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Global seasonal hydrological forecasts – a Copernicus Climate Change Service (C3S) experience

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The Copernicus Climate Change Service (C3S) aims to provide various information of past, present and future climate relevant to support adaption and mitigation strategies. All data and processing is open and free, and can be used by anyone for any purpose in downstream applications from the C3S website (https://climate.copernicus.eu/). To facilitate climate adaptation worldwide C3S has assigned the Swedish Meteorological and Hydrological Institute (SMHI) the development of a global proof-of-concept on seasonal hydrological forecasts and key indicators on climate change impacts. Co-design with users operating both globally and on each continent from various sectors has ensured the uptake of the data.

Here we present the setup, the implementation and the challenges of the global seasonal hydrological forecasts, which are based on the bias-adjusted ECMWF SEAS5 seasonal climate forecasts (daily precipitation and daily mean, maximum and minimum temperature) and the global WW-HYPE hydrological model (http://hypeweb.smhi.se). The forecasts are updated on a monthly basis when the newly initialised seasonal forecasts become available. Seasonal information for river flow, water discharge, actual and potential evapotranspiration, soil water content, precipitation and temperature is presented as maps and graphs, for both climatology and forecast period (7 months ahead). The option to download the forecast data (catchment scale) is available including the metadata and forecast skill information. The map shows the anomaly for each catchment and lead month using as reference either the catchment's normal conditions (based on terciles) or extremes (10th and 90th percentiles) for the month of interest. The user further has the option to mask the catchments in which seasonal forecasts have no skill (based on re-forecast analysis); meaning that climatology is more predictive than ECMWF SEAS5. The graphs display the median and different percentiles of the ensemble of forecasts, and the high and low thresholds of the normal and extreme conditions for the month of interest.

Keywords
Seasonal hydro-meteorological forecasting, Copernicus C3S, global climate services