



Spatiotemporal variations of radar glacier zones in the Karakoram Mountains

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Glaciers of the Karakoram Mountains are important climate indicators for densely populated South Central Asia. Glacial meltwater is a significant source of runoff in the Indus River Basin, upon which 60 million people rely for food security, economy and hydropower in Pakistan and India.

Contrary to worldwide and also Himalayan trends, Karakoram glaciers have recently been verified in near balance, with some glaciers even gaining mass or surging. This 'Karakoram anomaly' is of interest, and many hypotheses exist for its causes.

Complex climatology, coupled with the challenges of field study in this region, illicit notable uncertainties both in observation and prediction of glacial status. Constraining spatiotemporal variations in glacial mass balance will elucidate the extent and possible longevity of this anomaly, and its implications for water resources, as climate continues to change.

Depending on snowpack conditions during image acquisition, different snow and ice zones on a glacier are identifiable in synthetic aperture radar (SAR) images. The identification and monitoring of radar glacier zones over time can provide indicators of relative glacial mass balance to compliment field studies in a region with sparse field measurement.

We will present spatiotemporal evolution of basic radar glacier zones such as wet snow, bare ice, percolation, and firn for glaciers feeding into the Upper Indus Basin. We will incorporate both ascending and descending passes of Sentinel-1 series C -band sensors, and possibly ALOS-2 PALSAR-2 L-band images. We may also explore the impacts of these variations on timing and intensity of runoff.