Estimating stomatal ozone fluxes using a coupled transport-deposition model

Á. Juhász (1), R. Mészáros (1), I. Lagzi (2), Cs. Vincze (1), D. Szinyei (1), F. Ács (1), A. Horányi (3), L. Kullmann (3)

(1) Department of Meteorology, Eötvös Loránd University, Hungary, (2) Department of Physical Chemistry, Eötvös Loránd University, Hungary, (3) Hungarian Meteorological Service

Due to the rising emissions of the ozone precursor substances, elevated ozone concentrations may cover large areas in Europe for either shorter episodic or longer periods under certain meteorological conditions. These elevated concentrations can be harmful to agricultural and natural vegetation. Ozone basically reacts by plants through the stomata. Therefore, it can be state that the stomatal ozone flux is more appropriate measure for ozone damage than AOT 40 value. Therefore this study presents an application of a coupled Eulerian photochemical reactionąVtransport model and a detailed ozone dry deposition model for the investigation of stomatal ozone fluxes over Hungary. The reactionČ{diffusionČ{advection equations relating to ozone formation, transport and deposition are solved on an unstructured triangular grid using the SPRINT2D code. The model domain covers Central-Europe including Hungary, which is located at the centre of the domain and covered by a high resolution nested grid. The sophisticated dry deposition model estimates the dry deposition velocity of ozone by calculating the aerodynamic, the quasi-laminar boundary layer and the canopy resistance. The meteorological data utilised in the model were generated by the ALADIN meso-scale limited area numerical weather prediction model used by the Hungarian Meteorological Service. The time and space resolution of the data is 6 hours and 0.10 x 0.15 degrees, respectively. The land-cover map was generated based on a Hungarian land-use map. For the calculation of ozone concentration fields, national and EMEP emission inventories have been used. Stomatal ozone fluxes over Hungary were simulated for a summer month (July, 1998). Spatial and temporal distributions of the estimated fluxes are analysed and compared with AOT 40 value in this study.