Abstract to the **7th Highway and Urban Pollution in Barcelona, Spain**

Assessment of highway pollution during specific meteorological conditions in southern Germany

Peter Suppan and Gerd Schädler

Fraunhofer Institute for Environmental Atmospheric Research
Kreuzeckbahnstr. 19
82467 Garmisch-Partenkirchen
Germany

Keytopic: Atmospheric dispersion and deposition

Abstract:

The assessment of motorway emissions to the air quality can only be done by extensive air quality measurements over a long period or by detailed air quality modelling calculations. Due to changing wind regimes traffic emissions were distributed very inhomogeneous and a source attribution is very difficult to quantify.

During a measuring campaign in southern Germany in May 2001 a constant wind pattern with prevailing north-easterly winds was observed for more than 3 days. Due to the specific conditions of the meteorology therefore it was possible to estimate the influence of the highway between Munich and Augsburg by extensive air quality measurements and modelling simulations.

The dispersion model with full photochemistry, which was used for the simulations, was MCCM (Multiscale Climate Chemistry Model). This model is based on the well-documented fifth-generation NCAR/Penn State Mesoscale Model, MM5. MM5 includes a multiple-nesting capability, nonhydrostatic dynamics and FDDA capability as well as other options for modelling microphysical processes. Additional to this, two separate gas-phase chemistry mechanisms (RADM2 and RACM) with 39 and 47 chemical species respectively and particulate matter (PM_{10}) as a passive tracer are included. In association with the gas phase chemistry submodels 22 photolysis frequencies are computed according to cloud cover, ozone, temperature and pressure in the model atmosphere. Biogenic emissions are calculated based on landuse data, surface temperature and radiation. The online coupling of meteorology and chemistry provides fully consistent results with no interpolation of data in contrast to off-line coupled chemistry and transport models.

In a first stage base case simulations (multiple nesting strategy from the European scale – 2000 x 2000 km² - down to the domain of interest - 80 x 80 km²) with an updated emission inventory from 1998 with a spatial resolution of 1 x 1 km in the smallest domain were carried out. Apart from the excellent performance of the model in comparison with measurements, the model results show very pronounced the situation of less O_3- and higher NO_2-levels after passing the highway within a distance of more than 40 km. In order to estimate the effect of the motorway a scenario simulation was performed in which the emissions of the highway were reduced to the surrounding emission levels. It could be demonstrated that the emission reduction causes a significant increase of the ozone levels downwind of the highway in the magnitude of 10-20 ppbv, depending on the time of the day.