Examining CO_2 concentrations and flow dynamics in streams

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As part of the carbon cycle, carbon dioxide (CO_2) is flushed from soils into stream water; this CO_2 either escapes directly into the atmosphere from the water surface or gets transported downstream of the study site. To understand the amount and variability of both the carbon flushed from soils and the subsequent loss to the atmosphere, scientists first need to understand the variability in aquatic concentrations. Although previous studies have shown that CO_2 concentrations vary considerably over time and are often linked to water discharge, measurements have primarily been based on low-frequency manual sampling rather than continuous monitoring, so much of the temporal pattern is lost.

To get a better understanding of the relationships between CO_2 concentrations and discharge, Dinsmore et al. used CO_2 sensors submerged in the water column to continuously monitor concentrations in five catchments across Canada, the United Kingdom, and Fennoscandinavia. The study sites covered a range of mean CO_2 concentrations, flow regimes, and catchment characteristics, including flashy headwater streams, second-order streams, and lake outflows.

They find that the relationships between CO_2 concentrations and discharge are not consistent across sites: in two of the sites, CO_2 concentrations rose during high-flow periods, while in the other three, CO_2 concentrations fell during high-flow periods. The differences in the CO_2-discharge relationships between sites could be explained using measurable catchment characteristics providing a baseline set of sites that future studies can use for comparison. A more detailed analysis of

the transport of CO2 showed that in three of the five catchments the highest 30 percent of flow had the greatest influence on the total amount of CO2 lost downstream annually. From this finding the authors suggest that an increase in precipitation extremes, which is predicted to occur with climate change, would have a greater effect on the flushing of CO2 from soils to surface waters than would be caused by an increase in mean precipitation.

More information: Contrasting CO2 concentration discharge dynamics in headwater streams: A multicatchment comparison, *Journal of Geophysical Research-Biogeosciences*, doi:10.1002/jgrg.20047 onlinelibrary.wiley.com/doi/10 … /jgrg.20047/abstract

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