

## Glacier variations in the late Pleistocene in the Pamir-Alai, central Asia

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In the Pamir-Alai of the Central Asian mountains, moraines in four valleys date to four stages, in this thesis called Turkestan Stages IV to I, and have correspondingly different geomorphologic and ecological features. The periods of these stages are Turkestan Stage IV: late Pleistocene, Turkestan Stage III: late Holocene, Turkestan Stage II: Little Ice Age from AD 1500 to 1900, Turkestan Stage I: the 20th century. In Turkestan Stage IV, glaciers expanded downstream to about 10 km from their present terminal positions about 20 ka. Hummocky moraines on U-shaped valley bottoms indicate that debris-covered glaciers stagnated for a considerable time in marine isotope stage (MIS) 2. Several buried soil layers in a lateral moraine and a debris flow terrace indicate that glaciers shrank between at least 48 ka and 36 ka (MIS 3). It is possible that glacier expansion in MIS 3 was less pronounced than that in MIS 2.

This result is different from what recent studies indicate to have happened in the Karakorum, where expansion in MIS 3 was greater than that in MIS 2. The different variations of glaciers in the two regions (Central Asia and South Asia) indicate that the driving forces of climatic change were different. It is possible that precipitation in MIS 3 increased significantly in the Karakorum because of a strong wet Indian monsoon, but it appears that the low-pressure which was influenced by the westerlies in Central Asia was inactive in the Pamir-Alai and West Tien Shan. The paleoclimate of the Pamir-Alai in MIS 3 was therefore different from that in the Karakorum.