Circular hummocky moraines in High Asia similar to Veiki moraines / ice-walled lake plains

Jakob Heyman[a], Cynthia V. Sassenroth[b] and Andreas Johnsson[c]

[a]Department of Earth Sciences, University of Gothenburg, Gothenburg, Sweden, jakob.heyman@gu.se; [b]Department of Earth Sciences, University of Pisa, Italy, cynthia.sassenroth@phd.unipi.it; [c]Department of Earth Sciences, University of Gothenburg, Gothenburg, Sweden, andreasj@gvc.gu.se

Hummocky moraine regions with irregular semi-circular rims surrounding a central depression are regionally widespread in the footprints of the Fennoscandian as well as the Laurentide ice sheets. In Fennoscandia, circular hummocky moraines known as Veiki moraines in northern Sweden are interpreted as formed during an earlier ice advance of the last glacial cycle and preserved under non-erosive ice during the last glacial maximum. In North America, circular hummocky moraine regions known as ice-walled lake plains formed during the deglaciation of the last ice sheet along the south central region of the ice sheet in USA and Canada. Apart from a handful of present-day glaciers in Alaska and Svalbard that may be producing analogues to the circular hummocky moraines, these landforms have only been described from paleo-ice sheet regions.

We present the first record of circular hummocky moraine regions in High Asia, identified by remote sensing of satellite images and high resolution elevation models. We have identified circular hummocky moraine regions in multiple locations across the Tibetan Plateau and the Altai Mountains. The hummocky moraines are generally found on widespread and often massive latero-frontal end moraines which spread out in relatively flat locations. The hummocks vary in morphology but they are commonly strikingly similar to Veiki moraines in northern Sweden and ice-walled lake plains in North America. The circular hummocks in High Asia have similar dimensions and morphology to their analogues in Fennoscandia and North America and they are located close inside a former glacier terminus similar to the ice sheet hummocks. The High Asia circular hummocky moraines are formed by alpine glaciers considerably smaller than the ice sheets that former the Veiki moraines and the ice-walled lake plains, and our findings indicate that these landforms are not exclusively formed by ice sheets.