

A Middle to Late-Pleistocene Fluvio-Aeolian record from the Qaidam basin margin, northeastern Tibetan Plateau, China

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Middle to Late Pleistocene (MIS's 6-3a) dune-damming of a small (about 1.5 Km²) basin, at an elevation of 3437 m a.s.l, at the northeastern edge of the Qaidam basin generated a >12.5m fluvio-aeolian sequence whose upper part was documented in detail. This continuous fluvial sequence (9 meters) dated to 119-38.6 ka (MIS5e-MIS3a), includes about 35 sedimentary units characterized by fine gravel units at the base and fining-upward sedimentary units from fine angular gravels and granules to fine sand and silt at the middle and upper part of the section. These units were found to unconformably overlap flanks of a dune, characterized by steeply-dipping sand units, OSL dated to ~143-134 ka (MIS6). These finds reveal one of the oldest Quaternary records of dune-damming. Some of the contacts between the fluvial units, mainly at the middle and upper part of the section are composed of reddish silty-clay layers that contains carbonates and other pedogenic indicators that testify for unconformities, representing significant time gaps.

A massive sand-dominated unit dated to ~15 ka that marks the breaching phase of the dune dam, horizontally truncates the top of the dune, while the natural reservoir at the back of the dune, was probably almost full with fluvial sediments. This breaching unit together with another overlying ten sedimentary units dating until ~ 12 ka, represent the last deglaciation period during which a second dune-damming phase blocked the basin. These AFI phases dramatically changed the morphology and drainage of the Qaidam basin. The fluvial units are associated with specific deglaciation periods while periods of enhanced wind power led to significant eastward dune mobilization up the slopes of the Qaidam basin margins and consequent damming of local streams.

The upper part of the section (3.5 m) is aeolian and composed of massive, fine sandy-silty loess separated by pedogenic unconformities into two paleosols and a current soil with calcic B horizons. Dated to the Holocene (10.1 ka-present) this part of the section suggests a period of loess accumulation with changing rates of deposition and a wind power relax since the last deglaciation.

The sediments of the margins of the Qaidam basin accumulated by intense dune mobilization, consequent long-term dune damming, filling of backdune reservoirs and dune breaching by major floods. These processes, were probably controlled by the paleoclimate of glacial-interglacial cycles.