

Cool forests at risk?

The critical role of boreal and mountain ecosystems
for people, bioeconomy, and climate.

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Submissions

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Abstract of Contribution 173

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Abstract Submission

Topics: High latitude and high altitude in the Earth system, Modeling the future of Cool Forests – from vegetation to landscapes

Keywords: Pan-Eurasian EXperiment programme, concept of seamless environmental prediction, multi-scale and multi-processes modelling, virtual research platforms

PEEX Modelling Platform: concept, models, components, infrastructure and virtual research platforms – applicability for seamless environmental prediction

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Abstract

The Pan-Eurasian EXperiment (PEEX; <https://www.atm.helsinki.fi/peex>) Modelling Platform (PEEX-MP; <https://www.atm.helsinki.fi/peex/index.php/modelling-platform>) is integral part of the PEEX research programme and one of the key blocks of the PEEX research infrastructure. The seamless coupling multi-scale and -processes modelling concept developed is important and advanced step towards realization of the PEEX research agenda presented in the PEEX Science Plan (http://www.atm.helsinki.fi/peex/images/PEEX_Science_Plan.pdf).

Currently, PEEX-MP includes more than 30 different models capable of helping to address urgent scientific questions and grand challenges of the Arctic-boreal and China domains. These models cover main components - atmosphere, hydrosphere, pedosphere and biosphere - and resolve physical-chemical-biological processes at different spatial-temporal scales and resolutions. The Earth system modelling, online coupled integrated modelling, forward and inverse modelling, socio-economical modelling, and others are valuable and useful approaches for further development of the state-of-the-art and breaking-through research in the PEEX domain.

Among PEEX-MP models, there are models which are employed for realization of the PEEX research agenda, and in particular, there are: (i) Earth system models coupled with different components such as atmosphere-ocean-sea/ice-etc; (ii) online integrated meteorology-chemistry-aerosols multi-scale models simultaneously simulating meteorological and atmospheric composition patterns; (iii) multi-scale atmospheric chemical transport models with different complexity of physical-chemical processes, gas-phase chemistry/ aerosol and meteorological input to drive the simulations; (iv) multi-scale ocean-sea/ice modeling systems; (v) modeling systems for research on atmospheric processes at different scales; (vi) models for studying atmosphere-vegetation-ecosystems physical-chemical/aerosol processes and interactions taking into account emissions of different types; (vii) large eddy simulation models; (viii) tools for inverse modelling for emissions of pollutants including greenhouse gases; and even (ix) models applicable for emergency response on nuclear-biological-chemical danger in cases of accidental releases.

More details (contact persons; modes of runs – research, operational, semi-operational; brief models descriptions with references) on these models is available at: <https://www.atm.helsinki.fi/peex/index.php/modelling-tools-demonstration>.

The high performance computing facilities and capabilities are of critical importance for modelling activities. Expected generated large volumes of model data will be further processed and will become freely available for research, decision-makers, stakeholders and end-user communities.

The virtual research platforms - PEEX View, Virtual Research Environment, Web-based Atlas - will allow to improve both visualization of modelling and observational results with GIS and web-based technologies, in depth complex and sophisticated analysis of various components of the Earth's system interactions and feedbacks, evaluation of processes and parameterizations for models' improvements, etc.

Focus of Research

The focus is developing and application of the seamless approach for environmental predictions in PEEX domain. It emphasizes that solving challenges related to climate change, impact-on-society, etc. will require advanced approach. PEEX-MP will help to address urgent scientific questions and grand challenges (see http://www.atm.helsinki.fi/peex/images/PEEX_Science_Plan.pdf).

Key Challenges

The PEEX list of grand challenges cover subjects such as climate change, air quality, biodiversity loss, chemicalization, food supply, energy production and fresh water supply. The PEEX-MP presentation is focused on describing and promoting the developed concept for seamless environmental prediction in the PEEX domain including the Arctic-boreal regions.

Suggestion to Address these Challenges

Proposed PEEX-MP set of models, components, infrastructure and virtual research platforms allow to address mentioned challenges. Selected models and tools can be successfully applied for seamless environmental prediction in the PEEX Arctic-boreal and China domains.

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