Remote Sensing Products and Background Parameterization for Models



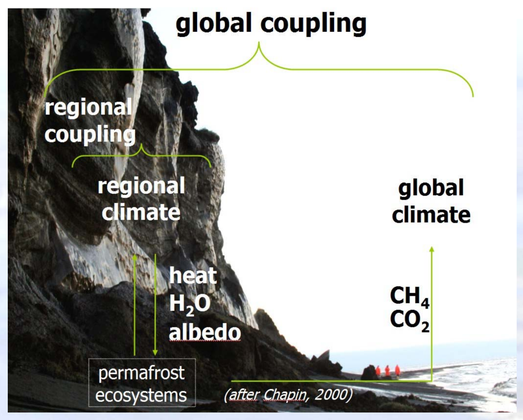
Global warming is most pronounced in high-latitudes.

Introduction

Terrestrial Permafrost

Permafrost (defined as ground below or at 0°C for at least 2 years) has been identified as one of six indicators of global climate change (World Meteorological Observation, WMO).

Permafrost is a key component of the cryosphere through its influence on regional energy and water exchanges, greenhouse gas fluxes and carbon budgets – and hence plays an important role in the global climate system.



The high-latitude ecosystems play a strong role in the climate system.

Regional-Scale Instruments

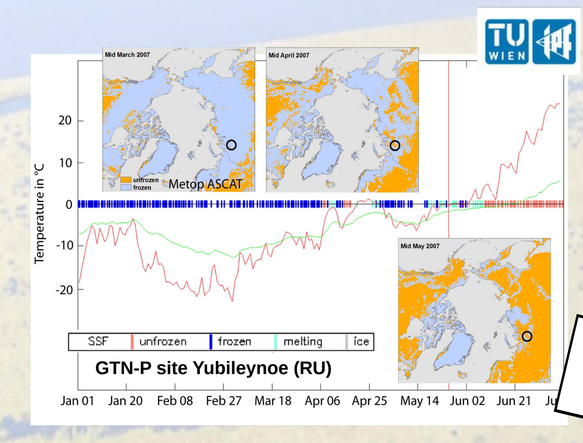
Operational Remote Sensing Observations

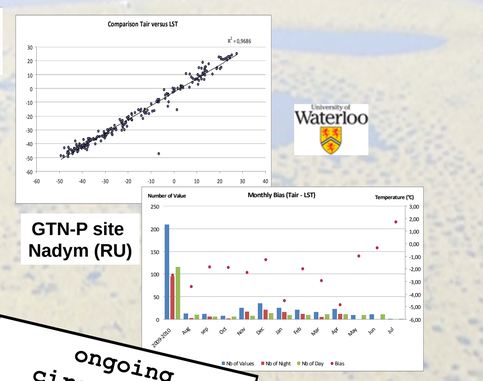
Evaluation

Using Circum-Arctic Ground Observations

GTN-P Global Terrestrial Network for Permafrost

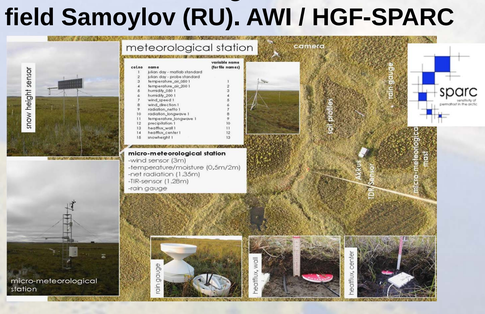
GTN-P Global terrestrial Network of Permafrost initiated by the IPA, authorized under GCOS



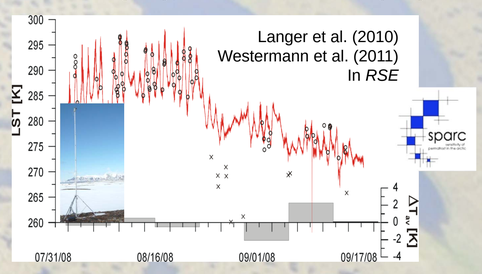


ongoing circumarctic evaluation

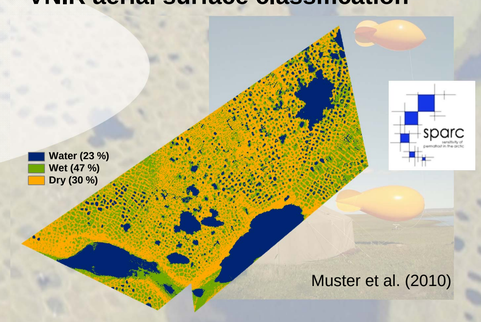
German-Russian long-term measurement field Samoylov (RU). AWI / HGF-SPARC



AWI / HGF-SPARC: Samoylov (RU), Svalbard (NO), Polar Bear Pass (CA)



AWI / HGF-SPARC: Samoylov (RU), VNIR aerial surface classification



Muster et al. (2010)

Evaluation of

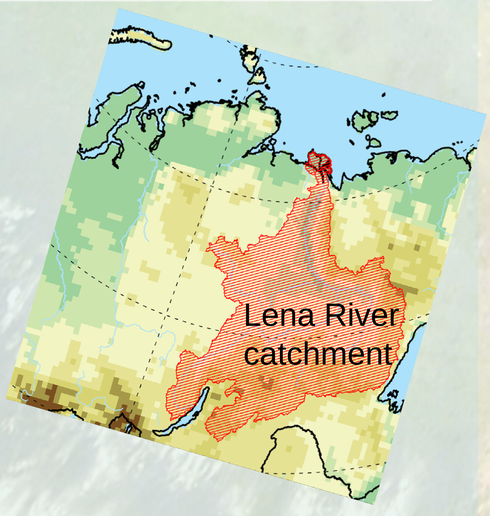
global and regional input-datasets (land cover, soils) [outside model]

external background parameters (albedo, fraction vegetation, LAI, Z_0, thermal emissivity) [outside model/ modelled]

output parameters (soil moisture, frozen/ thawed state, temperature) [modelled]

Regional Climate Modelling

COSMO-CLM (model of the Consortium for Small-scale Modelling in CLimate Mode)



to provide a consistent meteorological data set at high spatial- and temporal resolution

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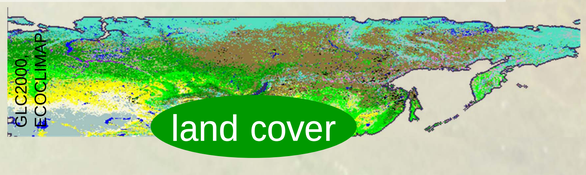
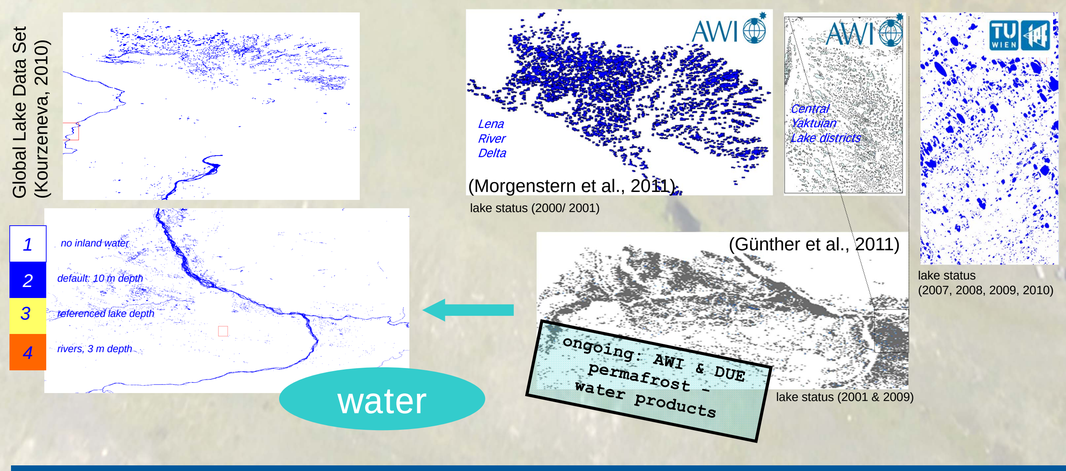
Evaluation of Background-Data for Modelling

First Results:

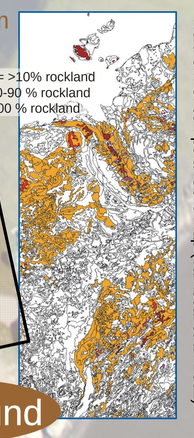


tundra: 100% vegetation cover & wetlands & ponds

but: model LUT definition for tundra: sparce vegetation, 50% barren!



Soil background-data from the FAO (1971-1981): contain no ‚rock' in mountain regions



ongoing: new digigal Data based on the N' Circumpolar Soils Maps and the Soil Atlas of the N' Circumpolar Region (2010)

subground

Ongoing

New regional to circum-arctic thematic background data: soils/rock, water bodies, wetlands, peatland

Adaptation of pre-processing for models for permafrost regions

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

HelmholtzZentrum münchen, Deutsches Forschungszentrum für Gesundheit und Umwelt

JÜLICH FORSCHUNGSZENTRUM

Helmholtz-Zentrum Geesthacht, Zentrum für Material- und Küstenforschung

KIT Karlsruhe Institute of Technology

GFZ Helmholtz Centre Potsdam

HELMHOLTZ ZENTRUM FÜR UMWELTFORSCHUNG UFZ

DLR