Drought forecasting using Standardized Precipitation Index and ECMWF monthly probabilistic forecasts

B. Kurnik, S. Niemeyer, and G. Laguardia

Joint Research Center, Ispra (VA), Italy (blaz.kurnik@jrc.it)

The Standardized Precipitation Index (SPI) allows describing and comparing droughts in different climatic conditions and over different time scales. The way the SPI is calculated, namely the accumulation of rainfall over time scales of one to several months and its normalization, makes the index time series being rather smooth and auto-correlated, especially for longer time scales.

In this study drought forecasting with the SPI computed from ECMWF monthly meteorological forecasts is presented. The European Centre for Medium Range Weather Forecasts (ECMFW) monthly forecasting system has recently been updated and now integrates the medium range and monthly meteorological forecasts. The precipitation forecast for the next month is added to the accumulated observed rainfall of the past months. The 3-months SPI (SPI3) is calculated using 2 months of observed data and one month of forecasted accumulated precipitation.

In the presented approach the forecasted SPI3 is presented as a probability, between 0 and 100, to exceed predefined threshold (SPI3 < -1.5) derived from 50 ensemble members.

Brier Score (BS) and Brier Skill Score (BSS) (Brier, 1951) methods have been used for validation of probabilistic SPI3 forecasts against observations. Additionally also contingency table categorical verification has been applied.

In the analyzed spatial and temporal domain BS values for ECMWF forecast are below of 0.16 (60 % of the probability or more) in most of the months and grids. Higher BS has been calculated in the year 2006 and in the areas where instability of SPI is quite high. BSS shows the ECMWF forecasts are better skilled than climatology in spatial and temporal domain. There are only few cases where BSS values are below -0.20. Draw from BSS and contingency table verification, we can conclude that meteorological forecasts are better skilled than climatological in analyzed temporal and spatial domain.