



Verification of a regional reanalysis: Evaluation of hydrometeors using microwave satellite data

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Within the Hans-Ertel-Centre for Weather Research, a regional reanalysis for the CORDEX Europe domain is created based on the COSMO-EU model of Deutscher Wetterdienst (DWD). To be able to provide the users of the reanalysis with an indication of its quality and consistency, extensive verification efforts are taken using several independent data sets. Microwave satellite data provide such an independent data set, as they are not used in the data assimilation cycle at DWD.

Brightness temperature (TB) fields at frequencies between 89 GHz and 190 GHz measured by instruments such as the Advanced Microwave Sounding Unit B (AMSU-B) or the Microwave Humidity Sounder (MHS) are analyzed in this study. They show strong TB depressions in features such as convective cells or frontal systems at these high frequencies due to scattering at large frozen hydrometeors. A special focus will be put on comparing these signatures in observation and simulation.

For the simulation of TBs from the reanalysis fields, the flexible, modular microwave forward operator PAMTRA is used. It is able to simulate both passive (such as AMSU or MHS) and active (such as Cloudsat) measurements from a satellite, airborne, or ground-based perspective. A number of hydrometeor habits can be chosen, including realistically shaped particles, such as dendrites, in contrast to the popular approximation of using soft spheres. This allows an estimation of the TB range arising from the uncertainty in hydrometeor type and, thus, gives a quantification of the simulation uncertainty.

Verification methods will be tested and developed for comparison of measured and simulated TB fields. Strongly scattering features as described above need to be identified and adequate methods need to be found for the comparison. Several existing methods will be employed and deficiencies will be accounted for by creating new methods, which are specifically suited for use with TB fields. First results of the TB comparisons indicate an underestimation of the simulated TBs in convective cells due to an overestimation of snow contents in the reanalysis.