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Limnic input and fate of terrestrial soil aggregate POC into a tropical reservoir, João Penido, Brazil

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Particulate organic carbon (POC), commonly defined as the organic carbon (OC) fraction >0.45 μm, is a component of the carbon (C) cycle that contributes to limnic storage of carbon in local to regional sediment traps in the landscape, e.g. wetlands, deltas, lakes and manmade reservoirs. POC originates from allochthonous sources, e.g. inputs from soil erosion and litterfall, and from autochthonous sources, e.g. in-stream growing macrophytes, biofilm and algae. Deposited POC can be buried or mineralised and emitted as greenhouse gases such as carbon dioxide (CO_2) and methane (CH_4) into the atmosphere. In the land–ocean aquatic continuum (LOAC), physical and chemical protection of organo-mineral aggregates and flocs determine the fate of POC. This study investigates whether allochthonous POC is more important than autochthonous POC for limnic storage in a tropical reservoir, in order to increase understanding about carbon burial in closed basins.

The input and sedimentation of POC in the studied drinking water reservoir João Penido, Brazil, was estimated by using the Revised Universal Soil Loss Equation (RUSLE) together with two field techniques: 1) fallout radionuclides (FRN) measurements of ^{137}Cs and $^{210}Pb_{ex}$ in soil and sediment (sampled in May–June 2016), and 2) hydro−acoustic sub−bottom profiling (survey performed in June 2016), which is a non-destructive survey technique that can be used to measure sediment thickness, and OC burial when combined with sediment coring. Mineralisation rates were measured from incubation experiments of reservoir sediments collected from a delta–lake sediment gradient and linked to carbon sources determined by carbon-nitrogen ratio (C/N) methods.

The results show the seasonal input of POC related to soil and litterfall in relation to in-stream produced autochthonous POC which is buried or mineralised in the reservoir. Results from incubation experiments indicate varying mineralisation rates and burial potential of POC along the delta–lake sediment gradient in the reservoir. The distinction of sources and fate of POC are used to simulate change in carbon burial and mineralisation rates in lakes and reservoirs with respect to increased soil erosion, e.g. from human perturbation such as increased agricultural practices in the catchment area.