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Seasonal and spatial contrasts of sedimentary organic carbon in floodplain lakes of the central Amazon basin.

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Three-quarters of the area of flooded land in the world are temporary wetlands (Downing, 2009), which play a significant role in the global carbon cycle(Einsele et al., 2001; Cole et al., 2007; Battin et al., 2009; Abril et al., 2013). Previous studies of the Amazonian floodplain lakes (várzeas), one important compartment of wetlands, showed that the sedimentation of organic carbon (OC) in the floodplain lakes is strongly linked to the periodical floods and to the biogeography from upstream to downstream(Victoria et al., 1992; Martinelli et al., 2003). However, the main sources of sedimentary OC remain uncertain. Hence, the study of the sources of OC buried in floodplain lake sediments can enhance our understanding of the carbon balance of the Amazon ecosystems. In this study, we investigated the seasonal and spatial pattern of sedimentary organic matter in five floodplain lakes of the central Amazon basin (Cabaliana, Janauaca, Canaçari, Miratuba, and Curuai) which have different morphologies, hydrodynamics and vegetation coverage. Surface sediments were collected in four hydrological seasons: low water (LW), rising water (RW), high water (HW) and falling water (FW) in 2009 and 2010. We investigated commonly used bulk geochemical tracers such as C:N ratio and stable isotopic composition of organic carbon ($\delta^{13}C_{OC}$). These results were compared with lignin-phenol parameters as an indicator of vascular plant detritus (Hedges and Ertel, 1982) and branched glycerol dialkyl glycerol tetraethers (brGDGTs) to trace the soil OC from land to the aquatic settings (Hopmans et al., 2004). Our data showed that during the RW and FW seasons, the concentration of lignin and brGDGTs were higher in comparison to other seasons. Our study also indicated that floodplain lake sediments primarily consisted of a mixture of C_3 plant detritus and soil OC. However, a downstream increase in C_4 plant-derived OC contribution was observed along the gradient of increasingly open waters, i.e. from upstream to downstream. We also identify the OC contribution from the seasonally flooded forests, i.e. temporary wetlands as the most important source of sedimentary OC in floodplain lakes. Accordingly, we attribute temporal and spatial difference in sedimentary OC composition to the hydrological connectivity between the Amazon River and its floodplain lakes and thus between the surrounding forests and the floodplain lakes.

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