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Globally significant greenhouse-gas emissions from African inland waters

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The relevance of inland waters to global biogeochemical cycles is increasingly recognized, and of particular importance is their contribution of greenhouse gases to the atmosphere. The latter remain largely unreported in African inland waters. Here we report dissolved CO_2, CH4 and N2O from 12 rivers in Sub-Saharan Africa acquired during >30 field expeditions and additional seasonally resolved sampling at >30 sites between 2006 and 2014. Fluxes were calculated from reported gas transfer velocity values, and upscaled using available spatial datasets, with an estimated uncertainty of about ±19%. CO_2 equivalent emissions (∼0.4±0.1 PgC yr-1) match 2/3 of the overall net carbon sink previously reported for Africa. Including emissions from wetlands of the Congo, the putative total emission (∼0.9±0.1 PgC yr-1) is about half of the global oceanic or land carbon sinks. In-situ respiration supported <14% of riverine CO_2 emissions, which must therefore largely be driven by mineralization in wetlands or uplands. Riverine CO_2 and CH4 emissions were directly correlated to wetland coverage and aboveground vegetation biomass, implying that future changes in wetland and upland vegetation cover will strongly impact GHG emissions from African inland waters.