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Pan-Eurasian Experiment (PEEX) Program and GlobalSMEAR (Stations for Measuring Earth Surface–Atmosphere Relations) Initiative

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Abstract

The Pan-Eurasian Experiment (PEEX) program was initiated as a bottom-up approach by the researchers coming from Finland and Russia in 2012. During its operation, the program has built extensive research network, especially in Russia and China, and delivered a Science Plan (Lappalainen et al., 2016) for the Northern Eurasian region. PEEX has introduced a concept design for a seamless modelling platform (Baklanov et al., 2018), ground-based in situ observation systems (Hari et al., 2016) for detecting land/ocean–atmosphere interactions and the arctic marine PEEX concept (Vihma et al., 2018). The main scientific mission of the PEEX program is to understand large-scale feedbacks and interactions between the Earth surface–atmosphere continuum in the changing climate of northern high latitude and in China.

PEEX is currently carrying out its research activities on a project basis and promoting the research infrastructure framework GlobalSMEAR (Stations for Measuring Earth Surface–Atmosphere Relations) outside Europe, especially in Russia and China. The GlobalSMEAR is an approach towards integrated Global Earth observatory (Kulmala, 2018) initiated by Academician Markku Kulmala and coordinated by Institute for Atmospheric and Earth System Research (INAR) of University of Helsinki. The mission is to establish a global network of well-equipped environmental observatories, carrying out comprehensive, continuous observations to observe Earth surface–atmosphere relations. The SMEAR concept is supporting the implementation of the GlobalSMEAR initiative and offers an observation platform that provides continuous, comprehensive environmental information from local level up-to the global Grand Challenges. GlobalSMEAR enables upgrading of the existing stations by adding a site-specific SMEAR-concept instrument setup together with technical guidance. The most well-equipped station implementing the SMEAR concept is the SMEAR II (a Station for Measuring Ecosystem-Atmosphere Relations) in Hyytiälä, Finland. During the past ten years, the SMEAR II station has been a major contributor to several Pan-European research infrastructure design, integrated activity and preparation projects that are currently on the ESFRI Roadmap, such as ICOS (Integrated Carbon Observation System), ACTRIS (Aerosols, Clouds, and Trace gases Research Infrastructure), eLTER (Integrated European Long-term Ecosystem, critical zone and socio-ecological system Research Infrastructure), and AnaEE (Infrastructure for Analysis and Experimentation on Ecosystems).

PEEX has also just recently released its Silk Road agenda (Lappalainen et al., 2018) together with the Digital Belt and Road (DBAR) Initiative. The near-future challenge is to achieve a successful integration of the methodological approaches of the socio–economic research to environmental sciences and to release the 1st scientific overview of the PEEX region.

Focus of Research

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Key Challenges

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Suggestion to Address these Challenges

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