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Sensitivity analysis of distributed erosion models - Application to four models

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We applied a previously-defined framework [1] for sensitivity analysis to four very different distributed erosion models (MHYDAS, STREAM, PESERA, MESALES). We investigated their sensitivities to input fluxes, hydrological sub-models and specific erosion parameters gathered into equivalent slope and equivalent erodibility. Tests involved multiple combinations of rain intensities and runoff conditions in addition to selected screenings of the equivalent parameter space, resorting to one-at-a-time displacements and Latin-Hypercube samples. Sensitivity to spatial distributions of erosion parameters was calculated as an index of numerical spread of soil loss results, obtained at the outlet of a nine-cell virtual catchment endowed with a fixed flow chart. Spatially-homogeneous or distributed parameterizations yielded soil loss of comparable magnitudes. Models were more sensitive to equivalent erodibility than to equivalent slope, while each model had sensitivity trends varying with input fluxes and the propensity of soils to runoff.

[1] Cheviron et al. (2010), Sensitivity analysis of distributed erosion models – Framework, Water Resources Research, accepted.