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Assessing the catchment's filtering effect on the propagation of meteorological anomalies

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The characteristics of drought propagation within a catchment are evaluated by means of the analysis of time series of water fluxes and storages' states.
The study area is the Agri basin, Southern Italy, closed at the Tarangelo gauging station (507 km2).
Once calibrated the IRP weather generator (Veneziano and Iacobellis, 2002) on observed data, a 100 years time series of precipitation has been produced. The drought statistics obtained from the synthetic data have been compared to the ones obtained from the limited observations available.
The DREAM hydrological model has been calibrated based on observed precipitation and discharge. From the model run on the synthetic precipitation we have obtained the time series of variables relevant for assessing the status of the catchment, namely total runoff and its components, actual evapotranspiration, and soil moisture.
The Standardized Precipitation Index (SPI; McKee et al., 1993) has been calculated for different averaging periods. The modelled data have been processed for the calculation of drought indices. In particular, we have chosen to use their transformation into standardized variables.
We have performed autocorrelation analysis for assessing the characteristic time scales of the variables. Moreover, we have investigated through cross correlation their relationships, assessing also the SPI averaging period for which the maximum correlation is reached.
The variables' drought statistics, namely number of events, duration, and deficit volumes, have been assessed.
As a result of the filtering effect exerted by the different catchment storages, the characteristic time scale and the maximum correlation SPI averaging periods for the different time series tend to increase. Thus, the number of drought events tends to decrease and their duration to increase under increasing storage.