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Long-term stability of peneplains and landscape evolution in southern Tibet inferred from field data, cosmogenic nuclides, and digital elevation models

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Peneplains constitute a widespread and well developed geomorphic element on the Tibetan Plateau, nevertheless little is known about their formation and the subsequent landscape evolution. In southern Tibet, north of Nam Co (~31˚20'N, 90˚E), a particularly well-preserved peneplain occurs at an elevation of ~5350 m in Cretaceous granitoids. The main planation surface has been incised by small streams that formed additional small low-relief surfaces at lower elevations. Fluvial incision of the main peneplain has generated a local relief of up to ~700 m. The progressive incision has led to hillslope gradients that increase with decreasing elevation, i.e. from the main peneplain at ~5350 m down to the current base level at ~4650 m, as revealed by field observations and the analysis of digital elevation model.

In order to quantify the landscape evolution of the peneplain region we determined local and catchment-wide erosion rates from the concentration of *in situ*-produced cosmogenic ^{10}Be. Local erosion rates on the main peneplain and the low-relief bedrock surfaces at lower elevation range from 6 to 12 m Ma^{-1} and indicate that the geomorphic surfaces are stable over long periods of time. Spatially integrated erosion rates of small river systems that are incising and eroding headwards into the main peneplain are only slightly higher and range from 11 to 18 m Ma^{-1}. Even if river incision has proceeded at a rate that is 2-4 times higher than the catchment-wide erosion rates, i.e. at 30 to 60 m Ma^{-1}, it would take about 10 to 20 Ma to generate the local relief of ~700 m observed today. This demonstrates that the major peneplain is a very stable geomorphic element with a minimum age of 10 to 20 Ma and that the landscape in the region has barely been modified by erosion in the last millions of years.