Complex erosion patterns produced by the Haizishan paleo-ice cap, SE Tibetan Plateau

Ping Fu[1], Arjen Stroeven[1], Jon Harbor[2], Jakob Heyman[1], Clas Hättestrand[1], Marc Caffee[2]

1. Stockholm University
2. Purdue University

Determining patterns and rates of glacial erosion is important in understanding landscape evolution, topographic relief production, geochemical cycles, climate change, and glacial thermal regimes of paleo glaciers and ice sheets. Combining *in situ* ^{10}Be and ^{26}Al apparent exposure age dating, geomorphological mapping, and field investigations, we examine glacial erosion patterns of the almost 4 000 km^2 Haizishan paleo-ice cap on the southeastern Tibetan Plateau. Our results show that ice caps developed several times on the low relief Haizishan Plateau and produced a zonal pattern of landscape modification. In locations where apparent exposure ages on bedrock are consistent with last deglaciation, complete resetting of the cosmogenic exposure age clock indicates that more than 2 m of glacial erosion occurred during the last major glaciation (which in this area correlates with the global Last Glacial Maximum (gLGM)). However, older apparent exposure ages on bedrock and in saprolites profiles in areas known to have been covered by the paleo ice cap during gLGM indicate inheritance and thus limited or no erosion by the last ice cap in several areas, including the central zone of the paleo ice cap and at the head of an outlet glacier. Similarly, cosmogenic radionuclide depth profiles in saprolites show erosion of >2 m in an outlet valley bottom and in the mountains that make up the northern border of the paleo ice cap, while samples from saprolites in areas of otherwise scoured terrain have a large nuclide inheritance indicating limited erosion. As patterns of glacial erosion intensity are largely driven by basal thermal regime, our results are consistent with a hypothesis of complex thermal regimes for the paleo Haizishan ice cap during gLGM that was proposed previously on the basis of landform patterns. Future work, including glaciological modeling, is required to fully understand the implications and mechanisms of the complex thermal regime of this paleo ice cap.