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SNOUT WATER ISOTOPIC CHARACTERISTICS (δ18O, δ2H and 3H) OF SATOPANTH GLACIER, WESTERN HIMALAYAS, INDIA

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ABSTRACT

Environmental isotope (δ18O and δ2H) are used to study the snout water characteristic of Satopanth Glacier (SPG), located at an altitude of 4000m in Central Himalayas in India. Satopanth glacier with catchment area ~65 km2, is an East-West trending glacier, ~13 km long, ~750 m average width, and is the source of Alaknanda River, a major tributary of River Ganga. The water samples of snout water, snow, ice and precipitation were collected during ablation period of 2017 (May to October) at the snout of the glacier. These samples were analysed for δ18O and δ2H using Isotope Ratio Mass Spectrometer and Tritium (3H) using ultra-low level liquid scintillation counter.

The EC of the snout water is measured in-situ and varies from 31μS/cm to 70μS/cm. The δ18O of snow ranges from -4.7‰ to -15.6‰ ice from -10.8‰ to -15.6‰ rainfall from 0.6‰ to -26.3‰ and snout water from -9.4‰ to -20.1‰The temporal variability in δ18O and δ2H is observed during the ablation period due to varied contribution from different sources. Local Meteoric Water Line (LMWL) derived for the monsoon rainfall (June – September) is δ2H = 8.2xδ18O + 13.6 (n=59). Similarly, δ18O-δ2H relationships developed for Snow (from accumulation zone) and Ice (ablation zone) of glacier are δ2H =7.8xδ18O + 14.7 (n=8) and δ2H =8.1xδ18O + 18.4 (n=27) respectively. The δ18O-δ2H relationships for Snow and Ice are found to have high intercept than the LMWL indicating different source of precipitation during winter (December to April), which is mostly from western disturbances originating from Mediterranean Sea (Jeelani and Deshpande, 2017). The δ18O and δ2H relationship of snout water (δ2H = 8.2xδ18O + 18.3, n=131) is found to have higher intercept than the LMWL, but similar to that of ice water, indicating that ice melt is the main source of water at the snout. The average 3H concentration in fresh ice and snow is found to be 0.88 TU (0.2 to 3.6 TU), and 4.1 TU (3.6 to 4.6 TU) respectively. However, the snout water 3H concentration is found to be 4.3 TU. The snout water 3H value shows close resemblance with snow as compared to ice. It indicates that the major contribution of snout water discharge is from melting of fresh snow and less proportion from ice. Less than 1 TU tritium concentration may be due to melting of old glacier ice (> 50 yrs).

Keywords: Environmental Isotope (δ18O, δ2H & 3H), Snout water, Satopanth Glacier, River Ganga,