

Storylines of combined land use and climatic drivers and their hydrological impacts in an alpine catchment (Brixental/Austria)

Ulrich Strasser (1), Kristian Förster (1), Gertraud Meissl (1), Thomas Marke (1), Markus Schermer (2), Rike Stotten (2), Herbert Formayer (3), and Matthias Themessl (4)

(1) University of Innsbruck, Institute of Geography, Innsbruck, Austria (ulrich.strasser@uibk.ac.at), (2) University of Innsbruck, Institute of Sociology, Innsbruck, Austria, (3) BOKU University of Natural Resources and Life Sciences, Vienna, Austria, (4) Zentralanstalt für Meteorologie und Geodynamik, Vienna, Austria

We present a numerical modelling experiment with storylines of coupled land use and climate evolution as input in the physically-based, distributed water balance model WaSiM. The aim is to quantify the effects of these two framing components on the future water cycle. The test site for the simulations is the catchment of the Brixentaler Ache in Tyrol/Austria (47.5°N, 322 km²). The climatic background is defined by simulations for the A1B and RCP 8.5 emission scenarios until 2050. These two climate projections were combined with three future land use developments for forest management, developed in an inter- and transdisciplinary assessment with local actors using plausible and consistent projections for forest management, policy, social cooperation, tourism and economy: (i) Ecological adaptation: The forest management consequently applies the political guidelines, and the forest cover is dominated by an ecological, place-adapted mixed cultivation with a harmonious age structure. (ii) Economical overexploitation and wildness: The increase in efficiency, cost reduction and short term results are in focus of the forest management. (iii) Withdrawal and wildness: Cultivation in general is decreasing, and the forest becomes vulnerable against natural hazards.

A new module for snow-canopy interaction simulation, providing explicit rates of intercepted and sublimated snow from the trees and stems of the different forest stands, has been implemented in WaSiM. The new version of the model is used to model the coupled future climate/land use storylines for the Brixental. Results show the effects of climate change and land use on the water balance and streamflow in the catchment.