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The combined impact of land use and climate change on the water balance of an Alpine catchment (Brixental/Austria) – Results of the ACRP-funded project STELLA

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In the present study, the impact of coupled storylines of potential future climate and land use evolution on the water balance of the Alpine catchment of the Brixentaler Ache in Tyrol/Austria (322 km2) is analysed. Therefore, downscaled and bias-corrected climate simulations for the A1B and RCP 8.5 emission scenarios are combined with three future land use developments of forest management. Both are later applied as input for the physically-based, distributed water balance model WaSiM. Land use evolution is elaborated by means of an inter- and transdisciplinary approach together with local actors to define 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.
As the water balance of the study site is largely influenced by the presence of a seasonal snow cover, a new module for snow-canopy interaction simulation has been implemented in the hydrological model that provides explicit rates of intercepted and sublimated snow from the trees, stems and leaves/needles of the different forest stands. The results presented show the impact of the combined climate and land use evolution on the water balance of the Brixentaler Ache.