# ERA5-Land: an improved version of the ERA5 reanalysis land component

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**Abstract**

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 of European Reanalysis ERA5. Among others, it will make it possible to better understand the processes and interactions between different components of the Earth System which has derived into the climate from 1950 until present. It will also support Near-Real Time (NRT) applications by means of an operational early delivery mode (ERA5T). The core of ERA5 is the ECMWF Integrated Forecasting System in combination with a powerful 4D-VAR data assimilation system. The description of the ERA5 land surface component is also part of the ERA5 portfolio. However, with the objective of serving, primary, the climate community, few inconsistencies can arise in the temporal-spatial evolution of hydrological components. For example, a well-defined spin-up strategy to avoid temporal gaps in the seam between different production streams for long memory variables is needed. In order to solve the latter and other shortcomings, as well as to support different communities focused on land applications, C3S has taken the initiative to develop the ERA5-Land dataset, an unique dataset of its kind which will provide a global scale description of the most important land variables through a single simulation driven by near-surface atmospheric fields from ERA5, with thermodynamical orographic adjustment of temperature. The synchronization with ERA5T mode will also make it possible to provide NRT updates. One of the added values of ERA5-Land with respect to the ERA5 atmospheric reanalysis is a global projected horizontal resolution of approximately 9 km (around 4 times finer resolution than ERA5), matching the recently implemented ECMWF TCo1279 operational grid, and therefore providing consistent input for Numerical Weather Prediction and climate studies involving land water resources, but also for accurate hydrological and agricultural

modeling. It will also include, for the first time, an estimation of key land-variables error based on meteorological forcing and model parameters uncertainties supplied by a 10-member ensemble parallel run, thus providing vital information to land-surface data assimilation systems. The offline nature of land reanalysis allows to incorporate forefront model developments before the production phase. For example, ERA5-Land will benefit from a revision of the soil thermal conductivity, making it more accurate the heat transfer through the vertical dimension. In this paper the ERA5-Land dataset will be presented, as well as its main strengths and weaknesses.