Geophysical Research Abstracts
Vol. 21, EGU2019-19084, 2019
EGU General Assembly 2019

Aeolian-Fluvial Interactions Stabilize Desert in the Qaidam Basin, Qinghai-Tibetan Plateau

Lupeng Yu (1), Joel Roskin (2,3), Noam Greenbaum (2,3)

(1) School of Resources and Environmental Sciences, Linyi University, Linyi, China, (2) Geomorphology and Portable Luminescence Laboratory, Leon Recanati Institute for Maritime Studies, University of Haifa, Mt. Carmel, Israel, (3) Department of Geography and Environmental Studies, University of Haifa, Mt. Carmel, Israel

Desert and dunefield evolution is usually considered to be mainly controlled by palaeoclimatic changes, especially precipitation changes. Accordingly, desert evolution records could be applied to reconstruct paleoclimatic changes. We noticed many cycles of dune sand and fluvial/flood-relevant sediments in and around the Tiekui Desert dunefield (TKD), eastern Qaidam Basin (QB), NE Qinghai-Tibetan Plateau, indicating that Aeolian-Fluvial Interactions (AFI), predominantly the damming of watercourses by dune (dune-damming), might have had a major impact on dunefield evolution. Here we apply OSL dating to establish the chronology of the AFIs in the TKD. Based on 120 OSL ages, records of AFIs since ca. 140 ka were reconstructed. Most of the AFIs developed with the onset of deglaciation periods, i.e. transition periods from cold to warm stages, e.g., MIS 2-1, MIS 3b-3a, MIS 5b-5a, MIS 5d-5c, and MIS 6-5e.

During glacier or cold periods, the flows were very limited or absent, and the TKD dunes remobilized, expanded and buried the shrunken streams and their floodplains. When deglaciation started, the meltwater from glaciers and permafrost in the source regions increased sharply, and precipitation also increased in early Holocene, however, the increased flow had no drainage patterns to cross the TKD. This caused floods in the TKD, which were finally blocked by large dunes, forming dune-dammed lakes. As long as dunes were mobile, dune movement maintained the dune dams and possibly advanced into water bodies. These processes hindered the forward migration of lakes and the re-establishment of drainage systems. With time, these water bodies elevated ground water levels, deposited fine grain sediments, and increased vegetation cover. These AFI processes reduced sand mobility and led to dune stabilization.

Once the TKD was mostly stabilized, aeolian activities significantly decreased and drainage systems began to develop. Then rivers deeply incised into the accumulated AFI sediments, which significantly lowered the groundwater levels. With the drop of groundwater level and decreased precipitation during the arid late Holocene, desert restarted to active.

To summarize, AFI processed directly controlled the growth of the TKD, while the climatic changes, i.e. glacial-interglacial cycles, controlled the occurrence of AFI. This study stresses the importance of surface processes for the geomorphology and paleoenvironmental evolution.