Monitoring ELA of Durung drung glacier of Greater Himalaya using RISAT-1 (SAR) data

*Rupal M. Brahmbhatt¹, Sanchayita Kundu², Arundhati Mishra², I. M. Bahuguna²

¹ M.G. Science Institute, Ahmedabad - 380009, India, Email: rupal.brahmbhatt@gmail.com

² Geosciences Applications Group, Space Applications Centre, ISRO, A’bad - 380015, India

Corresponding Author: * Rupal M. Brahmbhatt

Abstract

Studying glacier zones and equilibrium line altitude (ELA) are the important elements to understand glacier health and its evolution. This study has focused on investigating various glacier faces and ELA for the Durung Durung glacier (23 km, snout at 4150 m) with latitude and longitude of 76° 18’ E and 33° 45’ N respectively of Greater Himalaya. For this study the capability of synthetic aperture radar (SAR) and optical data for the period of 2012 to 2015 are used to derive glacial parameters with higher degree of accuracy. About 22 RISAT-1 and 100 optical images for the period of 2012 to 2015 have been processed and analyzed. A linear decision rule-based model has been used and the result further filtered by the use of a digital elevation model (DEM) to delineate glacial zones. The cross-polarized data is useful to derive the extra information from the volume of the glacier mass. In this analysis debris cover ice zone, bare ice zone, super imposed ice zone, wet snow zone, partially wet snow zone, and seasonal frozen percolation zone was identified and area has been estimated. The area of these zones has been varying which depends on the season of the data. The results show 4 years of ELA which was based on RISAT-1, C band dual-polarized data and with little aid of optical images. The ELA has remained at nearly 5200 m with the fluctuations of ±90 m for 4 years. Durung Durung glacier has experienced continuous negative mass balance. Moreover, buried crevasse zone was identified in accumulation area using this data which is vital element for glacier dynamics. The results obtained are useful in regard to further glaciological studies of the Himalayan glaciers

Keywords: Glacier, ELA, Crevasse, RISAT, SAR