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Alluvial fans and aeolian deposits in the desert margins of Mongolia

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Alluvial fans and aeolian deposits enable the reconstruction of Quaternary geomorphological processes resulting from environmental changes at the desert margins of Mongolia. The geomorphological processes, such as the formation of alluvial fans and terraces, sand and silt accumulation and mobilisation vary a) spatially with different climatic conditions and vegetation cover in relation to elevation and latitude and b) temporally due to climatic shifts (temperature and humidity) during the late Quaternary. The Khangai Mountains in central Mongolia are in the transition zone between the boreal forest in the north and the Gobi Desert in the south. Late Glacial to Holocene aeolian sediments are distributed above 1,800 m a.s.l.. Glacier advances and dated alluvial fan sediments provide evidence for enhanced Pleistocene weathering and sediment accumulation. Sections in the northern and central Gobi represent river terraces and alluvial fans in basin areas which date to the penultimate Glacial cycle (T2) and yield accumulation of the younger T1-surface during the global Last Glacial Maximum (gLGM) and late Glacial time. However, the gLGM phase represents rather sheetflow dominated transport mode, while, in contrast, late Glacial deposits exhibit more debrisflow controlled accumulation. Incision, forming the T1-terrace edges occurred during the Pleistocene-Holocene transition and the Holocene. The geomorphic evidence is interpreted as stronger fluvial morphodynamics induced by enhanced humidity under beginning interglacial conditions. These processes coincided with the development of aeolian mantles in upper regions of surrounding mountain areas, such as the Khangai and Gobi Altai ranges. Higher temperatures and humidity supported the formation of a vegetation cover, that served as a dust trap at least since late Glacial times and reduced the sediment supply on the alluvial fan surfaces and terraces. In addition, numerous lakes and remnants of paleolakes exist in western and southern Mongolia. Paleolake shorelines provide evidence for higher lake levels with more humidity mainly during interglacials, such as MIS 5e and the Holocene (Lehmkuhl et al., 2018). The MIS 2 was a very dry period with smaller glaciers than during the MIS 3 (Rother et al., 2014). Thus, lake basins and fluvial terraces may have acted as dust sources. In the late Holocene lake levels were generally low and aeolian mantles of sand and silt were partly remobilized.

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