



Geomorphology and paleoglaciology of the Bayan Har Mountains, eastern Tibetan Plateau

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The Bayan Har mountains on the eastern margin of the Tibetan Plateau is an area of considerable interest because (i) it harbors the headwaters of the Yellow River (Huang He), the most prominent river flowing off the eastern margin of the Tibetan Plateau, (ii) it contains a reportedly diverse array of glacial deposits and morphologies, and (iii) because it has been inferred to have nourished an ice sheet of regional extent (the Huang He ice sheet). The glacial history of the Bayan Har mountains region is extensive because it appears that superseding glaciations were ever limiting in extent. Although these are conditions appropriately to investigate older glaciations, the record is fragmentary at best. We report from an on-going investigation into previously reported sequences of glaciation in this region, which appear to cover deposits, morphologies and erratics of a 2-stage last glaciation phase (OIS 2-4; mountain glaciation character), the penultimate glaciation (OIS 6; ice sheet glaciation character), and deposits and large scale morphology of the Huang He ice sheet of suggested OIS 12 age. We have sampled surface boulders (including erratics) and boulders in till profiles to test, using cosmogenic radionuclide (TCN) concentrations in quartz, these provisionally assigned age ranges. Our study has concentrated to the sampling of localities available along a 300 km stretch of highway that crosses the formerly glaciated area of 80,000 km², thus illustrating its preliminary status. We anticipate to present TCN results at the meeting. Extensive geomorphological mapping of the region was accomplished using Landsat 7 ETM+ satellite images and a SRTM topographic database of

90 m resolution. Our mapping indeed shows a multitude of glacial features, including glacial troughs, cirques and U-shaped valleys, many suites of end moraines in valleys, at valley mouths and on the plateau surface properly, lateral moraines flanking U-shaped valleys and troughs, glacial lineations (including drumlins), and meltwater channels. There is a noticeable decrease in glacial trace abundance with decreasing elevation and increasing distance from the mountains, as one would expect, perhaps, with superseding glaciations of increasingly limited extent. We also found large scale morphology evidence for multiple glaciations through the presence of multiple generations of glacial valleys. Finally, we show that the hypothesized extent of the Huang He ice sheet closely mimics that section of the plateau surface which has not (yet) been affected by the presently active incision of the Yellow and Yangtze rivers. In essence, glacial traces will have the highest preservation potential on these relict surfaces away from the active reaches of these rivers. Hence, the hypothesized extent of the Huang He ice sheet, if shown to be a credible paleoglaciological reconstruction, may then well be a minimum extent which is continuously being consumed by fluvial action.