

Speaker: Dr Tanuj Shukla, IIT Kanpur

Time: 5 PM, 5 Sept (Sunday)

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Title: Accelerating hydrological cycle and terrestrial carbon feedbacks

Abstract

The connection between glaciers, chemical weathering and the global carbon cycle are inherently coupled and could steer the evolution of Earth climate over geological time scales. However, the question is how the glaciers enhance or inhibit mineral weathering? Is the tectonic uplift hypothesis kindled by Raymo and Ruddiman (1992) to drive the atmospheric CO₂ sink applies uniformly to alpine ecosystems? The answer hinges on the nature and type of the chemical reactions that control the weathering-carbon feedbacks over the short- to long-term. The traditional view for the glacial system suggests that the mineral weathering by carbonic acid (H₂CO₃; dissolved CO₂) is a globally significant CO₂ sink. Yet, the role of sulfuric acid (H₂SO₄)—commonly from sulfide oxidation—mediated weathering in generating HCO₃⁻ without atmospheric CO₂ consumption is still unclear.

This talk aims to demonstrate how the high-altitude glacial basins of the Himalayas differ critically from present understanding and act as a source of CO₂ than sink. I have used the glacier-fed rivers and lakes of high-altitude Himalayan basins as a model system to study carbon cycling and its impact on climate in the short- to long-term. The first part of the talk will cover observational and modelled estimates of contemporary stream chemistry of high altitude Himalayan basins and the second part will cover CO₂ cycling of glacial-fed lakes over long-term. I will finish my talk by demonstrating the role of glacial melt fractions and their potential to affect the future carbon emissions from the Himalayas along with discussion over future research plans.

About the Speaker

Dr. Tanuj Shukla is a postdoc researcher at the Department of Earth Sciences, Indian Institute of Technology Kanpur. His present research involvement includes quantifying the impact of terrestrial carbon cycling in glacial environments. His recent work has highlighted the prominent role of sulfide oxidation driving atmospheric CO₂ cycling in the glacial meltwater streams of the Himalaya and presented the first detailed inorganic carbon budget from the Himalayan glacierized basins. Such studies have global significance to better understand chemical weathering trends and their attendant CO₂ cycling from glacial basins. Prior to this, he was a Ph.D. scholar at Wadia Institute of Himalayan Geology, Dehradun. His aim was to better understand the role of climate in landform deposition mechanisms at the central Himalayas. This has improved our understanding of glacial sensitivity to the climate system over the short- to long-term. He has published several articles in internationally acclaimed journals including the citizen science approach in the science magazine. He is actively involved in advising undergraduate and postgraduate students and teaching courses at IITK. He has led several field-related activities in the high-altitude glacierized basins of the Himalayas and was involved in setting up a continuous river water quality monitoring observatory at Upper Ganga Basin.