Global Change in Tropical Mountain Environments

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It is expected that global climate change will have drastic impacts on water supply in many regions worldwide. Among those, tropical mountain areas are especially vulnerable. Many of their meteorological, hydrological and biological processes are characterised by strong spatial gradients and delicate balances that are easily perturbed by changing environmental conditions. On the other hand, mountain regions provide essential ecosystem services for their inhabitants and those of surrounding areas. The importance, vulnerability and complexity of the hydrological systems in mountain areas strongly contrast with the available data, in particular in tropical regions. The quality of existing data is another recurrent problem due to the low quality of instruments, poor maintenance, or insufficient data processing skills of technicians. The limited availability and low quality of data are the major obstacle in the calibration and validation of hydrological models that are used to predict the effects of human activities in general and climate change in particular. Two case studies are presented, one from the south Ecuadorian Andes and one from the Ethiopian Bale mountains. Both ecosystems are characterised by mountainous wetland ecosystems that provide important ecosystem services, in particular water supply, carbon sequestration and biodiversity conservation. Due to the isolated existence of the ecosystems, global change is expected to have tremendous impact on ecosystem dynamics, wetland area, soil properties and hydrological behaviour. The latest results of an integrated hydrometeorological model will be presented, quantifying the impact of global change on ecosystem boundaries, soil properties and water production and regulation. The uncertainty on the current predictions is assessed and the potential of new data sources to improve model predictions is evaluated. This analysis focuses particularly on two data types: (1) qualitative expert knowledge and (2) synthetic aperture radar images (ASAR).