Atmos. Chem. Phys. Discuss., 9, S760–S762, 2009
www.atmos-chem-phys-discuss.net/9/S760/2009/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "The impact of MM5 and WRF meteorology over complex terrain on CHIMERE model calculations" *by* A. de Meij et al.

A. de Meij et al.

Received and published: 12 March 2009

General Comments The subject of this paper is very interesting. Often, in fact too often, developers and users of CTM’s take the meteorological input data (and often also the emission input data) as given, without a carefull analysis. This paper adresses specifically the use of the MM5 and the WRF meteorological models as input to the CTM CHIMERE. First the meteorological models as such are evaluated against observations, followed by the analysis of the impact that these two meteorological drivers have on the calculated concentrations of O3, NO2 and PM. The paper contains many relevant details and analysis, and forms a useful contribution in the growing subject of the implications of the use of NWP models as input to CTM’s

specific comments The paper adresses mainly the impact of the PBL of MM5 and WRF on the calculated concentrations. In paragraph 2.2.3.1 it is stated that by using the PBL

scheme, the explicit vertical diffusion is de-activated. The impression given is that in fact the lowest layer in the model is the well-mixed PBL, and that no vertical layers are used within the PBL. The question arises whether this is in fact the case, or that a surface layer is still used. The fact that the calculated NO2-concentrations are higher than the observations gives the impression that a surface layer is used, and in fact with a too low value of Kz. The questions arises whether the MM5 and WRF deliver different values of Kz-profiles. In relation to this, the question arises whether the models deliver different values of u*. This would have an impact on especially the dry depositions, and might explain partly the differences in the calculated concentrations.

The average PBL height in June is around 1400m for the two meteorological driver models. We do consider several vertical layers in the PBL (around 5 to 6 layers, depending on the location in the model domain and time of the day). Comparing the gas and aerosol concentrations with the observations we analyze the concentrations in the first layer of the model (about 38m for both the models). In section 2.2.3.1 we added to the text that the CHIMERE model has 8 different vertical layers up to about 5500m. Within the model vertical structure the PBL is developed.

The differences in NO2 concentrations for June between the two models are a factor 1.26 higher for CHIMERE/MM5. The reviewer correctly remarks that the difference in u* or in Kz values between the two models could be held partly responsible for the differences in the gas concentrations. In general there are small differences in u* between MM5 and WRF. For both January and June u* by WRF is on average 7% lower than MM5. However we find larger differences in the Kz values for June between the two models (around 25%). The underlying reason for this is that we find a difference in the convective velocity scale (wstar) between the two meteorological models. Wstar is used to calculate the Kz values. We included this in the text. However, differences in cloud attenuation (which has in impact on photochemistry), wind speed and wind direction can also contribute to the difference in NO2 concentrations between CHIMERE/MM5 and CHIMERE/WRF.

ACPD

9, S760–S762, 2009

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 2319, 2009.

ACPD

9, S760–S762, 2009

Interactive Comment