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Reactive asymmetrical convective model for vertical mixing

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Description of the planetary boundary layer characteristics and chemical processes in atmosphere as well as understanding of atmospheric turbulent mixing are very important in air pollution transport modelling. Turbulent mixing in air pollution and chemical models is commonly described by different types of local closure. The local approach may fail in the convective boundary layer because the influence of large-scale transport is not accounted. This problem can be avoided if we use a non-local approach. The non-local eddy diffusivity schemes and asymmetrical mixing models take place in recent generation transport models.

It is shown that vertical mixing models have to be modified for chemical systems that react with time scales similar to the turbulence time scale. Reactive asymmetric convective model was framed with idea to compare effects of slow and fast chemistry on vertical turbulent mixing using different types of parametrization for varying vertical turbulent upward mixing rate. The upward mixing rate in reactive asymmetric convective model depends not only on turbulent characteristics, but also on the chemical reaction rates. To investigate the effects of turbulence on chemical reactions the NO-O3-NO2 chemical system was studied. The studied system plays very important role in atmospheric chemistry because it is the only ozone source in the planetary boundary layer.