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Simulating badland erosion with KINEROS2 in a Mediterranean mountain catchment (Vallcebre, Eastern Pyrenees).

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The Vallcebre catchments, located in the Catalan Pyrenees, yield large amounts of sediments (about 580 Mg km-2 year-1) that are produced in relatively small but very active eroded areas (badlands). The 12-year monitoring of sediment transport from these catchments showed a very large interannual variability that made it difficult the assessment of long term estimates. Several lines of evidence suggest that there is a delay between sediment production, done by summer intense rainstorms, and sediment transport, effected by the main floods produced by large precipitation events during wet antecedent conditions. As continuous sediment yield from small badland areas is difficult and costly, modelling may provide a valuable tool for investigating the role of summer rainstorms in the annual and interannual sediment yield rates an for estimating the relevance of temporal sediment stores in the drainage network. The physically-based KINEROS2 (Smith et al., 1995) erosion model was subject to a calibration-validation exercise with data obtained during three years in an instrumented 1240 m2 badland area (Castelltort, 1995), using the Generalized Likelihood Uncertainty Estimation (GLUE) approach (Beven and Binley, 1992). The ranges of the parameters for the Monte-Carlo exploration where selected after a literature revision and a sensitivity analysis. The goodness of the parameter sets was estimated using the Nash and Sufcliffe (1970) efficiency when predicting the erosion volumes for a set of 6 events. Only 1,475 of the 5,000 explored parameter sets gave a positive efficiency and were retained for a first trial. When these models were tested with other 6 events of similar characteristics, most of them gave mediocre efficiency values, showing that they were of limited robustness. Therefore, only the 267 parameter sets with a calibration efficiency higher than 0.75 were considered as behavioural, 90% of them obtaining efficiencies higher than 0.56 with the validation events. Although most of the

erosion weights for these events were located outside the 90% confidence prediction bounds, the cumulated observation was well located within these bounds. Finally, the model was applied to the badlands in the Ca l'Isard catchment and ran for the events of the period 2001 to 2004. The comparison of the results with the observed transport rates confirmed a clear temporal mismatch between erosion and sediment transport, although the total weights of sediment were largely underpredicted, suggesting the role of sediment sources not simulated by the model.

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