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

Hans Hersbach*[†], Bill Bell¹, Paul Berrisford¹, Andras Horanyi¹, Julien Nicolas¹, Raluca Radu¹, Joaquin Munoz Sabater¹, Cornel Soci¹, Dinand Schepers¹, and Adrian Simmons¹

¹European Centre for Medium-Range Weather Forecasts – Shinfield Park Reading RG2 9AX, United Kingdom

Abstract

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.

The focus will be on the ERA5 back extension from 1950 to 1978 that supplements the previously published segment from 1979 onwards. It features the assimilation of many conventional observations and improved use of early satellite data. The fidelity of the extension is illustrated by the accurate depiction of the North Sea Storm of 1953, and the events leading to the first discovery of Sudden Stratospheric Warmings in 1952. Time series of ERA5 global surface temperature anomalies show temperatures to be relatively stable from 1950 until the late 1970s, in agreement with the other contemporary full-input reanalyses and independent datasets. The evolution of upper air temperatures, humidities and winds show smoothly varying behaviour, including tropospheric warming and stratospheric cooling, modulated by volcanic eruptions. The Quasi Biennial Oscillation is well represented throughout.

Despite these good characteristics, the ERA5 back extension did use historical observations for tropical cyclones in a sub-optimal way, which, given their sparsity is a challenging subject in itself. The back extension was published as a separate, preliminary data set and the production of an improved version is currently in progress.

The presentation will end with an outlook on future ECMWF reanalysis plans.

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*Speaker

[†]Corresponding author: hans.hersbach@ecmwf.int