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Modelled climatology of photochemical regimes in Europe in 2006

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The concept of photochemical regimes was proposed by Sillman (1995, 1999) as a tool to develop strategies for reducing ozone precursor. In addition to the NO_x/VOC regimes a number of indices based on secondary species are in use. Several studies focused on regime analysis in the local scale during short term pollution episodes (e.g. Millard and Toupance, 2002; Jimenez and Baldasano, 2004). Also, photochemical regimes were analyzed by Beekaman and Vautard (2010) for the summer period in 2001 and 2003 over Europe.

We will present climatology of photochemical regimes over Europe based on the GEM-AQ model (Kaminski et al., 2008) simulations undertaken for 2006 in the scope of the AQMEII project. GEM-AQ was run on a global variable resolution grid with the core-uniform resolution of 0.20 deg over the entire European continent.

Exposure to high ozone concentration was significant and concentration values exceeded the information threshold and long term objective in many European locations in 2006. Based on hourly concentrations of the modelled ozone, hydrocarbon species and oxidized nitrogen compounds the following indices were calculated: VOC(C)/NO_x, O_3/NO_y, O_3/NO_z, H_2O_2/H2NO_3 in the lowest model layer. Mean value as well as quartiles were calculated for each month and for each index. We will discuss similarities and differences in the spatial distribution and seasonal variability of calculated indices. An attempt will be made to aggregate these indices based on the spatial data analysis techniques.

In addition, a detailed analysis of the diurnal variability of ozone production regimes during severe photochemical episodes will be presented. The focus will be on regimes in the morning hours that determine high ozone concentrations in the afternoon.