Quantitative Evaluation of Regional Precipitation Forecasts Using Multi-Dimensional Remote Sensing Observations "QUEST"

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Because of the complexity of atmospheric processes it is of the utmost importance to observe the atmospheric state as complete as possible. Multi-dimensional remote sensing data are best suited to observe the spatial-temporal distribution of water in all its phases. QUEST aims at establishing a framework for a physically based quantitative evaluation and improving the quality of weather forecasts by employing existing and upcoming remote sensing data as extensively as possible.

QUEST objectives are to

– Establish a data base of quality controlled ground-based and satellite remote sensing observations matched with Lokal-Modell simulations.

– Develop a set of forward modelling tools to simulate as completely and as accurately as possible the multi-dimensional observations from model output.

– Use data from field experiments to investigate the process chain from water vapour to precipitation at the ground.

– Perform a long-term (one year) evaluation of atmospheric quantities related to the hydrological cycle.

This long-term evaluation over the full year 2007 (General Observation Period "GOP") is the central activity of the current research period of QUEST. The GOP domain covers Germany and neighbor states and its dataset encompasses data collected by rain gauges, weather radar, micro rain radar, polarimetric radar, disdrometer, ceilometer, gps water vapor observations, lightning networks, satellites, radiosondes, and special meteorological observation sites (e. g. cloudnet stations). The duration of one year opens up the possibility to statistically approach model problems and better pin down specific model weaknesses. The long-term evaluation can also help to identify cases to be investigated more thoroughly in process studies. The GOP dataset includes also model forecast output needed for comparison with GOP data (direct model ouput and also post-processed quantities like timeseries of statistics over subdomains). The evaluation makes use of both an observation-to-model and an model-to-observation approach.

At Deutscher Wetterdienst, in addition to the 7-km forecast model LME with parameterized convection, a 2.8-km short-range convection-resolving model version (named LMK) has been introduced recently. The GOP model evaluation concentrates on these LMK forecasts, but also LME forecasts will be considered for assessing the possible benefit of the high-resolution convection-resolving model version.

Besides GOP activities results of earlier analyses will be presented. They include LMK case studies making use of a polarimetric radar simulator "SynPolRad" (for comparison of model data with data obtained by the polarimetric radar facility POLDIRAD operated by DLR) as well as long-term evaluations of LMK testsuites with MODIS and MSG retrievals of cloud properties.

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