

Modelling mountain hydrology to understand the impact of abiotic environmental variables on the health of aquatic ecosystems

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Despite their remoteness, mountain aquatic ecosystems have been subject to environmental degradation related to stressors including climate change, changes in land-use and land cover and the exposure to organic and inorganic contaminants. High altitude lakes, wetlands and streams are sustaining a rich biodiversity with many specialist species that are sensitive to changing conditions. Amphibians in their mountain habitat are of particular concern due to their global decline crisis. They are directly dependent on water quality and quantity and can therefore be seen as sentinel species and inform about the health of mountain aquatic ecosystems. Dramatic amphibian extinctions have been observed for several decades and are presently explained by a complex combination of causes, including habitat loss and degradation as well as the spread of the pathogenic fungus *Batrachochytrium dendrobatidis*. As a first step, this work aims at exploring changes in the abiotic variables of the mountain aquatic habitats. Existing data on climate, water quantity, water chemistry, land-use, land cover and pollution for the Pyrenees mountain range will be analyzed. Hydrological modelling (using for example SWAT - Soil and water assessment tool) will be used to describe and compare the hydrological and biogeochemical dynamics of the aquatic systems. Model outcomes will be confronted with data on sentinel species distribution and pathogen spread. Existing and newly collected data for three other mountain ranges – the Sierra Nevada (USA), the Dhofar (Oman) and the Great Hinggan (China) – will be analyzed and used in the modelling tools in order to compare different pedo-climatic contexts. Results of this work are expected to tackle questions as for example: Which hydrological and climatic variables (e.g. water and air temperature) are influencing amphibian disease dynamics? What is the role of catchment characteristics and small- to large-scale landscape gradients? Insights can help in species conservation efforts or protected area management by identifying especially vulnerable areas towards environmental degradation, biodiversity loss and pollutant transfer.