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Spatially distributed erosion model for Appenine basins

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In order to build a full watershed management tool, an existing spatially distributed hydrologic model has been extended with a suspended sediment modelling module. Suspended sediment is a main concern in Appenine basins because of the wide presence of clayey soils and of clay outcrops: these are among the major sources of suspended sediment, which is one of the main responsible for water intake plugging and for nutrient spreading. The model is based on a regular grid discretization of the watershed and computes discharge and overland flow through a Muskingum-Cunge model with spatially variable parameters, solving the ordinary differential equations with a 4^{th} order Runge-Kutta algorithm. Hydraulic values are calculated at the centre of each discretization cell. The sediment detachment-transport module is aimed to address water quality concerns and therefore focuses only on suspended sediment. Soil detachment is considered mainly as rainfall-driven and depends on hillside slope, rainfall intensity, vegetation cover characteristics and overland flow depth: the mathematical description of the process follows the study of Gabet & Dunne (WRR, 2003), along with a raindrop diameter specifically calculated for Italian climate by Zanchi & Torri (1980) and a raindrop final velocity estimate by Assouline & al. (J of H, 1997). Transport of detached material is described through a quasi-linear advection equation, neglecting sediment redeposition and assuming that suspended sediment velocity is equal to water velocity; partial differential equations are solved through an explicit Lax-Wendroff scheme, in order to achieve second-order accuracy and to better model the finite propagation speed of the hyperbolic partial differential equations involved. First encouraging results show the ability of the model to simulate suspended sediment yield during storm events and its suitability to Appenine environments.