Influence of salinity gradient on Ni complexation by Fluorescent Dissolved Organic Matter (FDOM) and dispersal across estuaries in New Caledonia

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Dissolved organic matter (DOM) is ubiquitous in the environment. Its composition and properties depend on water type (freshwater, estuarine, brackish, marine) and are influenced by the geological nature (ultramafic, volcano-sedimentary, metamorphic) and occupancy (mangrove, forest, agriculture, urbanized) of the upstream catchment. Due to its capacity to form complexes with dissolved trace metals, DOM can render them hardly available to living organisms, and thus limit their toxicity. Considering its capacity to be transported on large distances, DOM can significantly contribute to the dispersal of trace metals in aquatic ecosystems. In this study, we used 3D fluorescence spectroscopy to characterize the actual nature of FDOM (a fraction of DOM that shows specific fluorescence properties) across estuaries downstream of two contrasted catchments (ultramafic vs. volcano-sedimentary) in New Caledonia. In a first step, Excitation-Emission Matrix (EEM) were obtained on 0.2 µm filtered water samples and a parallel factor analysis (PARAFAC) allowed to identify the different FDOM components in the two catchments. These data indicated a dramatic decrease of all components as a function of increasing salinity, with a threshold value around 25 g/L whatever the catchment. This trend is considered to reflect an aggregation-flocculation behavior of FDOM across the salinity gradient of the studied estuaries. In a second step, fluorescence quenching experiments emphasized the complexing capacity of the different components toward dissolved Ni. FDOM might thus play a significant role on Ni dispersal in aquatic ecosystems through the formation of FDOM-Ni complexes. However, this dispersal capacity might be hampered in estuaries due to the suspected aggregation-flocculation behavior of FDOM across the salinity gradient. Rather than the geological setting of the upstream catchment, salinity appears thus as the major driver of Ni dynamics across estuaries through FDOM-Ni complexes.