

Copper-binding ligands and copper concentrations in the Amazon and Pará River Estuaries

CAITLYN ERIN KELLY, ADRIAN HOLLISTER, NICO FRÖHBERG AND ANDREA KOSCHINSKY

Constructor University

Continental and oceanic environments are merged with the help of rivers, which transport essential trace metals, organic matter and nutrients. The Amazon and Pará Rivers significantly influence freshwater output into the Atlantic Ocean, with the Amazon being the largest and the Pará the 5th largest primary outflow rivers on the planet. The convergence and mixing of these rivers with each other and with seawater provide marine systems access to valuable nutrients and trace metals such as copper (Cu), but at the same time, also introduce potential contaminants in the coastal ocean. The complexation of dissolved Cu by organic ligands plays a vital role in its bioavailability and toxicity. The interaction of Cu-organic matter in estuaries has been studied in previous GEOTRACES programs, including the M147 GEOTRACES process study of the Amazon-Pará River Estuary conducted in the wet season (April-May 2018; Hollister et al., 2021). A second GEOTRACES process study (M206) in the Amazon-Pará estuary was conducted during the dry season in December 2024. Dissolved (0.2 µm) surface water samples were collected along the Pará and Amazon River transects and a northward-moving plume, as well as from the largest protected Mangrove Belt south of the Pará (S ~ 0.01 to 37 PSU). Here, we present data for dissolved Cu concentration and Cu binding-organic ligand concentrations and stability constants, analysed using an automated voltammetric method. Due to the extreme dry season in 2024 and increasing anthropogenic impacts on coastal environments and marine systems, the Cu distribution and speciation will be impacted, which underlines the importance of this study.

References:

Hollister, A. P.; Whitby, H.; Seidel, M.; Lodeiro, P.; Gledhill, M.; Koschinsky, A. (2021) Dissolved concentrations and organic speciation of copper in the Amazon estuary and mixing plume. *Marine Chemistry* 234: 104005. doi: 10.1016/j.marchem.2021.104005