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Verification of modeling of convective events based on radar reflectivity

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The use of numerical modeling for atmospheric research is complicated by the problem of verification by a limited set of measurement data. Comparison with radar measurements is widely used for assessing the quality of the simulation. The probabilistic nature of the development of convective phenomena determines the complexity of the verification process: the reproduction of the pattern of the convective event is prior to the quantitative agreement of the values at a particular point at a particular moment.

We propose a method for verifying the simulation results based on comparing areas with the same reflectivity. The method is applied for verification of WRF-modeling of convective events in the Aragats highland massif in Armenia. It is shown that numerical simulation demonstrates approximately the same form of distribution of areas of equal reflectivity as for radar-measured reflectivity. In this case, the model tends to overestimate on average reflectivity, while enabling us to obtain the qualitatively correct description of the convective phenomenon.

The proposed technique can be used to verify the simulation results using data on reflectivity obtained by a satellite or a meteoradar. The technique allows one to avoid subjectivity in the interpretation of simulation results and estimate the quality of reproducing the “general pattern” of the convective event.