

## **Connecting ground based in-situ observations, ground-based remote sensing and satellite data within the Pan Eurasian Experiment (PEEX) program**

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300 words:

Human activities put an increasing stress on the Earth' environment and push the safe and sustainable boundaries of the vulnerable eco-system. It is of utmost importance to gauge with a comprehensive research program the current status of the environment, particularly in the most vulnerable locations. Pan-Eurasian Experiment (PEEX) is a new multidisciplinary research program aiming at resolving the major uncertainties in the Earth system science and global sustainability questions in the Arctic and boreal Pan-Eurasian regions.

The PEEX program aims to (i) understand the Earth system and the influence of environmental and societal changes in both pristine and industrialized Pan-Eurasian environments, (ii) establish and sustain long-term, continuous and comprehensive ground-based airborne and seaborne research infrastructures, and utilize satellite data and multi-scale model frameworks filling the gaps of the in-situ observational network, (iii) contribute to regional climate scenarios in the northern Pan-Eurasia and determine the relevant factors and interactions influencing human and societal wellbeing (iv) promote the dissemination of PEEX scientific results and strategies in scientific and stake-holder communities and policy making, (v) educate the next generation of multidisciplinary global change experts and scientists, and (vi) increase the public awareness of climate change impacts in the Pan-Eurasian region.

In this contribution, we underline general features of the satellite observations relevant to PEEX research program and how satellite observations connect to the ground based observations.

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### **500 words:**

Human activities put an increasing stress on the Earth' environment and push the safe and sustainable boundaries of the vulnerable eco-system. It is of utmost importance to gauge with a comprehensive research program the current status of the environment, particularly in the most vulnerable locations. Pan-Eurasian Experiment (PEEX) is a new multidisciplinary research program aiming at resolving the major uncertainties in the Earth system science and global sustainability questions in the Arctic and boreal Pan-Eurasian regions.

The PEEX program aims to (i) understand the Earth system and the influence of environmental and societal changes in both pristine and industrialized Pan-Eurasian environments, (ii) establish and sustain long-term, continuous and comprehensive ground-based airborne and seaborne research infrastructures, and utilize satellite data and multi-scale model frameworks filling the gaps of the in-situ observational network, (iii) contribute to regional climate scenarios in the northern Pan-Eurasia and determine the relevant factors and interactions influencing human and societal wellbeing (iv) promote the dissemination of PEEX scientific results and strategies in scientific and stake-holder communities and policy making, (v) educate the next generation of multidisciplinary global change experts and scientists, and (vi) increase the public awareness of climate change impacts in the Pan-Eurasian region.

The development of PEEX research infrastructure will be one of the first activities of PEEX. PEEX will find synergies with the major European land-atmosphere observation infrastructures such as ICOS a research infrastructure to decipher the greenhouse gas balance of Europe and adjacent regions, ACTRIS (Aerosols, Clouds, and Trace gases Research InfraStructure Network-project), and ANAEE (The experimentation in terrestrial ecosystem research) networks and with the flag ship stations like the SMEARs (Station for Measuring Ecosystem-Atmosphere Relations) when designing, re-organizing and networking existing station networks in the Northern Pan-Eurasian region.

In the PEEEX domain it is important to connect the comprehensive ground-based data to satellite observations in order to understand the overall context and relevance of the ground based observations. The satellite observations provide information on regional to global scales with spatial resolution varying from meters to tens of km, depending on the instrument and technique used. Likewise, spatial coverage and repeat time depend on the swath width and orbit. Of particular interest in the context of PEEEX are land, lake and atmospheric observations. The atmospheric observations are complementary to those from the stations described above in that they provide information on atmospheric concentrations of aerosols, trace gases and GHG.

In this contribution, we underline general features of the satellite observations relevant to PEEEX research program and how satellite observations connect to the ground based observations.