

Surface terrain characteristics and monsoon season mass balance of debris-covered glaciers in the Khumbu Himal, Nepal, obtained from high resolution Pléiades imagery.

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Debris-covered glaciers in the eastern Himalaya have pronounced surface relief consisting of hummocks and hollows, ice cliffs, lakes and former lake beds. This relief and spatially variable surface properties are expected to influence the spatially distributed surface energy balance and related ice mass loss and atmospheric interactions, but only a few studies have so far explicitly examined the nature of the surface terrain and its textures .

In this work we present a new high-resolution digital terrain model (DTM) of a portion of the Khumbu Himal in the eastern Nepalese Himalaya, derived from Pléiades satellite imagery sampled in spring 2015. We use this DTM to study the terrain characteristics of five sample glaciers and analyse the inter- and intra- glacier variability of terrain characteristics in the context of glacier flow velocities and surface changes presented in previous studies in the area. In parallel to this analysis we also present the seasonal geodetic mass balance between spring and fall 2015, and relate it to the terrain properties, surface velocity and limited knowledge of the local lapse rates in meteorological conditions during this monsoon season.