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# Deep soil dynamics of floodplain carbon in the Central Valley of California

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Active floodplains can putatively store large amounts of organic carbon (SOC) in subsoils originating from catchment erosion processes with subsequent floodplain deposition. Changes in catchment land use patterns and river management to optimize agricultural use of the floodplain or to restore the floodplain back to natural systems may alter SOC stocks in these soils. Our study focussed on the assessment of SOC pools associated with alluvial floodplain soils converting from conventional arable use to restored flooding and floodplain vegetation.
We evaluated depth-dependent SOC contents using 21 drillings down to 3m and 10 drillings down to 7m along a transect through a floodplain area of the lower Cosumnes River, a non-constrained tributary to the Sacramento – San Joaquin Delta in California. In general, our data underline the importance of carbon stocks in subsoils >1m, which represent up to 19 and 6% of SOC stocks at the different sampling locations accounting for drillings down to 3 and 7m, respectively. All of our sampling sites revealed a SOC-rich buried A horizon between 70 and 130cm with SOC concentrations between 11 and 17g/kg, representative of the functioning floodplain system pre-disturbance.
Radiocarbon dating showed that the 14C age in the buried horizon was younger than in the overlaying soils, indicating a substantial sedimentation phase with sediments of low SOC concentrations and higher carbon age. This sedimentation phase was probably associated with the huge upstream sediment production resulting from the hydraulic gold mining at the Cosumnes River starting around 1860. Apart from larger SOC contents in the buried horizon compared to the recent topsoil, its 13C and 15N isotopic signature also differed suggesting a change in long-term input of plant organic matter as well as different fertilization regimes during the agricultural use of the area from approx. 1890 onwards.
In summary, deep alluvial soils in floodplains store large amounts of SOC not yet accounted for in global models. Intensive agricultural use of these floodplains often combined with river regulation and embanking of floodplain areas may lead to a slow but continuous release of the buried SOC to the atmosphere. However, restoration of floodplains may promote the stabilization of alluvial SOC in floodplains and hence contribute to more sustainable soils.