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How do changes in model parameters compare to climate change impacts signals? A case study of a modeling chain to predict reservoir inflow and sedimentation processes in the Devoll Catchment (Albania)

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Mountainous regions are viewed as “water towers”, where lower temperatures and higher precipitations affect the annual water balance with snow accumulation in winter and maximum runoff driven by snowmelt during spring or summer. Moreover, the need for effective water resources management has turned into a major challenge, especially in the face of climate change. The current development of computer models allows representing the response of catchments even under the impact of changing climate conditions. For this reason, the Devoll catchment in Albania, which is characterized by a Mediterranean climate and varying topography, is studied as part of a modelling chain up to the Banja reservoir, where sedimentation processes are of great importance.
Three different models are used to predict the response of the catchment within the modeling chain: i) a hydrological model (WaSiM), ii) a soil erosion and transport model (RUSLE and SEDD), and iii) a three-dimensional numerical model (SSIIM 2) to simulate flow and suspended sediment transport in the reservoir. Since numerous parameters are involved in the chain and those can introduce uncertainties in the subsequent models, an approximate method is applied to estimate the uncertainties arising from the model parameters, whereby each parameter is subject to a ±1% variation. In addition, climate change impacts are considered while running the modeling chain with different climate scenarios. In all cases, we focus not only on discharge as a target variable but also on the suspended sediment load and bed elevation along the reservoir transect. Finally, a comparison between the results obtained from the variation in parameters and climate change impacts is performed.