

The ERA5 Global Reanalysis: provision of a detailed record of the climate and weather for the past 70 years.

Hans Hersbach, Bill Bell, Paul Berrisford, Per Dahlgren, András Horányi, Joaquín Muñoz-Sabater, Julien Nicolas, Raluca Radu, Cornel Soci, Dinand Schepers and Adrian Simmons.

At the European Centre for Medium-Range Weather Forecasts (ECMWF), reanalysis is a key contribution to the Copernicus Climate Service (C3S) that is implemented at ECMWF on behalf of the European Commission. The most recent ECMWF reanalysis ERA5, provides hourly estimates of the global atmosphere, land surface and ocean waves at a horizontal resolution of 31km. Daily updates are provided with a latency of 5 days, while an extension back to 1950 is to be made available in the 2nd quarter of 2020.

ERA5 uses a recent version of the ECMWF Numerical Weather Prediction forecast model and data assimilation system to assimilate both in situ and satellite observations (87 billion for the period 1979 - 2018), many of which stem from reprocessed data records. The assimilation method includes a variational method for estimating observation biases that respects the heterogeneity within the observing system. Information on uncertainties in the state estimates are provided by a 10-member ensemble of data assimilations at half the horizontal resolution.

This presentation provides a concise overview of the ERA5 data assimilation system. A basic evaluation of characteristics and performance is presented, which includes an inter-comparison with other reanalysis products, such as its predecessor ERA-Interim and several major reanalyses produced elsewhere. Attention is given to the importance of the specification of the background error covariance matrix that determines the weight given to the model's first guess in the assimilation. In addition, a special focus will be on the back extension from 1950 to 1978, where the absence of satellite data prior to 1972 puts a more demanding constraint on the data assimilation system.