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Combining a data-driven approach with seasonal forecasts data to predicting reservoir water volume in the Mediterranean area.

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Artificial reservoirs are one of the main water supply resources in the Mediterranean areas; their management can be strongly affected by the problems of drought and water scarcity. The reservoir water level is the result of the hydrological processes occurring in the upstream catchment, which, in turn, depend on meteorological variables, such as rainfall and temperature. It follows that a reliable forecast model of the meteorological forcing, along with a reliable water balance model, could enhance the correct management of a reservoir. With regard to the rainfall/temperature forecast model, the use of forecast climate data in the mid-term may provide further support for the future water level estimation of reservoirs.

From the perspective of the water balance model, instead, among the approaches used to predict the water levels for the next future, those based on data-driven methods have been demonstrated to be particularly capable of correctly reproducing the correlation between a dependent variable (e.g., water level, volume) and some covariates (e.g., temperature, precipitation).

This study describes the preliminary results of a novel application that exploits the Seasonal Forecast (SF) data, produced at the European Centre for Medium-Range Weather Forecasting (ECMWF), within a data-driven model aimed to predict the reservoir water volume at mid-term scale, up to 6 months ahead in four reservoirs of the Sicily (Italy) here considered as a case study. For each case, a NARX (Nonlinear AutoRegressive network with eXogenous inputs) neural network is calibrated to reproduce the monthly stored water volume starting from the monthly precipitation and mean monthly air temperature variables.

Preliminary results showed that the NARXs have the capability to reproduce the water levels in the investigated period (January 2017 - April 2020), including the variations during more or less dry periods. All this despite the SF data have not been previously treated with downscaling and/or bias correction techniques.