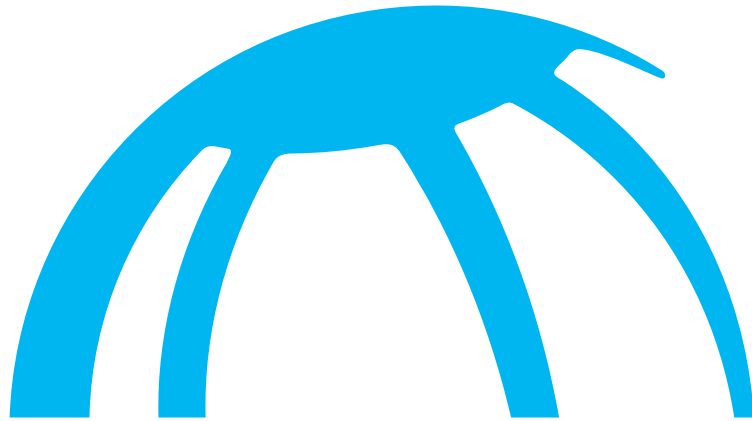
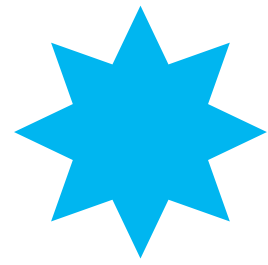




XI. INTERNATIONAL CONFERENCE ON PERMAFROST

POTSDAM, GERMANY
20-24 JUNE 2016

Exploring Permafrost
In a Future Earth

BOOK OF ABSTRACTS

Edited by Frank Günther and Anne Morgenstern

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Co-editors: Lydia Polakowksi, Matthias Fuchs, Ingmar Nitze, Samuel Stettner,
Hugues Lantuit & Guido Grosse

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Preface

The Local Organizing Committee (LOC) of the Eleventh International Conference on Permafrost (ICOP2016) is excited about the breadth and the quality of the abstracts submitted for this conference.

It was the first time that ICOP topical sessions were not set by the organizing committee in a top-down manner. Instead, sessions were submitted from the bottom-up by groups of researchers and engineers from all over the world. This grassroots effort prompted the submission of many innovative topics covering the full range of modern permafrost research. It also facilitated not only the engagement of the core permafrost community, but also of science disciplines traditionally less involved in ICOPs. In total, 51 session proposals were received by the LOC. These were submitted by up to three conveners including at least one early career researcher from the Permafrost Young Researchers Network (PYRN). After the evaluation process by the International Scientific Committee (ISC) and the LOC, including the addition of strategic topics and the combination of sessions with thematic overlap, 40 topical sessions were eventually opened for abstract submission. There was yet another novelty compared to previous ICOPs: the submission of contributions was not divided into abstracts and papers, in favor of a quicker and uniform review process allowing for the submission deadline to be set closer to the conference. This opened the possibility for authors to present recent results in the rapidly

evolving field of permafrost research. Abstracts of up to 3000 words were allowed, either plain or formatted with subheadings, and including one figure, table or equation.

We received the extraordinary number of 980 abstracts. This number varied between 79 and 0 among sessions, which led to a further consolidation into the final set of 32 sessions presented in this abstract volume. Abstract evaluation was placed in the hands of the session conveners. The vast majority of abstracts (97 %) was deemed eligible to be accepted for presentation during the conference, either immediately or after revision by the authors. The reduced number of abstracts presented in this volume is mostly due to the inability of travelling to the conference for some authors.

We are very delighted that the modified procedures for the compilation of the scientific conference program proved so successful and wish to extend our gratitude to the session conveners and ISC members for their tremendous efforts and great support in compiling such a high-quality program. We also wish to thank Lydia Polakowski, Matthias Fuchs, Ingmar Nitze, Samuel Stettner, Hugues Lantuit, and Guido Grosse for their technical help in the final editing phase of this abstract volume.

Frank Günther and Anne Morgenstern



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Plenary Session

From 1D to 4D – recent developments in mountain permafrost research

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Recent developments in mountain permafrost research can be approached at different levels or ‘dimensions’ and clearly indicate achievements as well as upcoming challenges.

The number of high-resolution data at single points (1D) has increased and delivers valuable data such as temperatures (underground, surface) or deformation (underground, surface), approving the occurrence of permafrost in many mountain areas. Very recently, the oldest rockglacier borehole at Murtél, Switzerland (running since 1987) was complemented by a new borehole to guarantee continuity (longterm monitoring) at this specific site. The 1D information can be used to prove the spatial extent of permafrost occurrence (2D) by mapping or modelling approaches. The availability of high resolution remote sensing data sets has improved for many mountain regions and builds an important base for mapping and modelling on different scales. Recently a first comprehensive map of permafrost distribution in the Himalaya was published. With the third dimension, the topography and the characteristics for mountains by definition (altitude, relief, steep slopes) become more important. In mountain areas, topographic as well as climatic parameters vary significantly within short distance and influence

the energy balance very locally. Related geomorphological processes and landforms (e.g. rockglaciers) are highly dependent on these local conditions. The fourth dimension includes the changes in time, giving insight in ongoing processes of permafrost degradation or aggradation, as observable at single points (1D), over larger areas (2D) and entire landforms (3D). This dimension is relevant in observational time scales, but also in retrospective (palaeopermafrost evolution) and anticipatory (future evolution) modelling approaches.

With the increasing number of long-term information and high-resolution data on permafrost occurrence, thickness, temperature and dynamics in high mountain areas, the current changes become more and more respected and result in an improved process understanding. Geomorphic processes such as rock falls, detachment slides as well as rockglacier acceleration and destabilization indicate reactions to changes in the thermo-hydrological regime and hence demonstrate the sensitivity of mountain systems to recent climatic changes. Related impacts of degrading or vanishing permafrost affect human societies directly and indirectly from very local to global scales, from mountain regions down to the foothills and lowlands.



Livelihoods on Frozen Ground: Why Permafrost Matters to Indigenous Communities in Siberia and Elsewhere

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Over the last years, scientific research and media coverage about the risks and consequences of permafrost degradation have been increasing. In particular, indigenous peoples in subarctic regions are considered to face serious difficulties in adapting to rapid environmental change. What has rarely been discussed, however, is the fact that pastoralism and other forms of renewable resource use in northern Eurasia had to grapple with rapid change in earlier

periods too. This presentation will illustrate how past permafrost degradation has facilitated (rather than impeded) particular forms of Northern pastoralism. It also discusses the extent to which indigenous groups have exerted anthropogenic changes in permafrost-based landscapes. Finally, this keynote will sketch out how indigenous communities in different parts of northern Eurasia may be able to cope with and respond to future permafrost degradation.

Permafrost-Ecosystem Interactions

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Ecological processes affect permafrost aggradation and degradation by altering boundary-layer conditions, and in turn, changing permafrost conditions affect ecological development. The nature and distribution of permafrost can be conceptualized as a function of interacting state factors, such as climate, geology, topography, hydrology, soils, vegetation, disturbance and time, following Jenny's state-factor approach. To assess the effects of these ecological components on permafrost distribution, soil thermal regimes, and ground ice characteristics, we have explored five general approaches involving disturbance and experimental manipulations, integrated-terrain-unit classification, n-factors, chronosequence sampling at the landscape scale, and multivariate analysis of effects of landscape components on permafrost distribution at the region scale. Natural and human disturbance, as well as experiments involving canopy and ground cover removal, provide controlled conditions for assessing the sometimes dramatic effects of changing vegetation and soil conditions on permafrost stability under uniform climatic conditions. The terrain-unit approach has long been effective at relating the abundance and morphology of ground ice to surficial geology, and to a lesser extent to topography and vegetation. N-factors have been used as a simple integrator of the effects of ecological conditions on soil thermal regimes, and multiple-regression analyses have found topography, vegetation structure, snow depth, and soil organic thickness to be signi-

ficant factors affecting soil temperatures. Sampling along chrono-sequences in landscapes with ecosystems in varying stages of successional development after disturbance, such as river channel migration, lake drainage, or fire, has shown that soil temperatures and ground ice are closely related to ecological changes that have occurred over periods of decades to millennium, and that ground-ice aggradation modifies the surface, causing feedbacks that lead to soil and vegetation changes. Disturbance related to fires and human activity, as well as climate change, can initiate permafrost degradation and loss of ground ice that leads to nearly complete reorganization of ecosystem patterns and processes. Immediately upon thawing, hydrologic shifts either through subsurface drainage in thaw-stable, coarse-grained soils, or from water impounding in collapsing depressions, to greatly alter vegetation and soil processes. Nutrient release, vegetation growth, and organic soil accumulation can lead to permafrost stabilization and recovery within decades to centuries. Finally, regression-tree analyses of large regional ground and remote sensing datasets have revealed nonlinear relationships among the state factors to control permafrost distribution. Overall, these permafrost-ecosystem interactions allow permafrost to degrade at mean annual air temperatures (MAAT) of -16°C in the high Arctic and to persist at MAATs of 2°C in boreal forests, greatly complicating our ability to predict the effects of climate change on permafrost.

Reconnaissance palaeoenvironmental study of 90 m of permafrost deposits at Batagaika megaslump, Yana Uplands, northern Siberia

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The headwall of a megaslump at Batagaika, in the Yana Uplands of northern Yakutia, exposes a remarkable stratigraphic sequence that may provide a long or high-resolution record of Quaternary palaeoenvironmental change. The sequence of about 90 m of permafrost sediments ('ice complex') is dominated by fine sand and very fine sand, with small amounts of silt. The stratigraphy includes a banded unit containing about 16 organic layers beneath a unit of yedoma containing large syngenetic ice wedges. Between these units is a prominent black layer about 1 m thick, with an erosive base.

This presentation reports the results of a reconnaissance study of the Batagaika deposits that outlines their stratigraphy, age and potential palaeoenvironmental significance. Sampling of the basal sequence was performed in 2011 and of the main part of the sequence in 2013. Sediment samples were collected from different stratigraphic units to determine their sedimentological and palaeoecological properties, and four samples of wood and roots were ^{14}C dated to indicate, in outline, the age of the sequence. Analysis of sediment properties, pollen, spores, diatoms, phytoliths, vertebrate remains and plant macrofossils provides a palaeoenvironmental framework for interpreting the

Quaternary history of the permafrost deposits.

We consider two palaeoenvironmental hypotheses. Hypothesis 1 interprets the prominent black layer as the Last Interglacial palaeosol/forest bed, similar to the Eva Forest Bed dated to about 125 ka in central Alaska (Péwé et al., 1997). Hypothesis 2 interprets the organic layers in the underlying unit as the Karginsky Pedocomplex, in line with Haesaerts et al.'s (2005) reconstruction of 14 warm climatic episodes between 29,000 and 26,500 BP based on multiple palaeosols within loess at Kurtak in southern Siberia. Our preliminary results favour hypothesis 1 and provide tentative correlations between Batagaika and the loess-palaeosol stratigraphy of central Alaska.

References

Haesaerts, P., Chekha, V.P., Damblon, F., Drozdov, N.I., Orlova, L.A., Van der Plicht, J., 2005. The loess-palaeosol succession of Kurtak (Yenisei basin, Siberia): a reference record from the Karga Stage (MIS 3). *Quaternaire* 16, 3–24.

Péwé, T.L., Berger, G.W., Westgate, J.A., Brown, P.M., Leavitt, S.W., 1997. Eva Interglaciation Forest Bed, unglaciated central Alaska: global warming 125,000 years ago. *Geological Society of America Special Paper* 319.