

Uncertainty estimation in modern reanalysis systems

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Uncertainty information is an integral part of any meteorological analysis and prediction system and provides essential added value to the users. Estimates of uncertainty are also important in reanalysis but are not provided with all currently available data sets. At the European Centre for Medium-Range Weather Forecasts (ECMWF) various reanalysis systems have been produced to date, or are currently in production, which includes uncertainty estimates. This is possible by using the Ensemble of Data Assimilation (EDA) technique. The EDA system provides flow-dependent background errors for the data assimilation system in the reanalysis, but in addition, the spread of the EDA can also be used for uncertainty estimates of the reanalysis products.

ECMWF is in the production phase of ERA5 (implemented by the Copernicus Climate Change Service on behalf of the European Commission) and has produced the ERA-20C and CERA-20C reanalyses (20th century coupled climate reanalysis system supported by the EU ERA-CLIM and ERA-CLIM2 R&D projects). All systems are using a 10-member ensemble, on which uncertainty estimates are based.

The presentation will focus on the diagnosis of the uncertainty information as provided by these EDA systems. Some relevant specific scientific questions will be discussed as for example the spatial-temporal variability of the reanalysis uncertainty information or how uncertainties in the verifying truth can influence the validation of uncertainty estimation. Finally guidance will be given how this information can be best used for the reanalysis user community.