

Pan-Eurasian Experiment (PEEX) focused on holistic understanding of feedback loops in the climate and Earth system and their impacts on the development of the Arctic-boreal regions

M. Kulmala¹, H.K. Lappalainen^{1,2}, T. Petäjä¹, T. Kurten³, V.-M. Kerminen¹, Y. Viisanen², V. Kotlyakov⁴, N. Kasimov⁵, V. Bondur⁶, G. Matvienko⁷, A. Baklanov⁸, HD. Guo⁹ and S. Zilitinkevich^{1,2,110}

¹Dept. of Physics, University of Helsinki, Finland.

²Finnish Meteorological Institute, Helsinki, Finland

³Dept. of Chemistry, University of Helsinki, Finland.

⁴The Institute of Geography RAS, Russia

⁵Moscow State University, Russia

⁶AEROCOSMOS, Russia

⁷Inst. of Atmospheric Optics SB RAS, Russia

⁸World Meteorological Organization, Switzerland

⁹Institute of Remote Sensing and Digital Earth, CAS, China

¹⁰ Dept. of Radiophysics, Nizhny Novgorod State University, Russia

Keywords: climate change, biogeochemical cycles, atmospheric aerosols, atmospheric boundary layer, research infrastructures, atmospheric and ecological measurements, Siberian ecosystems, Arctic Ocean, remote sensing, education programmes, socio-economic research

Presenting author email: veli-matti.kerminen@helsinki.fi

The global environment is changing rapidly due to anthropogenic influences, as a result of which the mankind is faced with several “Grand Challenges” during the 21st century. Two of these challenges, climate change and air quality, depend crucially on the changing atmospheric composition, more specifically on the concentrations of greenhouse gases, reactive trace gases and aerosol particles. In the future the arctic-boreal natural environment will play a crucial role for the global climate via the albedo change, carbon sinks and emissions, methane emissions and aerosol production via biogenic volatile organic compounds (BVOCs) (Arneth et al. 2010, Carslaw et al. 2010, Kulmala et al. 2014). Furthermore, concomitant with the severe climate change in Northern Eurasia, the atmospheric composition over this region is under a continuous change.

Over the last few years, Earth system science has emerged as one of the most rapidly developing scientific fields. This growth is facilitated by the importance to understand the fundamental scientific processes of climate change and air quality as well as the increasing impact of this research area. In order to advance this understanding further and apply it for reliable climate scenario development, mitigation and adaptation planning as well as early warning system development, we need a research approach combining a holistic scientific understanding of the climate-air quality feedbacks and interactions including the multi-scale modeling, continuous comprehensive observations and open data systems.

The Pan-Eurasian Experiment (PEEX) Program (<https://www.atm.helsinki.fi/peex/>) is filling the some of

the most critical scientific gaps. PEEX is a new multidisciplinary, multi-scale research initiative focused on understanding biosphere-ocean-cryosphere-climate-society interactions and feedbacks. PEEX is covering the Arctic and boreal regions in the North Eurasia geographical domain including China as a crucial area both in source and impact point of view. PEEX operates in an integrative way, and it aims to solve the major scientific and society relevant questions at multiple scales using tools from natural and social sciences and economics. The scientific results of PEEX will be used to develop new climate scenarios on global and regional scales. PEEX aims to contribute to the earth system science agenda, to climate policy concerning topics important to the Pan-Eurasian environment, and also aims to help societies of this region in building a sustainable future.

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