Universidade Vigo

XXII AIL MEETING
VIGO 2024

Dark Carbon Uptake in Emerged Sediments: Seasonal and Daily CO_2 Flux Patterns in a saline wetland

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Inland water bodies are currently shrinking due to alterations of the water cycle, exposing extensive areas of previously submerged sediments to the atmosphere. Consequently, the carbon cycle is altered, leading to an increased emission of CO_2. To study this, we performed monthly surveys throughout one year to measure CO_2 fluxes from dawn to dusk in the calcite-rich emerged sediments of the endorheic saline wetland of La Laguna de Fuente de Piedra, Málaga (Spain). Consistent with existing literature, CO_2 emission fluxes predominated in these sediments. However, at dawn and dusk fluxes were considerably lower, and even CO_2 uptake into the sediment occurred.

Consequently, we conducted three campaigns over a full 24-hour cycle to measure CO_2 fluxes in the emerged sediments and their most influential environmental drivers. This approach revealed a net CO_2 emission from the sediment during daylight hours, while a net CO_2 uptake by the sediment was measured during darkness.

The magnitude of CO_2 fluxes exhibited seasonality with both highest uptake and emission fluxes in summer, reaching a maximum emission and uptake value of 0.29 $g(CO_2)m^{-2}h^{-1}$ and -0.14 $g(CO_2)m^{-2}h^{-1}$ respectively. In contrast, winter showed the lowest fluxes, with a maximum emission value of 0.04 $g(CO_2)m^{-2}h^{-1}$ and a maximum uptake value of –0.01 $g(CO_2)m^{-2}h^{-1}$.

Our results reveal that, in addition to seasonal variability of CO_2 fluxes magnitude in Fuente de Piedra, a daily trend in CO_2 fluxes exists. This trend shows that CO_2 emissions from sediments increase towards midday but decrease towards midnight resulting in CO_2 uptake by the sediment.

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