EMS Annual Meeting Abstracts
Vol. 8, EMS2011-415, 2011
11th EMS / 10th ECAM

Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Study of the effect of spatial resolution and boundary layer scheme on the simulated meteorological fields and pollutant levels in the Valencia region (Western Mediterranean)

N. Castell, A. L. Torres, L. Téllez, and E. Mantilla
CEAM Foundation, Paterna (Valencia), Spain (nuria@ceam.es, +34 961318190)

European directives on air pollution mandate that the general public be informed when pollutant levels reach specific threshold values. Analysis of the air quality network in the Valencia Community has shown that the human health protection threshold for ozone (120 μg/m3 8-hour average) is systematically exceeded almost every day between March and September. Moreover, the vegetation protection threshold (AOT40 18000 μg/m3) has also been surpassed.

In this study, we analyze the effect of the meteorological model configuration on the dispersion of primary and secondary pollution in two high-ozone episodes in the Western Mediterranean. Numerical simulations have been carried out using the WRF-ARW meteorological model and the CAMx photochemical model. Both models make use of their nested grid capabilities to include interactions between the different scales that are involved.

Taking into account that air quality predictions rely on the accuracy of the meteorological fields as well as on the simulated emissions, a comparison between observations and modelled values for different model configurations has been performed. This comprehensive exercise, including simulations of emissions, meteorology and photochemistry, constitutes a sensitivity analysis of the WRF-CAMx modelling system's nesting capabilities over the complex topography of the Valencia region in the Western Mediterranean area.

The performance of the simulated meteorology is evaluated against the observed temperature, wind speed and wind direction. All the observational data are obtained from meteorological towers located throughout the Valencia Community, where hourly observations are available. These 44 towers include coastal and interior points. All the meteorological evaluations are conducted in terms of temporal variations and domain-wide statistical analysis over all the monitoring points.

The model performance for the air quality simulations is also temporally and statistically evaluated against observations from the air quality network. A total of 50 monitoring stations belonging to the Generalitat Valenciana have been employed. All monitoring stations gather data on ozone, nitrogen oxides and carbon monoxide, among other pollutants.

The results show differences in both meteorological parameters and pollutant levels depending on the spatial resolution selected. Particularly important is the vertical layer structure used in the meteorological modelling. There are also differences in the simulated meteorology depending on the physical parameterization of the boundary layer employed.

The conclusions of this study have been used in the configuration of the meteorological and photochemical models currently running over the Valencia Community to assess the air quality benefits that would result from emission controls.

Acknowledgements: The CEAM Foundation/UMH Research Institute is co-financed by the Generalitat Va-

lenciana and Bancaixa. This study has been partially funded by the Conselleria de Medi Ambient, Aigua, Urbanisme i Habitatge (Generalitat Valenciana, Spain) through the project PREVIOZONO; and by the Ministerio de Ciencia e Innovación through the projects “PROMECA” (CGL2009-10309) and “GRACCIE” (CSD2007-00067, Programa CONSOLIDER-INGENIO 2010).