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VuBleu. Vulnérabilité du Carbone Bleu des mangroves face à l'anthropisation

Présentation du travail de thèse de doctorat de Glenda Camila Barroso, Universidade Federal Fluminense au Brésil, (soutenance jeudi 1er avril 2021), réalisée dans le cadre de l'axe Mangroves de l'IRP VELITROP, VuBleu.

Implicações da eutrofização às emissões de dióxido de carbono e metano em solos expostos de manguezais ao longo de um gradiente de urbanização (estado do rio de janeiro, brasil) / Linking eutrophication to carbon dioxide and methane emissions from exposed mangrove soils along an urbanization gradient (Rio de Janeiro State, Brazil).

Mangroves are considered as blue carbon ecosystems due to their high capacity to store carbon (C) in their biomass and soils, which are one of the most threatened in the biosphere. Despite previous evidence on the role of anthropogenic inputs of nutrients, especially nitrogen (N) and phosphorus (P), to favour primary production and subsequent increased organic matter with potential remineralization and greenhouse gas emissions from mangrove soils to the atmosphere, such as carbon dioxide (CO2) and methane (CH4), there is still a scarcity of studies integrating GHG's emissions in intra-ecosystem spatial and seasonal variability under contrasting levels of eutrophication. Here, we aim to evaluate the variations in CO2 and CH4 efflux from exposed soils of three mangroves along a eutrophication gradient caused by urban sewage discharges. To access spatial (lower vs. upper intertidal zone) and seasonal (summer vs. winter) variability within mangroves, we measured soil-air CO2 and CH4 fluxes at low tide during spring tides. In addition, elementary (C, N, P), isotopic ($\delta^{13}C$ and $\delta^{15}N$), and molecular (sterols and n-alkanes) of organic matter were analyzed in the 2 cm surface soils inside the chambers after flux measurements. Organic carbon content (5.6-27.0%), nitrogen total (0.5- 0.9%); phosphorus inorganic (219.9 - 804.2mg g^{-1}) C/N ratios (13.6-31.0), $\delta^{13}C$ (-27.5 and - 21.4‰) and $\delta^{15}N$ (1.1- 6.5‰) showed a wide range of values. As a result, the mangroves along a gradient of urbanization were the only significant controlling factor for air-soil CO2 emissions (range:149.2 - 656.4 mmol$m^{-2}d^{-1}$), which increased ~2 times from the most eutrophic to the most preserved mangrove. In turn, intra-ecosystem seasonal and spatial variability were significant drivers of relatively low CH4 emissions (range:0.1-0.5mmol$m^{-2}d^{-1}$) in all sites. The CO2 fluxes in most eutrophic mangrove soils were even higher among global ecosystems, suggesting the potential role of sewage discharges and the labile organic matter indicated by their higher content of inorganic phosphorus, degraded sterols, algal n-alkanes and $\delta^{15}N$, associated with more depleted $\delta^{13}C$, and lower C: N and C:P ratios. Therefore, our findings reveal that mangrove pollution from untreated sewage may have climate implications as a critical component of global change.
Keywords: Mangroves. Greenhouse Gases. Nutrient Enrichment. Urbanization. Organic Matter.

par **Gwenaël Abril, directeur de recherche,** Équipe SOMAQUA, CNRS