



The impact of land data assimilation on global river discharge predictions

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Operational probabilistic flood forecasts have become common in supporting decision-making processes and providing a platform to risk reduction. The Global Flood Awareness System (GloFAS) is one of the few global scale applications that currently exist. GloFAS is developed by the Joint Research Centre of the European Commission (JRC) and the European Centre for Medium-Range Weather Forecasts (ECMWF) with the support of national authorities and research institutions. It couples state-of-the-art weather forecasts with a hydrological model to produce daily ensemble forecasts of river discharge with a forecast horizon of 30 days across a global river network. In GloFAS the real time streamflow forecasts are compared with climatological simulations to detect the severity of any high flow situations. In the current configuration, runoff produced "offline", where the ECMWF land-surface model (HTESSEL) is forced with atmospheric conditions from ERA Interim reanalysis, and runoff produced operationally in coupled mode with land data assimilation, are both used. This inhomogeneity of the application of land data assimilation in different parts of the GloFAS system can cause significant differences in river discharge and therefore limit the reliability of the flood severity information determined by comparing the real time forecasts to the historical discharge.

In this study we evaluate the potential impact of the land data assimilation on discharge forecasting in the global context. The analysis is based on the new ERA5 climate reanalysis dataset covering the period 1979 to present and developed through the Copernicus Climate Change Service (C3S). ERA5 is the 5th major global reanalysis produced by ECMWF, following FGGE, ERA-15, ERA-40 and ERA-Interim. This version consists of a high resolution reanalysis dataset (31 km), and additionally includes information on uncertainties based on 10 ensemble members at 62 km horizontal resolution. ERA5 is currently in production and the data release is expected in batches throughout 2017 and early 2018. ERA5 data is open access and free to download for all uses, including commercial use.

We will analyse the land data assimilation impact in the climatological context and also in the medium range horizon of the GloFAS forecasts. Two versions of ERA5 will be compared, the operationally produced coupled version including land data assimilation, and an "offline" surface-only rerun (uncoupled run) produced by forcing HTESSEL with ERA5 atmospheric variables. The impact on the skill of the global river discharge and other land-surface variables such as soil moisture will be investigated.