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Storylines of socio-economic and climatic drivers for land use and their hydrological impacts in alpine catchments – the STELLA project example

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Future land use in Alpine catchments is controlled by the evolution of socio-economy and climate. Estimates of their coupled development should hence fulfill the principles of plausibility (be convincing) and consistency (be unambiguous). In the project STELLA, coupled future climate and land use scenarios are used as input in a hydrological modelling exercise with the physically-based, distributed water balance model WaSiM. The aim of the project 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 so-called „storylines“ of future coupled climate and forest/land use management, policy, social cooperation, tourism and economy have jointly been developed in an inter- and transdisciplinary assessment with local actors. The climate background is given by simulations for the A1B (temperature conditions like today in Merano/Italy, 46.7°N) and RCP 8.5 (temperature conditions like today in Bologna/Italy, 44.5°N) emission scenarios. These two climate scenarios were combined with three potential socio-economic developments („local“/„glocal“/ „superglobal“), each in a positive and in a negative specification. From these twelve storylines of coupled climate/land use future, a set of four storylines was selected to be used in transient hydrological modelling experiments. Historical simulations of the water balance for the test site reveal the pattern of land use being the most prominent factor for the spatial distribution of its components. A new prototype for a snow-canopy interaction simulation module provides explicit rates of intercepted and sublimated snow from the trees and stems of the different forest stands in the catchment. This new canopy module will be used to model the coupled climate/land use future storylines for the Brixental. The aim is to quantify the effects of climate change and land use on the water balance and streamflow, both separately and in their respective combination.