[EE] Evening Poster | M (Multidisciplinary and Interdisciplinary) | M-ZZ Others

[M-ZZ39]Environmental, socio-economic and climatic changes in Northern Eurasia

convener:Pavel Groisman(NC State University Research Scholar at NOAA National Centers for Environmental Information, Asheville, North Carolina, USA), Erwan Monier(Massachusetts Institute of Technology), Shamil Maksyutov
Tue. May 22, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)
We invite presentations on the biogeochemical and hydrological cycles, climate and ecosystem interactions in Northern Eurasia (land-cover and land-use change, atmospheric aerosols, soil, and permafrost changes that affect and are being affected by human activity, climate and ecosystem change), human dimension, and tools to address the Northern Eurasia studies.

In environmental studies, our Session foci are on the carbon cycle of Northern Eurasia and on the permafrost changes in Siberia, Asian Mountains, and the Arctic coastal regions.

In the regional water cycle studies, our Session foci are on the changing distribution of precipitation intensity, frequency, especially, in the cold/shoulder season transition periods when surface air temperature is close to 0 deg. C, and on the pattern and seasonal cycle changes of runoff.

In the human dimension studies, our Session foci are on assessments of impact of the ongoing environmental changes in Northern Eurasia on the human well-being and on mitigation strategies development in response to harmful consequences of these changes.

Among the tools, a special attention at the Session will be paid to the perspectives of improving the coupling between the human and natural systems, through the use of Earth system models and integrated assessment models, to explore interactions and feedbacks between the various components of the coupled human-Earth system and to understand the role of Northern Eurasia in the global Earth system.

Three particular regional foci of this Session will be the studies of changes that impacts regional sustainable development in the Dry Latitudinal Belt of Northern Eurasia, the Eurasian Arctic, and the boreal forest zone of Northern Eurasia.

We invite also early career scientists associated with (or interested in) the Northern Eurasia Future Initiative (http://nefi-neespi.org/NEFI-WhitePaper.pdf).

[MZZ39-P03]Conquering the permafrost: urban infrastructure development in Norilsk, Russia

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Keywords:Permafrost, Russian, Urban Development, Arctic, Infrastructure

The city of Norilsk was established in 1935 as a GULAG mining and metallurgy work camp to explore the rich deposits of non-ferrous metals. By the 1989, the population of Norilsk reached 179,757 people. Two additional cities were developed in proximity to Norilsk in the 1960s-1980s: Talnakh (1989 population 65,710); and Kaerkan (1989 population 29,824) making the Norilsk region a major Arctic metropolis.

While such rapid growth is not unusual for developing industrial cities, the geographic location makes Norilsk rather unique among world urban centers. It was built in Central Siberia at 69°51' N latitude (above the Arctic Circle), in region characterized by harsh subarctic climate (mean annual temperature around -10 ^{o}C), over forest tundra/tundra transitional landscapes underlined by perennially frozen ground (permafrost). Throughout its existence, the Norilsk region was highly isolated: it is not connected to Russian road and railroad systems.

The harsh environmental conditions provided significant and rather unique challenges to Norilsk development. Specifically, the presence of ice-rich permafrost imposed restrictions on application of standard urban planning and engineering practices. This presentation analyzes the history of permafrost construction in Norilsk. It shows how though initial trial and errors, a set of guiding principles and engineering methods of construction on permafrost were developed allowing a rapid urbanization of the area during the 1960-1980s. However, despite significant advances in permafrost engineering, the pronounced permafrost degradation has become evident in Norilsk by the mid 1980s and has accelerated rapidly since the mid 1990s resulting in widespread deformation of buildings. Climatic changes are frequently identified as a major cause of accelerated deterioration of infrastructure build on permafrost. However, we argue that other factors, including the complexity of interactions between deferent components of urban infrastructure and permafrost, quality of construction, operation, and maintenance of infrastructure as well as socio-economic transformations are also responsible for emergence and intensification of the negative permafrost-related geotechnical processes manifested by the structural deformations of buildings in Norilsk.