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Sub-seasonal to climatic hydrologic predictions for sustainable reservoir management in water-stressed Mediterranean basins

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Given the specific nature of the Mediterranean region, water scarcity and documented progressive degradation of groundwater quality poses hazardous environmental, economic and social threats to several Mediterranean countries, with a significantly increased risk of conflicts around the limited availability of water resources. These risks are expected to be further exaggerated with the projected climate drying. Due to continued changes in drivers and pressures, traditional management practices alone are no longer sufficient.

Recent advances in weather and climate modeling research are putting into practice hydroclimatic projections of timescales ranging from sub-seasonal to climatic. Seasonal forecasts can be used for triggering a variety of water management strategies, as for example activating early responses and decisions in order to make water systems more adaptive and resilient to the increasing variability and uncertainty of hydrologic regimes, ultimately facilitating the reduction of drought related risks.

In the premises of the STREAM project, we use projections at the climate timescale to estimate the long-term trends and the changes in the temporal and quantitative variability of the hydrologic conditions in the basin of the Faneromeni reservoir under two concentration scenarios, the RCP 4.5 and RCP 8.5. The reservoir is located in Messara valley in Crete Island, Greece, an area highly water overexploited during the recent decades. We further use several seasonal forecast products provided under the umbrella of the Copernicus C3S programme, for a range of lead time horizons. Scenarios of water inflow and evaporation losses are used to inform the multi-objective operation design for the investigation of the impacts of alternative management policies. Our results are expected to improve the current practices used by the local practitioners for the management of water resources for sustainable water exploitation.

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