[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-P05]HUMAN-ASSOCIATED EXTREME EVENTS: FREEZING PRECIPITATION

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Keywords:freezing rain, freezing drizzle, weather conditions conducive to freezing precipitation, northern extratropics

Freezing precipitation events intertwine with agriculture, recreation, energy consumption, and seasonal transportation cycles of human activities. While not rare, such events are known as "human-associated extremes" (HAE) and deserve our attention, especially when their intensity, timing, and type begin changing. We have already observed significant changes in freezing precipitation occurrences in the past decade. Can we project the future changes in pattern of this HAE over the northern extratropics under conditions of increasing lower tropospheric temperatures, changes in the atmospheric circulation, water content, and vertical structure? The problem here is that the synoptic reports about the freezing rain (FR) and freezing drizzle (FD) occurrences cannot be projected into the future, are not regularly available in the existing synoptic reports, are affected (masked) by other weather event reports (Russia and Belarus), or have been severely contaminated during switches to automated weather reporting (FD and weather code reporting itself). Therefore, the objective of our study is to build a combination of standard weather variables to reveal ***weather conditions conducive to freezing precipitation*** (WCCFP) and thereafter to extrapolate the occurrence of these conditions toward the regions without synoptic observations and to the future. The first part of this scientific program, construction of WCCFP parameters, will be presented.

We used supplementary synoptic information to evaluate the weather conditions during the freezing events observed at more than 1,500 long-term (i.e., 40+ years) stations in North America and Northern For these stations, we estimated the near-surface temperature (T) and humidity (H) intervals, within which the freezing events do occur. It appears that within these T and H intervals the other precipitation events occurred also and they are not necessary characterized by freezing. Therefore, we used Integrated Global Radiosonde Archive to blend our synoptic data with collocated upper air soundings and selected those that corresponded to freezing events at the ground. For freezing events, we found and quantified (a) unusually warm air as compared to long-term climatology values of corresponding Julian day; (b) much warmer low tropospheric air temperature than in the "nearby" days without freezing event at the ground; (c) frequent near surface temperature inversions, when the air at the 850 hPa is warmer than at the surface and the troposphere temperatures are warm enough to let the snowflakes to be condensed into rain drops, and (d) the lowest troposphere and near surface temperatures are cold enough to cool the temperature of these rain drops below freezing.

Combination of these meteorological variables (near-surface temperature, humidity, and the low troposphere temperature anomalies and gradients) allows us to build a set of the weather conditions that are *conducive* to freezing precipitation occurrence when it rains.