Science Societies

Diurnal CO2 Flux Variations Above an Alkaline Playa

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Researchers measure CO2 fluxes and other data at the hydromag- nesite-magnesite playa near Atlin, BC. Photo courtesy of Andrew Mattock

The carbonate mineral deposits at Atlin, British Columbia, known as hydromagnesite-magnesite playas, are unique in the world. The playas have been forming from carbon and magnesium dissolved in the groundwater for millennia and are exposed to the elements at the Earth's surface. Since carbon is present in the groundwater and minerals, CO_2 gas can be exchanged with the atmosphere. Understanding physical and chemical processes governing CO_2 exchange between predominantly unvegetated carbonate deposits and their importance in the carbon cycle is essential in the current climate.

Using dynamic closed chambers, researchers continuously measured CO_2 exchange between the playa and the atmosphere. They found that the CO_2 fluxes had a distinct diurnal oscillation with emissions of CO_2 in the daytime balanced by similar uptake of CO_2 at nighttime. At 1-m depth in the playa, CO_2 concentrations exceeded 8000 ppm, and the researchers found minimal net exchange of carbon across the playa-atmosphere interface despite the large source of CO_2 just below the surface.

These findings provide insights into the factors controlling CO_2 fluxes in an inorganic carbon system and guidance for future application of these flux methods to measure CO_2 capture and storage in engineered mineral systems.

Adapted from

Doucet, A-M., Jones, F., Raymond, K. E., Dipple, G., Black, T. A., Ladd, B., & Mayer, K. U. (2023). Quantitative analysis of diurnal CO_2 flux variations above an alkaline playa. *Vadose Zone Journal*, *22*, e20292. https://doi.org/10.1002/vzj2.20292