

Reanalysis and climate data records as a supporting tool for global extremes monitoring

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Funded by the European Union Copernicus programme and implemented by the European Centre for Medium-Range Weather Forecasts (ECMWF), the Copernicus Climate Change Service (C3S, <http://climate.copernicus.eu/>) is currently producing the next generation global reanalysis, ERA5. ERA5 is already available for the period 1979 to present through the Climate Data Store (CDS, <https://cds.climate.copernicus.eu/>). In parallel to the production of ERA5, a stand-alone version of the land surface component, at higher resolution and with a series of land surface improvements, is also being produced (ERA5-Land). This improved version of the land component of reanalysis will be available through the CDS shortly. The role of reanalyses in climate and land monitoring applications is now widely recognized. For instance, ECMWF's reanalysis ERA-interim is periodically used, together with other datasets, as input to the World Meteorological Organization (WMO) annual assessment of the State of the Climate, routinely presented at the Conference of the Parties of the United Nations Framework Convention on Climate Change (UNFCCC). Reanalyses are also a resource for the production of Essential Climate Variables (ECVs) and Climate Indicators recommended by the Global Climate Observing System (GCOS). By optimally combining both satellite and conventional observations with a high-quality forecast model, reanalyses indeed provide consistent "maps without gaps" of ECVs and strive to ensure integrity and coherence in the representation of the main Earth system cycles (e.g. water, energy and carbon).

Complementary to the production of reanalysis, C3S also produces climate data records (CDRs) of ECVs based on satellite data. Different methods and techniques are applied to archives of satellite data to generate long satellite-based records of single ECVs that assures consistency, stability and target accuracy requirements set by GCOS.

The consistency shown by reanalysis and CDRs over several decades provides the basis to use both tools to support the monitoring of heatwaves, droughts or other extreme events such as floods. They are used to create observational and reanalysis-based climatologies that serve as a reference to detect anomalies in time series, either in the study of past events or in the prediction of future extremes.

In this presentation we will introduce C3S activities on reanalysis and the generation of ECVs, and some examples of their use to monitor climate extremes will be shown.