EMS Annual Meeting Abstracts
Vol. 14, EMS2017-13-1, 2017


# An explicit method of mesoscale convective storm prediction for Central region of Russia

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Introduction

Accurate prediction of convective cloud systems formation and dynamics is important because the frequency of severe weather phenomena is increasing with a climate change. Since passage of convective storms is accompanied by a number of dangerous weather events – intensive lightning activity, rain, hail, wind squalls, and tornado it could lead to human injuries, destruction of infrastructure and serious economic losses.

It is known that there is a significant affect of electrical process in clouds on convection evolution. However for this moment the atmospheric electric field is insufficiently studied. That is why convection forecast methods mainly are based on atmospheric instability analysis. Such techniques do not explicitly consider electrical processes occurring in convective clouds.

This work presents simulation results of the convective storm observed 13 – 14 of July, 2016 over Central Russia. Cumulonimbus cloud (Cb) electrification model coupled with numerical weather prediction model are used for this study.

Methodology

Cb electrification model is a set of equations describing the processes of the generation and separation of electric charges in convective clouds, constants and meteorological data (air temperature, wind speed, fractions of liquid and solid cloud particles). Non-inductive charge generation: implies the interaction of solid hydrometeors (ice crystals+graupels, particles of snow+graupels) in a presence of super-cooled water [1]. Pair wise interaction between other hydrometeors is neglected because of the small charge generated as a result of the collision/merger between particles [1].

Full physical and mathematical discription as well as used WRF-ARW configuration are demonstared in the current work. To verify the model simulations radar, thunderstorm detectors and synoptic maps are used.

Conclusions

According to the preliminary results proposed approach of explicit electric field modeling is applicable to short-term forecasting of intense convection and tracking of isolated storms, convective cells and mesoscale convective complexes. Obtained varying values of the eclectic field could help to identify the diversity of hazardous weather phenomena associated with convection.

References

1. Mansel et al. (2005) J. Geophys. Res., 110, 12-20.