The analyses of water stable isotopes and insoluble particles of the ice core from Trambau glacier, Nepal Himalaya

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Ice core drilling in mountain glaciers has been conducted only in limited areas, and there are few cases drilled at high altitudes, especially in the southern face of the Himalayas. The Nepal Himalaya is strongly influenced by the summer monsoon and is under complex climatic conditions where glaciers accumulating by precipitation and melting by higher temperatures occur simultaneously in the summer. Therefore, paleoenvironmental information obtained directly from ice cores in this region is important for understanding the effects of monsoon circulation and complex mountainous topography on water vapor and atmospheric aerosol transport.

An 81.2-m-long ice core was obtained in November 2019 at an elevation of 5,862 m on Trambau Glacier (27.919˚N, 86.545˚E), Rolwaling region, Nepal Himalaya. In-situ analyses revealed that the average bulk density of the ice core was 866 kg m^{-3}, and it was estimated that about 88 % of the entire core was composed of melt-refrozen ice. In addition, this ice core contains a large amount of dust layer, accounting for 13% of the total. Based on the annual accumulation rate at the drilling site, this ice core was expected to preserve paleoenvironmental records for 100 to130 years.

In this study, the oxgen isotope of water in the Trambau core were analyzed, and its periodic variations were counted as a preliminary dating. The interannual variation of oxygen isotope ratio based on the preliminaly dating shows a long-term increasing trend of +2.79 ‰over the past 125 years. After correcting for the effects of flow and elevation of the glacier and comparing it with nearby Himalayan ice core data, it is clear that the increasing rate of $\delta^{18}O$ on Trambau Glacier is greater than in those of the other ice cores. In addition, we also analyzed insoluble particles (dust). Since this core contained many coarse particles(>10 μm), it was filtered before measurement. To distinguish between local supply and long distance aerosol transport by atmospheric circulation, coarse and fine particles were analyzed separately. Here we present the results of dust number and mass concentrations compared to nearby mountain glacier ice cores.

Keywords: ice core, Himalaya, water stable isotopes, insoluble particles, dust

