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The transfer of modern organic Carbon by landslide activity in tropical montane ecosystems

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Geomorphic processes play an important role in the transfer and storage of Carbon within mountainous terrain. Among these, mass wasting stands out because of its impact on above and below-ground Carbon pools and its potential for releasing or sequestering Carbon. A combined remote-sensing and GIS approach was used to quantify the amount and spatial redistribution of modern organic Carbon mobilized by mass wasting activity in a tropical mountain setting. The study focused on a population of shallow landslides triggered by Hurricane Mitch (1998) on seven watersheds draining the southern flanks of the Sierra de Las Minas mountain range (SLM) in central Guatemala. Results illustrate that mass wasting contributed to the transfer of 43 x10^4 MgC, or 3% of the pre-event C in above-ground vegetation and soils for an equivalent Carbon flux rate of 0.08 to 0.33 MgC ha^{-1} y^{-1}. The ultimate fate of the Carbon released by landsliding is very uncertain but depending on the proportion sequestered by colluvial deposits, mass wasting could be either a net source or sink of Carbon. In a simulated setting in which all Carbon transferred by landslides from all tropical mountains of the globe is released to the atmosphere, it would represent an amount equivalent to 1 – 11% of the global Carbon currently being released by the burning of fossil fuels. Meanwhile, in a scenario where a significant proportion of the Carbon transferred by landslides is retained within sedimentary deposits, sequestration rates would equal 2 – 19% of the residual land sink.