



Ice thickness and thermal structure of a high altitude Himalayan glacier

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There are still large uncertainties in the ice volume estimates of Himalayan glaciers due to lack of reliable ice thickness data. Ice volume estimates in the region are mainly based on area-volume scaling and modeling ice thickness and subglacial topography but ice thickness measurements are essential for calibrating and validating these methods. In addition, very little is known about the thermal structure of Himalayan glaciers, and this can play an important role in glacier dynamics and consequently impact the glacier's response to the changing climate.

Here, we present ground penetrating radar (GPR) data from Rikha Samba, a medium size glacier (5.5 km²) in central Nepal with an elevation range from 5380 to 6560 m a.s.l. We combine GPR data from two field campaigns carried out in 2010 and 2015, measured with center frequencies of 5 MHz and 30 MHz, respectively. Our results reveal that Rikha Samba is a polythermal glacier with a layer of temperate ice up to 100 m thick below the cold ice, and a maximum observed thickness of about 180 m. Our analysis also highlights that commonly used GPR point measurements on polythermal mountain glaciers may lead to misinterpretation of glacier thickness due to intense volume scattering from the temperate ice below the cold ice.