

13E.4 | The Application and Effects of Sky Models on Hill Shading (#833)

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The recently opened field of geomorphological route and track research in the Central Himalayas for the first time focused on glacier routes which are the highest traditionally used and seasonally strongly frequented tracks in the world (KÜNKEL 2013).

The combination of expeditive glacial-geomorphological field research and the analysis of multi-temporal remote sensing data (Aster, SRTM and TanDEM-X) made it possible to compare both, glacier and track changes.

It can be shown that frequent track adaptations are necessarily, strongly determined by climate-change induced glacier variations, i.e. surface shrinking, crevasses, supra- and pro-glacial lakes. Of the same importance are hazardous geomorphological side-effects such as: undercutting of side-moraine walls and increasing rockfall, which does not seem to be predominantly caused by melting permafrost but due to lacking ice abutments of the decreased glacier tongues.

The comparison of numerous existing maps and photos taken from expeditions from the early 1950s until today as well as multi-temporal satellite imagery show enormous changes of the tracks themselves and the use and existence of track companions such as camps and shepherd dwellings. Here, most up-to-date ultra-high resolution satellite imagery is of unbeatable value. Even publicly available data can in many instances well serve the cartographers' purpose. On snowfree glacial surfaces, however, trails are mostly hard to identify, a fact which still justifies field verification. Regarding the relief changes of the glaciers proper and of the glacier forefields the German TanDEM-X interferometric SAR mission is going to offer a quantum-leap in resolution and accuracy which shall well satisfy the cartographers' needs for the updating at medium map-scales.

A route which was tracked during October-November 2011 fieldwork for the new edition of the ARGE Schneider Map Khumbu Himal 1:50.000 is already not up-to-date anymore at the date of its publishing. Under the recent conditions of extremely quick glacier retreats it is simply not possible to produce a map that is totally up-to-date at the time of publication.

It is a dangerous attempt for cartographers to put glacier routes in the maps of high mountain areas today as the glaciers will surely have been changed by the date of publication. Therefore it is important to mark that glacier routes are no defined linear tracks and only recommended for mountaineers with experience in glacial environments. Even locals do often not know the latest conditions.

REFERENCES:

ARGE (2013): Schneider Map Khumbu Himal, 1:50.000 Hrsg.: Arbeitsgemeinschaft für vergleichende Hochgebirgsforschung, München

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