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Seasonal to daily drought prediction in the Po catchment, Italy.

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In the last years, the Po river catchment has been increasingly affected by drought events, caused by a marked reduction in snow and rain precipitations in autumn and winter seasons.
The main stakeholders and administrations that are involved in the use of water decided to develop a model capable of generating forecast scenarios used in a system supporting decision-making and alerting processes necessary for a good water management.
The system is composed by a spatially distributed hydrological model combined with hydraulic model used with real-time data provided by telemetry network and forecast meteorological data provided by deterministic and probabilistic seasonal model. It also includes stochastic models capable to highlight meteorological and hydrological drought conditions evaluating return periods and drought indexes.
The deterministic modelling chain covers a 15 days forecast, while the probabilistic one covers 3 months forecast. Here it is presented a method to transfer information from hydrometeorological models to spatial and temporal scales useful for hydrological applications.
Drought event models require a large forecast lead time, so the use of seasonal forecasts became crucial. Unfortunately this kind of forecast model usually provides data at monthly or seasonal time scale, while management models require daily data. For this reason a rainfall generator, based on Neymann Scott rectangular pulse model, is used. In this way, daily time series of precipitation in selected reference sites are available. Similarly, the temperature forecast can be downscaled through AR, Richardson's or Kilsby's models.
This approach generates an ensemble output allowing the user to evaluate, not only the simulated scenarios, but also the uncertainty of the system towards the forecast, giving a higher degree of sensitivity of the results.
The system provides the standardized precipitation index (SPI) and ad hoc developed discharge index. Moreover hydrologic droughts are characterised applying the run-method in terms of severity and duration respect to a threshold discharge. A multivariate analysis of droughts severity and duration allows to estimate the return period of the event.