Observing and characterizing avalanche activity in the Khumbu Himal, Nepal, using Pleiades and airborne HDR imagery

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In the high, steep terrain of the Khumbu Himal, Nepal, snow avalanches play an important role in glacier mass balance, and rockfall supplies much of the rock material that forms the extensive debris covers on glaciers in the region. Information on the frequency and size of gravitational mass movements is helpful for understanding current and future glacier behaviour but currently lacking.

In this study we use a combination of high resolution Pleiades optical satellite imagery in conjunction with airborne HDR imagery of slopes in deep shadow or overexposed snow slopes, provided by the German Aerospace Center (DLR) MACS system (see Brauchle et al., MM3.2/GI2.12/GMPV6.4/HS11.13/NH8.9/SSS12.24), to undertake a qualitative observational study of the gravitational processes evident in these sets of imagery. We classify the features found and discuss their likely frequency in the context of previously published research findings. Terrain analysis based upon digital terrain models derived from the same Pleiades imagery is used to investigate the slope angle, degree of confinement, curvature and aspect of observed avalanche and rock fall tracks.

This work presents a first overview of the types of gravitational slides affecting glaciers of the Khumbu Himal. Subsequent research efforts will focus on attempting to quantify volumes of mass movement using repeat satellite imagery.