Aqua.MORE: Socio-hydrological Modelling of Water Resources in an Alpine Catchment

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The new agent-based model Aqua.MORE is designed to simulate water fluxes at the human-environment interface in a coupled water supply/demand system at the catchment scale. It was developed in a joint cooperation of hydro-climatologists and ecologists. The agent based modelling (ABM) approach represents the relevant real-world entities as individual agents: These are the natural water flow on the one hand, and different socio-economic actors with specific water use behaviours on the other. The model is easily adaptable to different catchments and actors, as their creation and characterization is rather simple, implemented in the programming environment of NetLogo. Due to its easy handling and flexibility, Aqua.MORE is suitable as a research and management tool developed for inter- and transdisciplinary studies, addressing a wide range of users from researchers of different fields to resource managers and decision makers.

To demonstrate the model strengths and application possibilities, we present a catchment study in Matsch Valley, South Tyrol (Italy). Here, the natural water availability is characterized by dry inner Alpine climate and a runoff regime that is dominated by snow and ice melt. Agriculture is the dominant water consumer due to regular irrigation. Local inhabitants and tourism are additional water users. The bottom-up simulation of the individual water agents with Aqua.MORE allows a comprehensive water assessment of the entire catchment for the current state as well as for future scenarios. In contrast to common (physical only) hydrological models, the Aqua.MORE output includes the natural water variabilities as well as socio-economic effects, and their mutual interactions. The novel model application therefore matches the paradigms of the current research decade on change in hydrology and society 'Panta Rhei'.