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Natural organic matter molecular signatures in Gabonese mangrove sediment

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The carbon (C) cycle regulates climate change by exchanging atmospheric CO2 with Earth's biosphere. Marine sediments are key accumulators of organic carbon (Corg), storing over 96% of annual oceanic carbon1. Among coastal ecosystems, mangroves are among the most C dense, storing large amounts of Corg as natural organic matter (NOM). However, global warming, ocean acidification, erosion, and human activities threaten these ecosystems. In this work, the differences of NOM composition were evaluated in two sediments (0-5 cm) of Mamboumba mangrove (Akanda National Park, Gabon) and Ozouri mangrove (Ogooué delta of the Ogooué-Maritime Province, Gabon). Tetramethylammonium hydroxide pyrolysis - gas chromatography/mass spectrometry (TMAH-Py-GC/MS) was used to investigate the assessment of NOM biomarkers in these samples. Some indices were calculated from the identified biomarkers to investigate the molecular composition of NOM2-3. Preliminary results indicate that both NOM are rich in lignin compounds but have different oxidation stages and origins. In the Mamboumba mangrove sediment, the identified compounds are predominantly of angiosperm origin, with probable contributions from bacteria, algae, and NOM freshly derived from mangrove plant tissues. This NOM has undergone transformations such as demethylation promoted by microbial action, but to a lesser extent compared to the Ozouri mangrove sediment. However, the Ozouri mangrove showed highly degraded NOM, with a greater contribution from aquatic plants, including mangrove species and marine macrophytes, whose origin is predominantly associated with non-woody tissue plants, and besides, hexadecanoic acids and nitrogen-containing compounds was determined, which may come from phospholipids and amide forms related to proteins and peptides present in exogenous sources4. Thus, these results suggest environments with different origins and stages of NOM transformation, with Mamboumba mangrove being fresher and Ozouri mangrove more degraded. The input of NOM in the Ozouri mangrove has probably been influenced by the surrounding area, which may be related to anthropogenic factors that directly affect the geochemical factors of this mangrove.[1]Lønborg, C., et al. (2020). Front. Mar. Sci., 7, 466. [2]Tareq, S.M., et al. (2006). J. Geochem. Explor., 88, 1-3, 445-449. [3]Kumar, M., et al. (2019). Estuar. Coast. Shelf Sci., 229, 106403. [4]Iwai, H., et al. (2013). J. Anal. Appl. Pyrolysis, 99, 9-15.

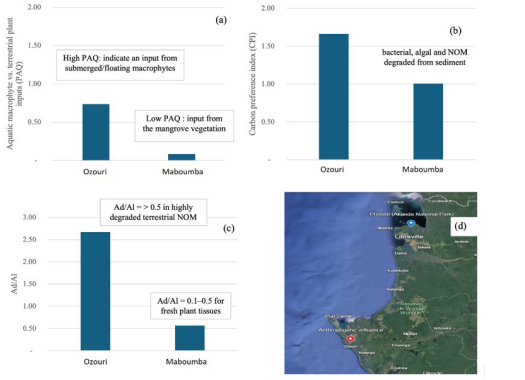

Figure 1: Indexes determined by chromatographic analysis (TMAH-Py-GC/MS), including: (a) Aquatic and terrestrial input (PAQ), (b) Carbon Preference Index (CPI), (c) Ad/Al ratio (Lignin acid (Ad) to aldehyde (Al) ratios was used as a tracer for lignin degradation degree), and (d) study area of this research, highlighting Ozouri and Maboumba mangroves in Gabon.