Hillslope erosion model for splash erosion, sheet flow, and concentrated flow erosion

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Hillslope erosion causes important soil and fertility loss, as well as contributing to contaminant transport (sediment and adsorbed chemicals). Also, erosion contributes to stream and lake embankment. Recent studies estimate that worldwide, the 45000 dams over 15 m high, trap more than 25% of global sediment and that these would be losing between 0.5 and 1 % of their capacity annually. The increase in soil erosion due to human mismanagement causes advancing desertification of the landscape. The aim of this work is to provide tools for decision making regarding erosion management decisions in the Chilean semi-arid Secano area. Specifically, a numerical erosion model with physical base, so as to be incorporated in distributed hydrological models, that considers rainfall erosion, sheet erosion, and rill erosion in a hillslope. The model will be applied to field plots where soil loss has been monitored. The numerical model (Hillslope Erosion Model, HES) is an event model and considers dividing the hillslope length in 1 m elements. Water and sediment can enter each element from upslope, and Manning is used to estimate mean velocities. HES estimated total soil loss during the events rather well, obtaining good approximations for the different plot treatments, without using calibration of parameters. Sensitivity analysis showed that for sheet flow, the most sensitive parameters are percent cover and cohesion, and for rill flow, these are cohesion and slope. For both, the rill network has little effect.