

Quantitative evaluation of high-resolution precipitation forecasts using multi-dimensional remote sensing observations

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The new generation of numerical weather prediction (NWP) models provides precipitation forecasts with horizontal grid spacing in the order of a few kilometers. Because the amount of precipitation at the ground results from a complex process chain, several atmospheric parameters should be evaluated when testing model performance and consistency. Therefore we use high-resolution, multi-dimensional remote sensing observations from satellite (e.g. from Meteosat Second Generation (MSG), MODIS) and ground (radar and profiling stations) for the evaluation of the non-hydrostatic Lokal-Modell Kürzestfrist (LMK) of the German Meteorological Service (DWD) with 2.8 km resolution. The evaluation is performed using both the observation-to-model and model-to-observation approach. The latter is especially useful when the relation between measurement and model variables is complex (see contribution by Pfeifer et al. for polarimetric radar).

A detailed case study from the BALTEX Bridge Campaigns (BBC) is presented to illustrate how the combination of the different observations can be used to identify model deficiencies in the LMK: for the selected cases, the LMK underestimates the lifetime of clouds and precipitation. In order to generalize these results a statistical analysis of longer time periods needs to be performed. Such a long-term evaluation allows the identification of systematic model deficits and might attribute them to specific regions or regimes. Therefore a two month test suite of the Lokal-Modell is analyzed using MSG, radar, GPS and ceilometer observations. Because the LMK is operated as lumped ensemble with members starting every 3rd hour it is possible to discriminate between errors resulting from the initial conditions and from the model formulation. Based on these examples, the presentation will discuss the benefits of both the case study and the long term perspective and will highlight in particular the synergetic uses of both.