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Impact of climate change on superficial water resources in the South of France: statistical modelling over historical and future scenario periods

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In the Mediterranean, climate change and human pressures are expected to significantly impact surface water resources. We studied these impacts on the water discharge of six coastal drainage basins of the Gulf of Lions in southern France over the sixty-years period 1959-2018. Our approach was based on statistical analyses of hydrological, climate, land use and water management data. Results suggested that the annual water discharge of the six rivers studied can be predicted with high confidence by only two climatic indices, exclusively calculated from monthly temperature and precipitation data. This is a strong argument that climate is clearly the dominant driver of water discharge trends in the study region. These models also easily allow individual testing of the role of temperatures and precipitations on the evolution of annual water discharge. The latter decreased with about 30-45% in the study catchments over the 1959-2018 period and 25% can be attributed solely to the annual temperatures increase. Considering future projections of different climate models under a RCP 8.5 scenario, which depicts the strongest climatic changes, the annual water discharge could still decrease about 49-87% during the 2006-2100 period. For all models, we furthermore examined the relationships between the observed and simulated climatologies, our climatic indices and the large scale teleconnection patterns in order to better understand the spatial and temporal variabilities in the predicted water discharge series.