



## **Hydrological scenarios in the Oetztal Alps based on enhanced process understanding of seasonal snow and glacier melt for improved water resources management - Results of the HydroGeM3 project**

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Climate change is expected to affect supply and demand of water in Alpine headwatersheds in the next decades. Glaciers are retreating, seasonal snowcover duration is shortening, and streamflow is expected to decrease after a period of peak water. Future changes in the spatiotemporal availability of water resources can pose serious challenges to water management and induce conflicts in water use downstream. In the HydroGeM3 project, future climate change effects on the availability of water resources in the Oetztal Alps (Tyrol, Austria) are investigated by forcing the hydroclimatological model AMUNDSEN with scenario data retrieved from different RCP climate scenarios. Indicators for hydropower generation and winter tourism have been defined in an inter- and transdisciplinary stakeholder process. Quality assessment of the non-scenario model results is supported by means of multilevel spatiotemporal validation, and time series of streamflow components estimated with tracer-based hydrograph separation (stable isotope ratios) are compared to respective model results. Water demand is assessed using a newly developed agent-based model to estimate water fluxes at the human-environment interface. Model results indicate considerable decrease in snow amounts of up to 80 % in low to medium elevations in the future and strongly retreating glaciers with less than 20 % of their present-day volume still left by 2100. Runoff volumes in some catchments decrease by almost 40 % on the annual scale along with a shift of peak flows from July to June, and the average natural ski season length decreases by up to 50 days.