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Seasonal Predictability of Water Scarcity at the Global Scale

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Timely indication of water scarcity is most important for early mitigation of serious water and food shortages across the globe.
Within the EU FP7 GLOWASIS project a pre-validated GMES Global Service for Water Scarcity Information has been set up and tested. The service uses the global hydrological model PCR-GLOBWB to compute water fluxes and establishes monthly water scarcity by combining the outputs from PCR-GLOBWB with a number of water demands. The service has been set up in the forecast shell Delft-FEWS.

In this contribution, we evaluate the skill of the system across the globe in terms of forecasting a number of drought and water scarcity related indicators such as the water scarcity index, river discharge, soil moisture content and actual evaporation. First, we test how much skill is gained from memory by comparing skill from an Ensermble Streamflow Prediction (ESP) and reverse ESP (revESP) experiment using ERAInterim precipitation (GPCP corrected), temperature and Penman Monteith potential evaporation. From these experiments, critical lead times are derived for water scarcity, discharge and other hydrologic variables indicating the relative importance of initial condition versus meteorological forcing (at 0.5 degree resolution).

Subsequently, from a seasonal hydrological hindcast of 30 years (1981-2010) the added value of ECMWF seasonal forecasts (with and without bias correction) over climatological forecasts (e.g. ESP) is evaluated by looking qualitatively at the ‘actual skill’ of the water scarcity forecasts for individual water scarcity/drought events over the globe.

The first analyses show that predictability of water scarcity is highly variable across the globe (per season and location). In some areas water scarcity is predictable at least up to three month lead time.