**Pan-Eurasian EXperiment (PEEX) and integrated Global Earth observatory GlobalSMEAR Initiative**

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**Keywords:** Multidisciplinary approach, Multiscale research, Global Earth observatory, Earth surface–atmosphere interactions, European research infrastructures

The Pan-Eurasian EXperiment (PEEX; <https://www.atm.helsinki.fi/peex>) is a multidisciplinary climate change, air quality, environment and research infrastructure program focused on the Northern Eurasian domain. Its main scientific aim is to understand large-scale feedbacks and interactions between the land-atmosphere-sea continuum in the changing climate of northern high latitude and in China. PEEX has delivered a Science Plan1for the Northern Eurasian region and introduced a concept design for a seamless modelling platform2, ground-based *in situ*observation systems3 for detecting land–atmosphere and ocean–atmosphere interactions, the arctic marine PEEX concept4, and has also just recently released its Silk Road agenda5 in collaboration with the Digital Belt and Road (DBAR) Initiative. The PEEX program in Pan-Eurasia has an impact not only on science but also on science diplomacy in Russia and China.

PEEX program was initiated as a bottom-up approach by the researchers coming from Finland and Russia in 2012. During its five years in operation, the program has built extensive research network, that involves already over 100 Universities and research institutes and over 40 companies from Russia, China, EU-Countries, US and Canada. Furthermore, PEEX has a sister program DBAR with wide partnership via the Silk Road. PEEX is hosting an Arctic-Boreal Hub and the head of PEEX program, Academician Markku Kulmala, is a president of the European Center of International Eurasian Academy of Sciences (IEAS) and member in Chinese Acadamy of Sciences (CAS).

PEEX is currently promoting the research infrastructure framework GlobalSMEAR outside Europe, especially in Russia and China. The GlobalSMEAR is an approach towards integrated Global Earth observatory6 initiated by 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, SMEAR (Station for Measuring Earth Surface–Atmosphere Relations) flagship stations, carrying out comprehensive, continuous observations to observe Earth surface–atmosphere relations. The most well-equipped station implementing the SMEAR concept is the SMEAR II (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), and AnaEE (Infrastructure for Analysis and Experimentation on Ecosystems).

The establishment of new SMEAR flagship stations not only in Russia and China but also across Silk Road countries like Mongolia and Kazakhstan are envisioned and they will enable the regional policy makers to be able to make sustainable decisions based on comprehensive environmental data. GlobalSMEAR enables upgrading of the existing stations by adding a site-specific and tailored SMEAR-instrument setup together with technical guidance with a detailed data exploitation and science plan.

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