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Numerical assessment of the impact of climate change on the sediment yield in alpine catchments

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Abstract: Sediment-laden torrential floods are among the most important natural hazards in Austria. Ongoing climate change in the Austrian Alps will make it necessary to expand and reassess protection measures. Climate change projections for the Alpine region show increasing precipitation during winter and stronger convective precipitation events in summer, even if the aspired warming thresholds of the Paris Agreement were reached. In the research project RunSed-CC one module aims at numerical modelling the current and future sediment transport based on runoff and sediment availability in the Schöttlbach catchment in Styria (Austria). The 2D depth-averaged numerical models Telemac-2D & Sisyphe will be implemented, calibrated and validated by linking the simulated runoff from a hydrologic model and the observed sediment data. The high variability of boundary conditions in a torrent leads to significant uncertainties. Minimum and maximum calculations of sensitive input parameters will allow to assess the possible bandwidth of the results. Different algorithms for the sediment transport in mountain streams will be adapted or implemented to enhance the capability of the numerical model. The calibrated sediment transport model will be used to generate sediment-discharge functions related to the given parameter range in the catchment. This enables the analysis of the possible impact of climate change on the sediment yield in alpine catchments including a scenario coming close to the Paris Agreement (rcp4.5) and a high-end emission scenario (rcp8.5). The calibrated numerical sediment transport model will be applied for estimating the changes of sediment transport in the catchment due to different climate scenarios and modified boundary conditions (e.g. different flood hydrograph, sediment availability). The research will include further sensitivity analyses of key parameters for sediment transport processes and flood hazards in the climate change scenarios.