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## Continental and global hydro-climatic forecasting services to address user needs for the water-related sectors

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Addressing the user needs at the local and large scales remains an ongoing scientific and operational effort to the various hydro-climatic service providers. The evolution of hydro-climatic services has received high attention, particularly given the recent scientific and computational advancements that have led to skillful meteorological forecasts at time horizons from sub-seasonal (up to 6 weeks ahead) to seasonal (up to a year ahead). Sub-seasonal to seasonal (S2S) forecasts have great potential for user groups that are affected by climatic variations and that could manage such variations to their advantage through better predictions. Therefore the Swedish Meteorological and Hydrological Institute co-developed with users from the water-related sectors a demonstrator interface to communicate the ensemble of pan-European and global hydro-climatic indicators at the catchment scale.

Here we present these operational hydro-climatic services for the long time horizons, and focus on the setup, the implementation and the challenges. The provided hydro-climatic forecasts are based on the bias-adjusted meteorological forecasts from ECMWF (i.e. daily precipitation and daily mean, maximum and minimum temperature) and the pan-European E-HYPE and global WW-HYPE hydrological models (<http://hypeweb.smhi.se/>). The forecasts are updated frequently when the newly initialised forecasts become available. Hydro-climatic information for variables such as 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. The service provides also the option to download the forecast information (catchment scale) including also the metadata and forecast skill information. The map shows the anomaly for each catchment and lead time using as reference either the catchment's normal conditions (based on terciles) or extremes (10<sup>th</sup> and 90<sup>th</sup> percentiles) for the period of interest. To overcome misinterpretation of the forecasted information, we set as default the option to the user to mask the catchments in which forecasts have no skill (based on re-forecast analysis); meaning that climatology is more predictive than ECMWF forecasts. 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 period of interest.

**Keywords**

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