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# Impacts of climate and land use changes on the hydrological and erosive response of a humid and dry Mediterranean catchment

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The impacts of climate and land use changes on streamflow and sediment export were evaluated for a humid (São Lourenço) and a dry (Guadalupe) Mediterranean catchment, using the Soil and Water Assessment Tool (SWAT) model. SWAT was able to produce viable streamflow and sediment export simulations for both catchments, which provided a baseline for investigating climate and land use changes under the A1B and B1 emission scenarios for the period between 2071 and 2100. Compared to the baseline period (1971-2000), climate change scenarios forecasted a decrease in annual precipitation in both catchments (humid, both scenarios: -12%; dry, both scenarios: -8%), but with strong increases during winter. Land use changes followed a socio-economic storyline in which traditional agriculture was replaced by more profitable land uses, i.e. corn and commercial forestry at the humid site and sunflower at the dry site. Climate changes led to a decrease of streamflow in both catchments (humid, both scenarios: -13%; dry, A1B: -14%; B1: -18%), mostly as a consequence of the projected decrease in rainfall. Land use changes led to small increases in flow discharge, but a higher increase was observed for the dry site under scenario A1B (humid, A1B: +0.3%; B1: +1%; dry, A1B: +6%; B1: +0.3%). The combination of climate and land use scenarios was mostly dominated by the climatic response, since a decrease in streamflow was observed for both catchments (humid, A1B: -13%; B1: -12%; dry, A1B: -8%; B1: -18%). Regarding the erosive response, clear differences were observed between catchments mostly due to differences in both the present-day and forecasted vegetation types. Climate scenarios led to a decrease in sediment export at the humid catchment (A1B: -11%; B1: -9%) and to an increase at the dry catchment (A1B: +24%; B1: +22%) in the first case due to the predominant vegetation type (vineyards and maritime pine) providing year-round cover, while in the second, due to annual crops (wheat and pasture) exposing soils during winter. For land use scenarios, the same contrast occurred between catchments (humid, A1B: -18%; B1: -10%; dry, A1B: +257%; B1: +9%) due to the expansion of permanent cover vegetation in one case and annual crops in the other. Climate and land use changes had off-setting effects on sediment export at the humid catchment (A1B: -29%; B1: -22%), as a result of reduced precipitation and cultivation of more soil-protective crops. A different response was observed for the dry catchment (A1B: +222%; B1: +5%), as the increase in sediment export associated with the cultivation of highly erosion-prone crops was not aggravated by the higher rainfall amounts forecasted for winter months. The results of the present study highlight that indirect impacts of climate change, like land use changes, might be similar or more severe than direct impacts.