



## **ENVIRO-HIRLAM: research and operational applications for PEEEX studies**

Alexander Mahura (1), Roman Nuterman (2), Alexander Baklanov (3), Bjarne Amstrup (4), Georgii Nerobelov (5), Margarita Sedeeva (5), Risto Makkonen (1), Markku Kulmala (1), Sergej Zilitinkevich (1), and Sergej Smyshlyaev (5)

(1) Institute for Atmospheric and Earth System Research (INAR) / Physics, Faculty of Science, University of Helsinki (UHEL), P.O.Box 64, FI-00014, Helsinki, Finland, (2) University of Copenhagen (UCPH), Juliane Maries Vej 30, DK-2100 Copenhagen, Denmark, (3) World Meteorological Organization (WMO), 7 bis, Avenue de la Paix, 1211 Geneva 2, Switzerland, (4) Danish Meteorological Institute (DMI), Lyngbyvej 100, DK-2100, Copenhagen, Denmark, (5) Russian State Hydrometeorological University (RSHU), Maolohitiskii Prospekt 98, 195196, St.Petersburg, Russia

The Pan-Eurasian EXperiment (PEEX; <https://www.atm.helsinki.fi/peex>) is a long-term interdisciplinary climate change, air quality, environment and research infrastructure programme. The main focus is on the Northern Eurasia, and in particular, for the territories of the Arctic-boreal regions and China. The PEEEX-Modelling-Platform (PEEX-MP) has utilised more than 30 different models running at different scales, resolutions, geographical domains, etc. and used as research tools providing insights and valuable information/ output for different level assessments for environment and population. One of these models is seamless /online coupled integrated meteorology-chemistry-aerosols system, the so-called Enviro-HIRLAM (Environment – HIgh Resolution Limited Area Model) model, which is developed for modelling of both meteorology and atmospheric composition and can provide additional value for PEEEX studies.

Applicability of the Enviro-HIRLAM modelling system in both research and operational modes for selected studies in the PEEEX domain will be shown on examples with focus on regional-subregional-urban scales. For research mode, the model was adapted, setup and run to study effects of aerosols (direct, indirect and combined) feedbacks on meteorology in North-West Russia (and St. Petersburg metropolitan area). It was used also to study spatio-temporal variability of concentration and deposition patterns of pollutants from the Kola Peninsula sources for selected periods with unfavourable meteorological and air pollution episodes in winter. For operational mode, the downscaling was setup at resolutions of 15, 5, and 2.5 km (with focus on Shanghai metropolitan area); and it can be used to study formation and development of meteorological and chemical (with focus on aerosols) fields on regional-subregional-urban scales for a larger part of the most populated territories of China.

The model is planned to be further developed and applied for different research tasks according to the PEEEX Science Plan ([http://www.atm.helsinki.fi/peex/images/PEEX\\_SP\\_\\_27052015.pdf](http://www.atm.helsinki.fi/peex/images/PEEX_SP__27052015.pdf)). The work was supported by EU funding: FP7 MarcoPolo project (Grant Agreement Number 606953; <http://www.marcopolo-panda.eu>), & Nord-Forsk funding – CRAICC-PEEX (2014-2015), CarboNord (2014-2017), CRUCIAL (2016-2017) projects.