Geophysical Research Abstracts
Vol. 19, EGU2017-14805, 2017
EGU General Assembly 2017

Simulating air quality in the Netherlands with WRF-Chem 3.8.1 at high resolution

Andreas Hilboll (1,2), Jeroen Kuenen (3), Hugo Denier van der Gon (3), Mihalis Vrekoussis (1,2,4)

(1) Center for Marine Environmental Sciences (MARUM), University of Bremen, Bremen, Germany, (2) Institute of Environmental Physics (IUP), University of Bremen, Bremen, Germany, (3) TNO, Dept. Climate, Air and Sustainability, Utrecht, The Netherlands, (4) Energy, Environment and Water Research Center (EEWRC), The Cyprus Institute, Cyprus

Air pollution is the single most important environmental hazard for public health. Especially nitrogen dioxide (NO_2) plays a key role in air quality research, both due to its immediate importance for the production of tropospheric ozone and acid rain, and as a general indicator of fossil fuel burning. To improve the quality and reproducibility of measurements of NO_2 vertical distribution from MAX-DOAS instruments, the *CINDI-2* campaign was held in Cabauw (NL) in September 2016, featuring instruments from many of the leading atmospheric research institutions in the world.

The measurement site in Cabauw is located in a rather rural region, surrounded by several major pollution centers (Utrecht, Rotterdam, Amsterdam). Since the instruments measure in several azimuthal directions, the measurements are able to provide information about the high spatial and temporal variability in pollutant concentrations, caused by both the spatial heterogeneity of emissions and meteorological conditions.

When using air quality models in the analysis of the measured data to identify pollution sources, this mandates high spatial resolution in order to resolve the expected fine spatial structure in NO_2 concentrations. In spite of constant advances in computing power, this remains a challenge, mostly due to the uncertainties and large spatial heterogeneity of emissions and the need to parameterize small-scale processes.

In this study, we use the most recent version 3.8.1 of the *Weather Research and Forecasting Model with Chemistry* (WRF-Chem) to simulate air pollutant concentrations over the Netherlands, to facilitate the analysis of the *CINDI-2* NO_2 measurements. The model setup contains three nested domains with horizontal resolutions of 15, 3, and 1 km. Anthropogenic emissions are taken from the TNO-MACC III inventory and, where available, from the Dutch Pollutant Release and Transfer Register (Emissieregistratie), at a spatial resolution of 7 and 1 km, respectively. We use the *Common Reactive Intermediates gas-phase chemical mechanism* (CRIv2-R5) with the *MOSAIC* aerosol module.

The high spatial resolution of model and emissions will allow us to resolve the strong spatial gradients in the NO_2 concentrations measured during the *CINDI-2* campaign, allowing for an unprecedented level of detail in the analysis of individual pollution sources.