Geophysical Research Abstracts
Vol. 15, EGU2013-9877-2, 2013
EGU General Assembly 2013

Potential Changes in Flood Frequency and Timing in an Alpine Watershed under Climate Change Conditions

Klaus Schneeberger (1,2) and Christian Dobler (1,2)

(1) alpS - Centre for Climate Change Adaptation Technologies, Innsbruck, Austria, (2) Institute of Geography, University of Innsbruck, Austria

Climate change may have significant effects on the frequency and intensity of floods across many regions of the world. In mountain regions, the complex process of runoff generation is the result from a combination of higher precipitation induced by orographic effects, reduced evapotranspiration rates caused by relatively low mean temperatures, and temporary storage in form of snow and ice. Potential changes in temperature and precipitation patterns may lead to a modification of these factors, and thus, may significantly affect hydrological processes in Alpine catchments. The aim of this study is to assess how climate change may affect flood frequency and timing in an Alpine watershed. The Tyrolean Lech Valley, a typical Alpine watershed ($\sim$1,000 km^2) situated in the Northern Alps, was selected as study area.

Current approaches to assess climate change impacts on peak flows usually follow a 'top-down' approach, where the results of climate models are used as input into a hydrological model. However, a number of recent studies have shown that projections based on such modelling chains are associated with high uncertainty, which makes it difficult to obtain clear signals. In this study we applied an alternative approach to assess changes in flood frequency and timing in the Lech watershed. Thereby, hypothetical climate change scenarios were constructed and, in a next step, used as an input into a hydrological model. The main advantage of this approach is that the full range of climate change can be considered, including results beyond what current models project. The hydrological model applied in this study is the semi-distributive rainfall-runoff model HQsim, which has been calibrated and validated on observed meteorological and hydrological data.

The results show that climate change may have significant effects on the flood regime of the Alpine Lech watershed. We found strong changes in the timing of annual maximum floods. Under warmer climate conditions, the potential flood period is expected to significantly extend, leading to more intense floods during winter. This is mainly the result of increasing temperatures and independently from changes in precipitation. These insights may be crucial for flood protection policies.