

## **A glacial geomorphological map of the northeastern Tibetan plateau**

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The extent and chronology of Quaternary glaciations on the Tibetan plateau remains elusive, despite intensified research over the past 20 years. While reconstructions of the North American and European ice sheets are fairly well established, the extent of Tibetan palaeo-glaciers range from an ice sheet covering the entire plateau to local valley glaciers restricted to the highest mountain areas. The primary data for reconstructing the outline of former glaciers are glacial landforms and glacial deposits. However, for the Tibetan plateau this data has rarely been systematically mapped over large areas, making it problematic to evaluate proposed palaeoglaciological reconstructions. In order to make well motivated reconstructions of the extent of palaeo-glaciers based on sound evidence, regional-scale or plateau-wide scale mapping efforts are required. We here present the first detailed glacial geomorphological map of the northeastern Tibetan plateau, covering an area of c. 135.000 km<sup>2</sup> centered on the Bayan Har Mountains and encompassing a previously suggested ice sheet – the Huang He ice sheet. The landscape is characterized by a plateau surface at c. 4300 m asl, higher mountain groups reaching up to 1500 m above the plateau surface and marginal areas of fluvial incision by rivers draining the Tibetan plateau creating a steep, fluvial landscape. The map is based on interpretation of satellite images (Landsat ETM+, Landsat TM, ASTER), a digital elevation model (SRTM 90 m resolution) and Google Earth imagery. Field investigations of the mapped landforms have been performed during two field seasons, 2005 and 2006. We have identified and mapped glacial valleys and cirques, marginal moraines, marginal moraine remnants, glacial hummocky terrain, glacial lineations and glacial meltwater channels. Glacial landforms are abundant mainly in and around higher mountain blocks, whereas there is a lack of glacial landforms identifiable by remote sensing in the intervening, lower areas. Upland areas such as the Bayan Har Mountains display a consistent pattern of glacial lineations in the higher central parts of the mountains, marginal moraines across glacially eroded valleys and glacial hummocky terrain and meltwater channels mainly on the lower slopes of the mountains. The mapped landforms indicate glacial advances of varying extent in and around several mountain areas. The presented map, together with chronological constraints from cosmogenic isotope and optically stimulated luminescence dating, will eventually form the basis for a new palaeoglaciological reconstruction for the northeastern Tibetan plateau.