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Inorganic and organic carbon spatial variability in the Congo River during high waters (December 2013)

Alberto V. Borges (1), Steven Bouillon (2), Cristian Teodoru (2), Bruno Leporcq (3), Jean-Pïerre Descy (3), and François Darchambeau (1)

(1) University of Liège, Institut de Physique (B5), Chemical Oceanography Unit, Liège, Belgium (alberto.borges@ulg.ac.be, +32-(0)4-3663367), (2) Department of Earth and Environmental Sciences, KU Leuven, Leuven, Belgium , (3) Research Unit in Environmental and Evolutionary Biology, University of Namur, Namur, Belgium

Rivers are important components of the global carbon cycle, as they transport terrestrial organic matter from the land to the sea, and emit CO_2 to the atmosphere. In particular, tropical systems that account for 60% of global freshwater discharge to the oceans. In contrast with south American rivers, very little information is available for African rivers on their carbon flows and stocks, in particular the Congo river, the second largest river in the World in terms of freshwater discharge (1457 km^3 yr^{-1}) and in terms of drainage basin (3.75 10^6 km^2) located the second largest tropical forest in the World. Here, we report a data-set of continuous (every minute) records of the partial pressure of CO_2 (pCO_2) (total of 10,000 records), and discrete samples of particulate (POC) and dissolved (DOC) organic carbon (total of 75 samples) in the mainstem and major tributaries of the Congo river, along the 1700 km stretch from Kisangani to Kinshasa (total river length = 4374 km), during the high water period (December 2013). The pCO_2 dynamic range was high ranging from minimum values of 2000 ppm in white waters tributaries (higher turbidity, conductivity and O_2, lower DOC), up to maximal values of 18,000 ppm in blackwaters tributaries (lower turbidity, conductivity and O_2, higher DOC). In the mainstem, very strong horizontal (cross-section) gradients were imposed by the presence of blackwaters close to the riverbanks and the presence of whitewaters in the middle of the river. In the mainstem, a distinct horizontal (longitudinal) pattern was observed with pCO_2 increasing, and conductivity and turbidity decreasing downstream.