Methodology for evaluating clouds and precipitation in high resolution models using radar data

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Verification of numerical forecasts is an essential part of the numerical weather prediction. The project HD(CP)2 (High Definition Clouds and Precipitation for Climate Prediction) will provide an unprecedented data set of high resolution model simulations (100m), however, there is up to now no standard verification methods to evaluate the model performance adequately. Thus based on the 3D radar data from the 15 radar stations covering the whole Germany, methodology for evaluating clouds and precipitation is developed and applied to compare the high resolution model data representing small scale phenomena with the observations (radar).

A synergy of methods and tools are adopted. At a very first step, the radar forward operator named EMRADSCOPE (see Ulrich Blahak's presentation) is applied to model simulation outputs to obtain the prognostic reflectivity (Z). Using these complex 3D data, the validation and comparison of precipitation between model and radar data is carried out through the following three aspects:

(1) The general information of the vertical clouds and precipitation structure is detected by an instructive method Contoured Frequency by Altitude Diagrams (CFADs).

(2) The complex 3D characteristics of precipitation-objects are revealed by a modified object-based quality measure SAL(H), which contains four distinct components that consider aspects of the structure (S), amplitude (A), location (L), and Height (H, added) of the precipitation field.

(3) Furthermore, a fuzzy SAL is also applied which tries to estimate objectively a potential time shift between the observed and simulated precipitation.