EMS7/ECAM8 Abstracts,
Vol. 4, EMS2007-A-00122, 2007
7th EMS Annual Meeting / 8th ECAM

Sensitivity analysis of tropospheric ozone to modified initial and boundary conditions in both rural and industrial zones.

N. Castell (1), A. Stein (2), R. Salvador (1), E. Mantilla (1) and M. Millán (1)

(1) Centro de Estudios Ambientales del Mediterráneo, Valencia, Spain, (nuria@ceam.es), (2) Earth Resources and Technology on assignment to NOAA/Air Resources Laboratory

A three-dimensional air quality model contains a set of chemical species mass conservation equations which describes the time evolution of chemical species in the atmosphere. In order to solve this set of equations, proper choices of initial and boundary conditions are needed. The initial conditions are the pollutant concentrations specified throughout the modeling domain at the start of the simulation. Boundary conditions are the pollutant concentrations specified at the perimeter of the modeling domain and are prescribed throughout the simulation period.

Ideally, initial and boundary conditions should be determined based on observations. However, such high-resolution observations are generally not available and therefore initial and boundary values must be specified based on other sources of information. Since initial and boundary conditions are specified in some extent of presumption, it is important to evaluate their influence in the model calculations.

Photochemical modeling studies will be affected by the assumed initial and boundary conditions and its impact could depend on several factors like: chemical species, deposition and chemical reactions. This factors change from one area to another, and for that it is necessary to study the importance of initial and boundary conditions in the modeling area of interest.

We present a study of the impact of initial and boundary concentrations on the modelled ozone ground concentration over two domains: Huelva and Badajoz, an industrial and a rural zone, respectively. The impacts are analyzed for the same meteoro-

logical episode.

As expected, the impact of initial conditions diminishes as the simulation progresses. However, it is important to mention that the influence of the initial conditions over the Badajoz area lasts longer than the one in the area of Huelva. Therefore, in order to reduce the influence from the initial conditions we need to estimate the spin-up times required for each study domain.

Once the influence of initial conditions is minimized through a proper spin-up time, the influence of boundary conditions increases with the simulation time and could account for about 50% of the ground-level ozone at some points in the domain. Therefore, it is necessary to carefully consider the choice of boundary conditions and spin-up times when applying air quality models in different geographical areas.