

**JOINT CRAICC-PEEX RESEARCH AND EDUCATION ACTIVITY
MAIN RESULTS OF SERIES OF JOINT WORKSHOPS ORGANIZED IN 2015-2016**

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INTRODUCTION

In 2014 Nordforsk opened a call for a joint research and education activity enhancing collaboration between Nordic Centres of Excellence and Russia research communities. A joint proposal introduced by Nordic Center of Excellence “Cryosphere-atmosphere interactions in a changing Arctic climate“ (CRAICC) and Pan-Eurasian Experiment (PEEX) was selected for funding for the years 2014-2016. The aim of this activity was to enhance research collaboration between CRAICC and PEEX in six selected topical fields: (i) short-lived climate forcers in the Arctic and Eurasia, (ii) carbon exchange in the soil/cryosphere – vegetation - atmosphere continuum, (iii) climate change for Arctic seas and shipping, (iv) climatology of the high-latitude planetary boundary layer and (vi) climatology of the high-latitude planetary boundary layer and turbulent exchange across strongly heterogeneous interface.

The joint CRAICC-PEEX activity was implemented via organizing series of workshops representing in a frame of above listed topical areas in 2014-2016. The Nordic partners representing CRAICC have been University of Helsinki, Finnish Meteorological Institute, Norwegian Institute for Air Research, Stockholm University, University of Århus, University of Iceland, and the partners representing PEEX and Russian communities have been Nansen Environmental and Remote Sensing Center, Danish Meteorological Institute, Institute of Geography (RAS), Moscow State University, AEROCOSMOS, Institute of Atmospheric Optics (SB RAS), Russian State Hydrometeorological University, Institute of Geography (IG RAS) and Laboratory of Climatology (IG, RAS).

WORKSHOP OVERVIEW

The 1st CRAICC-PEEX workshop brought together 17 participants from Russia, Sweden, UK and Finland for topical sessions on the SLCF-modelling-in situ observations in the Arctic and subarctic regions of Eurasia. The WS was organized by the University of Helsinki in a connection of UHEL-UK modelling WS and Helsinki University summer school in Hyytiälä, Finland. The WS-1 process, discussions were continued in a connection of the 1st PEEX Science Conference in Helsinki in February 2015. During this process we have updated the PEEX – CRAICC communities with on-going preparatory work for the hierarchical PEEX observation network. Starting from August 2014 we have made preparatory work for metadata collection of the existing land- atmosphere observation activities and networks in Russia, China and in the Nordic Countries. The meta database is an interactive tool that will be updated regularly by the PEEX community and station operators. Also the pathways to solidify the PEEX network have been analyzed including how to connect the existing stations the meta database and actions to connect individual activities to GAW station network. The results of a case study on evaluating model simulated

short lived climate pollutants in the high latitude Pan-Eurasian region” (Spracklen et al.) will be submitted to J. Atmospheric Chemistry and Physics PEEEX Special issue.

The 2nd joint workshop on the carbon exchange research and the ecosystem research infrastructures in the Arctic and subarctic regions of Eurasia was organized together by the University of Helsinki and Finnish Meteorological Institute and took place in February 2015 in Helsinki Vuosaari, Finland. The workshop brought together 43 participants from Russia, Sweden, Germany and Finland. The WS was aimed to explore and enhance the collaboration possibilities among participants and to design the PEEEX observation infrastructure in carbon exchange research. The scientific focus was on the issues how to measure the key processes and feedbacks, key regions and interactions between measurements and models. The workshop managed to bring in a large selection of infrastructures and research themes, linking the different carbon cycle processes together. Understanding of these processes in the Arctic is still limited, and many regions are lacking proper facilities to conduct comprehensive measurements. An important topic was how to improve the joint work of the community in making better use of the existing measurements and data. It was agreed that the data flow should be improved, but that currently there are great obstacles to obtain data from Russia. The coverage of data for models was also discussed. The GHG fluxes are rather small compared to anthropogenic emissions, and thus it seems that the potential misrepresentation or lack of measurements does not largely affect the outcomes of GCMs. The largest uncertainties are in wetland emissions, energy exchange, snow cover changes, albedo, and these measurements should be improved.

The 3rd joint workshop for “Climate Change for Arctic Seas and Shipping” took place in Aug 2015 at Danish Meteorological Institute (DMI, Copenhagen, Denmark). In total, more than 30 researchers and students attended the event from universities and research institutions from China, Denmark, Finland, Japan, Russia, Switzerland, and Sweden (<http://research.dmi.dk/events/upcoming-events/3rd-craicc-peex-workshop>). Based on 3rd WShop outcomes, it is critical to follow what kind of needs and requirements are important to take into account for maritime industry, services and increased shipping in the Arctic, where providing ice and maritime services and predicting capabilities for shipping are essential. Climate change projections became important for possibilities to increase ship traffic in the Arctic region. Future scenarios of increased ship emissions, effects on atmospheric pollution, feedbacks on meteorology and climate are also valuable to investigate. Forecasting of extreme weather events for shipping in this region and link with climate change became very important. Moreover, requirements from end-users on what is needed for practical realization and mitigation scenarios should be realised.

The 4th workshop on “Estimating and monitoring anthropogenic emission in the Arctic by using remote sensing, was organized together with GC Rieber Climate Institute (GCR) and Pan-Eurasian Experiment (PEEX) workshop at NERSC, Norway in September 2015. The Climate Processes Group – GC Rieber Climate Institute (GCR) at the Nansen Environmental and Remote Sensing Centre is developing a coherent research strategy to address the scientific challenges of the rapidly warming high latitudes of the Earth. This workshop summarized the available expertise in the GCR and drafted ideas for perspective research directions compatible with the international Pan-Eurasian Experiment (PEEX) (Lappalainen et al., 2015). PEEEX (<https://www.atm.helsinki.fi/peex/>) is a multidisciplinary, multi-scale bottom-up open scientific initiative. The PEEEX approach emphasizes that solving challenges related to climate change, air quality and cryospheric change requires largescale coordinated co-operation of the international research communities. The workshop presentations discussed both the large- and small-scale components of the climatology of the high-latitudes. A particular attention has been given to the links between climate scales as well as to the scales shaping the climate impact on society (Esau and Petterson 2016).

The 5th and 6th workshops on “the climatology of the high-latitude planetary boundary layer” and “the turbulent exchange across strongly heterogeneous interface” will be organized in May 2016, in Beijing China as a part of the 2nd PEEEX Science Conference.

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