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Modelling the impact of vegetation on marly catchments in the Southern Alps of France

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The Southern Alps of France have been identified as a hot-spot in a global climate change context where the rainfall intensity increase may exacerbate the erosion of already badly erodible lands: Badlands. Vegetalization methods are a promising area of research for erosion control and slope and riverbed stabilization. Nevertheless the impact of vegetation on erosive dynamics is still poorly understood. We own data collected over the last thirty years on marly catchments in the Southern Alps of France from the Draix-Bléone Observatory, part of the Network of Drainage Basins RBV. These are temporal data of sedimentary flux at the scale of the precipitation event but also more recent topographic data on watersheds with areas ranging from 10-3 square kilometers to twenty square kilometers. Erosion rates in this landscape reach 1 cm per year. We simulate the topographic evolution of the catchments over a few decades to centuries with the landscape evolution model Landlab, using our data to calibrate and explicitly validate the model. This model, in comparison with other landscape evolution models, incorporates a more advanced vegetation module in terms of ecology. Nevertheless the erosion-vegetation coupling is not present in Landlab and we are working on its construction. To this end we use an erosion module and a vegetation module that we seek to couple. We want to see how the erosion laws parameters depend on the vegetation cover. We have implemented the calibration of parameters of a non-linear diffusion module coupled with a transport-limited law by comparing the simulated annual sediment flux with the one of the data of the observatory as a function of the percentage of vegetation cover of the ground. We obtained average values of parameters adjusted according to vegetation cover. We observe that the values of the erosion laws parameters are strongly affected by the percentage of vegetation cover. We will then spatialize these parameters on our vegetation maps in order to obtain different parameter values for different types of vegetation.