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Assessing Impacts of Climate Change on surface water temperatures in semi-arid alpine basins

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Temperature plays a critical role in the functioning of inland aquatic ecosystems. The metabolic rates of aquatic organisms, their productivity, and, more broadly, the rates of biogeochemical processes are largely determined by water temperature. Hence, understanding the processes that govern temperature in water bodies in response to external factors across daily to multi-year scales is essential. This is particularly urgent in alpine semi-arid basins with substantial human impact and strong influence of snow dynamics, and, especially within the context of global change, where ecosystem integrity is at risk. A process-based model has been developed to simulate water temperature in lakes and rivers at a regional (watershed) scale. The simulation algorithms are tested in the small alpine watershed of the River Genil, upstream of the city of Granada, which includes two water-supply reservoirs (Canales and Quéntar). Urban water demand largely determines withdrawal rates from these reservoirs, thus affecting the thermal dynamics in the water column and downstream reaches. Autonomous temperature sensors have been deployed at different sites and programmed to record hourly data. The model is forced with climate databases (reanalysis, regional climate simulation, and measured data sets) and used in hindcast/forecast exercises to assess the impact of climate change on the thermal regime of inland waters.