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Author: Dr. William Bell
European Center For Medium Range Weather Forecasts (ECMWF), United Kingdom

Dr. Hans Hersbach
United Kingdom
Dr. Carlo Buontempo
United Kingdom
Dr. Chiara Cagnazzo
ECMWF, Germany
Dr. Anca Brookshaw
United Kingdom
Dr. Samantha Burgess
United Kingdom
Mr. David Armstrong
United Kingdom
Dr. Stijn Vermoote
United Kingdom

THE ASSIMILATION OF EARTH OBSERVATIONS IN C3S ATMOSPHERIC REANALYSES

Abstract

The European Union's Copernicus Climate Change Service (C3S), established in 2015 and operated by the European Centre for Medium Range Weather Forecasts (ECMWF), delivers high quality climate monitoring and climate projections to support policy and resilience measures at the global-to-local scale, by public and private entities. Central to the C3S mission is the provision of a comprehensive suite of quality assured data products based on Earth Observations of a broad range of Essential Climate Variables (ECVs), freely available to users through the Copernicus Atmospheric Data Store (CADS). Atmospheric reanalyses are a key component of the C3S portfolio. The latest C3S global reanalysis, ERA5, has attracted a diverse and rapidly growing user base which currently stands at 100 000 users. Reanalyses optimally combine observations with a forecast model through the process of data assimilation to provide a continuous estimate of the state of the atmosphere over multi-decadal timescales. They assimilate vast amounts of observational information, including meteorological satellite data from all major operational missions launched by Europe, the US, Japan and China since 1972. In ERA5, around 100 billion observations have been assimilated during the span of the reanalysis, 1940-present. As users demand ever greater accuracies at ever smaller spatial scales in successive generations of reanalyses, so the requirements on the quality and quantity of input observational data become ever more stringent. The next generation of reanalysis, ERA6, will exploit data from current and future satellite missions, including EUMETSAT's Metop-SG. In addition, in support of C3S, EUMETSAT is engaged in a programme of reprocessing data from long-term operational satellite missions for assimilation in ERA6. C3S also supports the recovery and assessment of data from the very earliest satellite missions, dating back to the 1960s and 1970s. The ongoing assessment of these datasets has quantified the significant benefits of assimilating these datasets.