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Spatial and temporal patterns of dissolved organic matter optical properties across large rivers in Africa

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Tropical rivers have disproportionally high carbon transport and outgassing compared to temperate and Arctic rivers. Yet the cycling of dissolved organic matter (DOM) within these systems is still poorly studied with the exception of the Amazon basin. The chromophoric or colored dissolved organic matter (CDOM) is the fraction of DOM that absorbs ultraviolet and visible light. As the biochemical nature of DOM (and CDOM) defines its optical properties, optical measurements are particularly useful to assess the composition of DOM in freshwater and hence can be applied as proxies for assessments of DOM sources and its biogeochemical role. However, less is known on how specific optical characteristics can be applied as proxies and how these proxies vary from one system to another. In this study we compared concentrations and stable isotopic signature of dissolved organic carbon with optical properties of DOM from diverse tropical river systems across the African continent including the Congo basin, the Zambezi basin, the Ogooué basin and the Niger basin. These major rivers of the African continent were monitored for long period (from 1-3 years) at biweekly frequency. This large dataset allowed us to compare the spatial and temporal patterns of DOM quality along various environmental gradients, including hydrology, river size, terrestrial vegetation and connectivity to terrestrial inputs. The optical proxies presented and discussed in this study include absorption coefficients a(λ) at different wavelength (254, 300, 350 and 440 nm), spectral slopes ($S_{275-295}$and $S_{350-400}$), the spectral slope ratio (S_R=$S_{275-295}$:$S_{350-400}$) and the a(250):a(365) ratio.