Fire-induced catchment erosion on a depleted soil system from GeoWEPP and RUSLE models, Santa Olga, Chile

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The recent increase in frequency and extent of severe wildfires in South-Central Chile is degrading the already eroded soils of the Coastal Cordillera. Spatially explicit quantification of erosion triggered by these disturbances may reveal useful information for soil conservation and land planning purposes, which is especially relevant in drinking-water catchments. We compared estimations of water erosion using a process-based and an empirical modeling approaches in a small (173 ha) burned drinking water catchment. To this end, we implemented the GeoWEPP process-based model and the RUSLE empirical approach for different scenarios of wildfire severity using remote sensing, in situ soil and hydro-meteorological data (2001-2019). Individual Hydrologic Response Units resulted in very low erosion rates in GeoWEPP respect to RUSLE, while both simulations represent low erosion rates respect to observations reported for other latitudes of the Coastal Cordillera. Those low erosion rates could be explained by low rainfall erosivity and high critical shear stress, which in turn is a consequence of soil compaction. The spatial variations of the modeled sediment yields (2001-2019) were associated both to the wildfire and to the land management at hillslopes, which involves clear cut timber harvest at most forest plantations areas. A better quantification of those erosion processes is necessary to improve the understanding of the evolution of Chilean forestry landscape, in order to prioritize efforts for soil conservation and ecosystem restoration.