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Monitoring Air Quality over China: Evaluation of the modeling system of the PANDA project

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Air pollution has become a pressing problem in Asia and specifically in China due to rapid increase in anthropogenic emissions related to growth of China's economic activity and increasing demand for energy in the past decade. Observed levels of particulate matter and ozone regularly exceed World Health Organization (WHO) air quality guidelines in many parts of the country leading to increased risk of respiratory illnesses and other health problems. The EU-funded project PANDA aims to establish a team of European and Chinese scientists to monitor air pollution over China and elaborate air quality indicators in support of European and Chinese policies. PANDA combines state-of-the-art air pollution modeling with space and surface observations of chemical species to improve methods for monitoring air quality.

The modeling system of the PANDA project follows a downscaling approach: global models such as MOZART and MACC system provide initial and boundary conditions to regional WRF-Chem and EMEP simulations over East Asia. WRF-Chem simulations at higher resolution (e.g. 20km) are then performed over a smaller domain covering East China and initial and boundary conditions from this run are used to perform simulations at a finer resolution (e.g. 5km) over specific megacities like Shanghai.

Here we present results of model simulations for January and July 2010 performed during the first year of the project. We show an intercomparison of the global (MACC, EMEP) and regional (WRF-Chem) simulations and a comprehensive evaluation with satellite measurements (NO_2, CO) and in-situ data (O_3, CO, NO_x, PM10 and PM2.5) at several surface stations. Using the WRF-Chem model, we demonstrate that model performance is influenced not only by the resolution (e.g. 60km, 20km) but also the emission inventories used (MACCity, HTAPv2), their resolution and diurnal variation, and the choice of initial and boundary conditions (e.g. MOZART, MACC analysis).