Geophysical Research Abstracts
Vol. 15, EGU2013-9475, 2013
EGU General Assembly 2013

Modelling the Effects of Land Use and Climate Changes on Hydrology in the Ursern Valley, Switzerland

Abdallah Alaoui (1), Elias Willimann (1), Karsten Jasper (2), Jan Magnusson (3), and Rolf Weingartner (1)

(1) Hydrology group, Geographical Institute, Bern, CH-3012, Switzerland (alaoui@giub.unibe.ch, ++41 (0)31 6318511), (2) Hydrological Forecasts Section, Federal Office for the Environment, FOEN, CH-3003, Bern, Switzerland, (3) Snow Hydrology Research Group, Institute for Snow and Avalanche Research, SLF, CH-7260, Davos, Switzerland

While many studies have been conducted in mountainous catchments to examine the impact of climate change on hydrology, the interactions between climate changes and land use components have largely unknown impacts on hydrology in alpine regions. They need to be given special attention in order to devise possible strategies concerning general development in these regions. Thus, the main aim was to examine the impact of land use and climate changes on hydrology by model simulations. For this purpose, the physically based WaSiM-ETH model was applied to the catchment of Ursern Valley in the central Alps (191 km2) over the period of 1983-2005. Modelling results showed that the reduction of the mean monthly discharge during the summer period is due primarily to the retreat of snow discharge in time and secondarily to the reduction in the glacier surface area together with its retreat in time, rather than the increase in the evapotranspiration due to the expansion of the green alder on the expense of grassland. The significant decrease in summer discharge during July, August, and September shows a change in the regime from b-glacio-nival to nivo-glacial. These changes are confirmed by the modeling results that attest to a temporal shift in snowmelt and glacier discharge towards earlier in the year: March, April and May for snowmelt and May and June for glacier discharge. It is expected that the change in the yearly total discharge due to the land use changes will be reduced by 0.6 % in the near future whereas, it will be reduced by about 5% if climate change is also taken into account.