Fate of eroded soil organic matter in temperate, forested catchments: *implications for erosion-induced carbon sequestration*

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Topsoil and associated soil organic matter are continuously laterally distributed on the landscape by the process of soil erosion. The role of soil erosion on terrestrial carbon sequestration has been gaining a lot of attention over the last two decades. Soil erosion has been shown to lead to a sink of atmospheric carbon dioxide in soil if at least some of the eroded carbon is replaced by production of new photosynthate and/or some of the eroded carbon is stabilized in downslope depositional landform positions. However, until recently most of the work in this area has been focused on agricultural or grassland systems. Here, we present results from temperate forested catchments in the southern part of the Sierra Nevada Mountains. We found that most of the soil organic matter eroded from low-order catchments in the western slope of the Sierra Nevada Mountains is composed of forest floor material that has high concentrations of carbon. The steep slopes of these catchments also contribute to export of large proportion of the eroded forest floor material out of the catchments. Our radiocarbon analyses showed that the soil organic matter in the eroded material is composed of modern (post-1950) carbon with fraction modern values at or above 1. We also found that neither elevation, nor climate (across six years that we investigated) leads to significant changes in the composition and mean residence times of the eroded material, despite considerable differences in mean residence time of soil organic mater in soil profiles of the contributing hillslopes in the high vs. low elevation (low elevation: 1800 m, high elevation: 2300 m) catchments we studied. Our findings show that soil organic matter eroded from upland forested catchments is a lot more susceptible to decomposition, compared to organic matter eroded from agricultural or grassland systems likely leading to a less significant role of soil erosion on terrestrial carbon sequestration in forested catchments.