Understanding Nature of Contamination on Himalayan Glaciers Using Field and Satellite Data Analysis

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Change in snow albedo of accumulation area in a glacier is important parameters to assess its mass balance, as it can significantly influence snow melt. Albedo can be influenced by numerous parameters; however nature of contamination is a key parameter, as it affects albedo in visible region of electromagnetic spectrum. In the present study, influence of soil, ash and coal contamination on snow reflectance were analyzed under controlled condition experiment at Dhundi observatory, near Manali, India of winter 2005 and 2007. Normalized Difference Snow Index (NDSI) and albedo was computed for varying amount of contamination.. In addition, measurements of snow albedo were carried out in accumulation area of Chhota Shigri glacier. The relationship between NDSI, albedo and nature of contamination suggest, it would be predominantly by mineral dust generated by weathering of surrounding rock. This concept was extended to Samudra Tapu glacier in Himachal Pradesh India, where satellite derived TOA reflectance data of year 2007 at the end of ablation season was analyzed. Reflectance in visible region and average NDSI of accumulation area of Samundra Tapu was more than 60 percent and 0.89 respectively, suggesting contamination is predominately due to mineral dust generated from wreathing of surrounding rocks.

Key words: glacier, snow, albedo, mineral dust/soil, black carbon.