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Overview and current status of data assimilation systems on the convection-permitting scale

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A key challenge of short- to medium-range weather forecasting is the development of a suitable data assimilation system on the convection-permitting scale. On the one hand, the data assimilation methodology should be capable of ingesting non-linear, direct and indirect observations of key prognostic variables continuously in time and location of the observation. On the other hand, the forecast systems should be able to handle the increasing non-linear behavior of the forecast system resembling the corresponding behavior of the atmosphere, particularly convection, clouds, and precipitation. Currently, the number of suitable forecast systems and performance analyses is rather sparse.

This presentation gives a short overview of the status of data assimilation on this scale and discusses the different variants of ensemble based and variational approaches. The approach currently pursued at IPM is presented, which consists of a hybrid combination of the EnKF and variational data assimilation capable of handling the variability of the boundaries and a large set of different types of observations. Variables, which are particularly considered critical are soil moisture and runoff, dynamics and humidity, which are addressed by observations of passive space borne remote sensing, surface observations, radar, and GPS. First results based on theoretical considerations and the data assimilation tools available in the WRF-NOAH model system are presented at the conference using interesting weather situations which were characterized in detail during the international field campaign COPS.