# Fast-moving rivers 'breathe' like humans

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Scientists have discovered a surprising similarity between rivers and humans: both release more carbon dioxide when they work hard. When people are physically active, their lungs release more carbon dioxide gas than when they are at rest. Now, researchers from the University of Glasgow have found for the first time that fast-moving rivers work in a similar manner, releasing more gas than slower streams.

In a new paper published in Journal of Geophysical Research: Biogeosciences, a team from the University's School of Geographical and Earth Sciences describe their findings from several years of testing around rivers in two locations in Scotland and four in the Peruvian Amazon. The research provides more insight into the carbon cycle, the complex process by which the element carbon is used and transferred between living things, the land, bodies of water and the atmosphere. Detailed understanding of the carbon cycle is crucial for determining the impact of human activity on the world's climate, but the role of rivers in releasing carbon into the atmosphere has been given less attention overall by scientists than the impact of the same process in seas and oceans. University of Glasgow PhD student Hazel Long and researcher Dr Leena Vihermaa used infrared gas analysers to quantify the amount of carbon dioxide released by the rivers in each location. A separate flow meter measured the velocity of the water streaming past the detector.

Hazel said:
"Carbon is absorbed into waterways through a wide range of sources, including soil and decaying organic material, which are picked up as rivers flow from the land to the sea. Recently, the scientific community has begun paying closer attention to the amount of carbon released into the atmosphere along the way, and it has turned out to be a very significant amount, as much as two trillion kilograms of carbon each year. What we've discovered is that the rate of that carbon release is tied closely to the velocity of the water in the river. Although we measured the carbon released by rivers separated by thousands of miles, the results were similar for each. We found that the faster the waters moved, the more carbon they released."

Susan Waldron, Professor of Biogeochemistry at the University of Glasgow's School of Geographical and Earth Sciences, was also involved in the research. Professor Waldron said: "Our natural surroundings are rich in carbon, which is constantly being exchanged in very complicated ways. The role that rivers play in the carbon cycle is often overlooked, so developing a better understanding of how rivers release carbon will be critically important to helping us navigate the future changes caused by global warming. We're making the data from this research freely available via the Environmental Information Data Centre at the Centre for Ecology and Hydrology, so that anyone with an interest in the topic can use our

findings for their own purposes."

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The paper, titled 'Hydraulics are a first order control on CO2 efflux from fluvial systems', is published in Journal of Geophysical Research: Biogeosciences

University of Glasgow