

Evaluation and comparison of O₃ and PM10 forecasts of ALARO-CAMx and WRF-Chem

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ZAMG runs two models for Air-Quality forecasts operationally: ALARO-CAMx and WRF-Chem.

ALARO-CAMx is a combination of the meteorological model ALARO and the photochemical dispersion model CAMx and is operated at ZAMG by order of the regional governments since 2005. The emphasis of this modeling system is to predict ozone peaks in the North-east Austrian flatlands. Two modeling domains are used with the highest resolution (5 km) in the Alpine region. Various new features have been implemented in the model in the past to improve the daily forecasts, e.g. data assimilation of O₃ and PM10 observations from the Austrian measurement network (with optimum interpolation technique), MACC-II boundary conditions and the combination of highly resolved emission inventories for Austria with TNO and EMEP data. The biogenic emissions are provided by the SMOKE model. The model runs 2 times per day for a period of 48 hours.

The second model which is operational is the on-line coupled model WRF-Chem. Meteorology is simulated simultaneously with the emission, turbulent mixing, transport, transformation as well as the fate of trace gases and aerosols. 2 domains are used for the simulations. The mother domain covers Europe with a resolution of 12 km. The inner domain includes the Alpine region with a horizontal resolution of 4km. The model runs 2 times per day for a period of 72 hours and is initialized with ECMWF forecasts.

The evaluation of both models is conducted for the months January to September 2017 with the main focus on the forecast of ozone. The summer 2017 was the 3rd warmest summers since the beginning of the meteorological measurements in Austria more than 200 years ago. Although this summer had several heat waves, no new meteorological records for e.g. days with maximum temperature > 30°C or minimum temperature > 20°C have been reached. Due to the meteorological conditions, 23 air quality stations have measured exceedances of the ozone information threshold (180 µg/m³), mainly in the eastern part of Austria. The measurements of the Air-Quality stations are compared with the area forecasts for every province of Austria. Besides the evaluation, a comparison of the forecasts of ALARO-CAMx and WRF-Chem is done. In addition, the daily and long-term means of the PM10 forecasts are compared with the measurements.