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MC2-AQ simulations of ground level ozone during cold front passage over Europe – a case study

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Fronts play an important role in vertical redistribution of boundary layer air and downward transport of air from upper troposphere/lower stratosphere. Due to prevailing westerly flow observed over Europe a number of transport events is associated with front passages. To analyze the complexity of horizontal and vertical transport as well as chemical transformation of ozone within the frontal zone the MC2-AQ model was run over Europe for selected cases.

The MC2-AQ modelling system is based on the Canadian Mesoscale Compressible Community (MC2) Model, a non-hydrostatic meteorological model, to which modules permitting on-line calculations of chemical transformations, anthropogenic and biogenic emissions, and deposition were added. The transport of chemical species is done on the same grid and with the same advection, convection and diffusion schemes as are used for the meteorological fields.

We will present model results for three episodes of cold front passage over Europe in the year 2000. First we will make comparison of model results with various observational data and then the main mechanisms responsible in each case for the change of ground level ozone concentration will be shown. We will also discuss importance of uplifting in warm conveyor belt and intrusion of dry air from upper troposphere/lower stratosphere on ozone level near the ground.