



Carbon redistribution by erosion processes in an intensively disturbed catchment

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Understanding how organic carbon moves with sediments along the fluvial system is crucial to close catchment scale carbon budgets. Especially challenging is the analysis of organic carbon dynamics during fluvial transport in heterogeneous, fragile and disturbed environments with ephemeral and intense hydrological pulses, typical of Mediterranean conditions. This paper explores the catchment scale organic carbon redistribution by lateral flows in extreme Mediterranean environmental conditions from a geomorphological perspective. The study area is a catchment (Cárcavo) in SE Spain with a semiarid climate, erodible lithologies, shallow soils, and highly disturbed by agricultural terraces, land levelling, reforestations and construction of check-dams. To increase understanding of erosion induced catchment scale organic carbon redistribution, we studied the subcatchments of 8 check-dams distributed along the catchment main channel in detail. We determined ^{137}Cs , physicochemical characteristics and organic carbon pools of soils and sediments deposited behind each check-dam, performed spatial analysis of properties of the catchment and buffer areas around check-dams, and carried out geomorphological analysis of the slope-channel connections.

Soils showed very low Total Organic Carbon (TOC) values oscillating between 15.2 and 4.4 g Kg⁻¹ for forest and agricultural soils, respectively. Sediments mobilized by erosion were poor in TOC compared to the eroded (forest) soils (6.6±0.7 g Kg⁻¹), and the redistribution of organic carbon through the catchment, especially of the Mineral Associated Organic Carbon (MAC) pool, showed the same pattern as clay particles and ^{137}Cs . The TOC erosion rates (0.031±0.03 Mg ha⁻¹ y⁻¹) were comparable to others reported for subhumid Mediterranean catchments and to those modelled worldwide for pasture land. Those lateral fluxes were equivalent to 10.4 % of the TOC stock from the topsoil at the moment of the check-dam construction and reforestation works. However the organic carbon in deposited sediments comes not only from surface erosion processes, but also from deeper soil or sediment layers mobilized by concentrated erosion processes. Sediment richer in organic carbon comes from the soil surface of vegetated (reforested) areas close and well connected to the channels. Subcatchments dominated by laminar erosion processes showed two times higher TOC/total erosion ratio than subcatchments dominated by concentrated flow erosion processes. Lithology, soils and geomorphology exert a more important control on organic carbon redistribution than land use and vegetation cover in this geomorphologically very active catchment.