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Drought forecasting and mitigation in Emilia Romagna Region, Italy.

Mauro Del Longo, Carlo Cacciamani, Silvano Pecora, and Enrica Zenoni
ARPA-EMR Emilia Romagna Region Environmental Agency, Parma, Italy (mdellongo@arpa.emr.it)

In the last ten years, in particular during 2002, 2003, 2005 and 2006, the Emilia Romagna Region has been interested by drought and water scarcity events; these brought the main stakeholders and administrations that are involved in the use of water to develop a model capable of providing to decision makers the necessary data useful to organize planning and managing activities for water resources. These activities are necessary to meet emergency situations that occur in the Emilia Romagna Region, that is affected by water scarcity conditions caused by severe meteorological drought combined with an intense use of the available resources.
In particular, it is possible to minimize the risk of wastage in agricultural and industrial production, and to protect ecosystem and environment according to recent European Directives.
The application of the forecasting models regards the Emilia Romagna Region, where the territory passes from the Appennines to the Adriatic sea.
In this area the Appenninic tributaries of Po river and the Po river itself, the Reno river and Romagnoli rivers are located.
The developed model prototype describes the water distribution and use in its complexity and, in a basin characterized by a high level of anthropogenic pressure, it is able to optimize the water allocation in conflict situations.
The system represents an innovative approach in drought forecast and in water resource management in the Po basin, taking into account deterministic and probabilistic meteorological forecasts, a chain for numerical modelling of hydrological and hydraulic simulations, the dissemination of forecast results and finally national and regional regulations for water scarcity management.
More in detail, the system architecture has been designed to receive in input hydro-meteorological variables observed in real time, the withdrawals data, storage and release data in natural and artificial reservoirs and deterministic meteorological forecasts with a fifteen days lead time and probabilistic seasonal forecasts with a three months time horizon.
The implemented stochastic model allows to assess the characteristics of the observed and forecasted drought event, calculating the return period and meteo-hydrological drought indexes.
The model chain simulates hydrological and water balance in the territory of Emilia Romagna Region, simulating different allocation of the water resource and implementing what-if scenarios, that can be used in an objective way by decision makers, where the objective approach consists in a general agreement of stakeholders about the shared methodology.
The model details are very sharp, simulating also the interaction between Adriatic sea and Po river in the delta area, in terms of salt intrusion forecasting.
The system is able to characterize the vulnerability of the territory of Emilia Romagna Region, evaluated by a correlation between drought impacts and their causes, listed by a filling-in questionnaires; so the system as a whole can be considered as a useful tool to face situations of water scarcity and to define alert strategies in the Emilia Romagna Region.