

C3S global reanalysis: integrator of climate observations; status and requirements for the observing system.

Hans Hersbach, Bill Bell, Paul Berrisford, Andras Horanyi, Julien Nicolas, Raluca Radu, Joaquin Munoz Sabater, 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 Change Service (C3S) that is implemented at ECMWF on behalf of the European Commission.

The most recent ECMWF global reanalysis, ERA5, provides hourly snapshots of the Earth's atmosphere, land surface and ocean waves from 1950 with updates with a latency of 5 days. It is highly popular and used for a wide range of applications. Preparations for the next generation of global reanalysis, ERA6, are underway; production of this coupled ocean-atmosphere-land reanalysis is envisaged to start in 2024.

Reanalysis relies on the ingestion of many observational data sets and transforms these into complete 'maps-without-gaps' using a modern data assimilation system. This embraces synoptic observations and gridded forcing datasets which latter have been produced elsewhere.

The ERA5 reanalysis uses synoptic observations from many sources, from in-situ to satellites, for a range of quantities from geophysical (level 2) variables to (level 1B) satellite radiances, bending angles and backscatter. So far over 100 billion observations have been actively ingested. External forcing datasets include level-4 datasets for sea surface temperature and sea ice cover and CMIP5-based datasets for the temporal evolution of aerosols, greenhouse gases and ozone as used in the ERA5 radiation scheme.

Reanalysis products highly benefit from the usage of newly-rescued and reprocessed observations, both satellite and in-situ. and improved gridded datasets, which all receive attention in the C3S programme.

This presentation will cover a concise overview of datasets that are ingested in C3S reanalysis and how these are integrated into consistent products. It will also detail our requirements for both the future climate observing system and improvement of the existing historical data record.