Geophysical Research Abstracts
Vol. 14, EGU2012-12590, 2012
EGU General Assembly 2012

Ice fraction impact on modeling of the atmospheric super convection cases

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Calculations of the extreme convection cases in the atmosphere over territory of Belarus (summer 2010, 2011) have been made aiming to study a role of the ice phase in the processes of cloud formation and development. Mathematical modeling of meteorological processes has been elaborated on the basis of mesoscale system of the Weather Research and Forecasting (ARW System Version 3). Computations are carried out within the single 2500 $\times$ 2500 km domain having the centre in 53.83 N, 27.47 E and grid step of 10 km and less. In the process of calculations, the full set of microphysical parameters available in the package ARW3 has been used. Intercomparison between modeling results and real meteorological data is provided.

Cases are examined in the zone of cold atmospheric fronts where the free convection is accompanied by the forced convection thus contributing to the formation of supercells. Such cells are characterized by high vertical velocities for which the application of the equation of state is not completely satisfied. In these conditions principles of self-regulation of microphysical processes may vary. These cases are not rare and thought to be of a certain interest, as they are featured by the variety and complexity of microphysical processes.

It is also shown that under high velocities of microphysical processes occurring in a cloud, elimination of the ice crystals formation phase from the analysis even at the considerable space step ($\sim$10 km) results in the significant modification of the cloud model parameters.

Moreover, velocities of the given microphysical processes can serve as the additional factors limiting the space and temporary resolution of the model.