



Dynamic behaviour of dissolved black carbon in the Amazon River

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Dissolved organic carbon (DOC) exported from rivers contains a substantial amount of charcoal, polycondensed aromatic byproducts from biomass or fossil fuel combustion, called black carbon (BC), regardless of fire history. The cycling of BC is a large and old component of the global carbon cycle and is thus important to constrain the sources to the ocean. The Amazon River exerts perhaps the largest influence on global BC export and cycling considering it exports an order of magnitude more DOC than any other river on Earth. Here we show the first spatially-resolved measurements of DBC quantity and radiocarbon values (^{14}C), paired with ultra-high resolution DOM characterisations, in the Amazon River and its tributaries during base flow. Although BC-like polycondensed aromatic structures found in DOM decrease downstream, DBC molecular markers show dynamic sources and cycling, suggesting that the cycling of DBC isn't related to bulk molecular composition in DOM, per se. We observe that river DBC is mostly modern but has heterogeneous ^{14}C values along the river network, whereby older DBC ages are correlated with higher rates of atmospheric aerosol deposition as opposed to pre-aging in soils. The observation of high levels of fossil fuel inputs to a relatively pristine catchment such as the Amazon basin are striking and have important implications on our understanding of global DOC and BC cycling over both modern and geological time scales.