

Aspects of weathering and solute acquisition processes controlling chemistry of proglacial stream at Dokriani Glacier, Central Himalaya, India

Shipika Sundriyal^{*1}, Tanuj Shukla², Rajesh Singh¹, Dwarika Prashad Dobhal³

¹National Institute of Hydrology, 247667, Roorkee

²Indian Institute of Technology, Kalyanpur, 208016, Kanpur

³Centre for Glaciology, Wadia Institute of Himalayan Geology, 33 GMS Road, 248001, Dehradun

Being one of the youngest and most fragile ecosystems, the Himalaya shelters the largest concentration of glaciers outside the polar region. There are about 9,575 glaciers in Indian Himalaya covering an area of 37,466 km², with an approximate storage of 2000 km³ fresh water. The region is aptly called the “Water Tower of Asia” as it provides around 8.6 × 10⁶ m³ of water annually and the glaciers form one of the major components of the hydrological cycle. Therefore, it is important to study the dynamics of the changes taking place in the Himalayan glaciers due to the ongoing climate change. In order to understand the effect of the climate and changes in the glaciers, it is important to analyze the water chemistry of glaciers. This analysis is one of the visible indicators that provide a fair idea about the health of the glaciers. Water sampling for major ion chemistry was performed at a proglacial and subglacial outflows from the entire ablation season. The study focuses on the characteristics and differences between chemical processes in subglacial and proglacial zones. Firstly we examine seasonal variations of the entire ablation season in relation to both subglacial and proglacial zones. Secondly, we assess the role of sulphide oxidation, carbonation, weathering processes in this system. Thirdly, we estimate the solute fluxes and the chemical denudation rate and compare these data with previous reported data and other parts of the Himalayan glacierized basins. This study is important because it gives a new insight into seasonal geochemical dynamics occurring in the glacial and proglacial environments of a highly reactive glacierized basin.

Keywords. Himalayan Glacier, Hydrological cycle, Subglacial, Proglacial, Sulphide oxidation, Carbonation, Weathering.