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Organic matter turnover in a tropical floodplain shows hysteresis during a flood cycle

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Tropical inland waters are increasingly recognized for their role in the global carbon cycle, but uncertainty about the effects of such systems on the transported organic matter remains. The seasonal interactions between river, floodplain, and vegetation result in highly dynamic systems, which can exhibit markedly different biogeochemical patterns throughout a flood cycle. In this study, we investigated patterns and rates of organic matter turnover, and determined responsible processes.

Multi-probes upstream and downstream of the Barotse Plains, a pristine floodplain in the Upper Zambezi (Zambia), provided a high-resolution data set over the course of a hydrological cycle. Concentrations of oxygen, carbon dioxide, dissolved organic carbon, and suspended particulate matter in water column of the main channel showed clear hysteresis trends relative to hydrological parameters.

Considering that the respiration rate in the river water remained rather low and stable throughout the year, these patterns indicated that degradation of the terrestrial organic matter was mainly occurring on the floodplain. We suggest that the main location of terrestrially-derived organic matter degradation in river-floodplain systems shifts during a flood cycle from the water of the main channel, to the soil-water interface on the floodplain when the water spends more time on the floodplain.