

Asia dust production ramped up since latest Oligocene: Tibetan Plateau uplift vs global cooling

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As the world's second largest sand sea and one of the most important dust sources to the global aerosol system, the formation of the Taklimakan Desert marks a major environmental event in central Asia during the Cenozoic. Determining when and how the desert formed holds the key to better understanding tectonic-climatic linkages in this critical region. However, the age of the Taklimakan remains controversial, with the dominant view being from 3.4 to ~7 million years ago (Ma) based on magnetostratigraphy of the sedimentary sequences within and along the margins of the desert. In this study, a volcanic tuff preserved in the stratigraphy was precisely dated by radioisotopic methods, and the initial desertification was constrained to be Late Oligocene. It is suggested that the Taklimakan was formed as a response to a combination of widespread regional aridification and increased erosion in the surrounding mountain fronts, both of which are closely linked to the tectonically driven surface uplift of the Tibetan-Pamir Plateau and Tian Shan, which had reached a climatically sensitive threshold at this time. The Taklimakan Desert has supplied dust to the global dust system constantly since its formation, a process which can be illustrated by the concept of **dust factory**. A dust factory consists of a dynamics chain involving tectonic uplift, erosion, transportation, sorting and deposition operating in a coupled mountain-basin system, and is responsible for producing eolian dust to the global dust cycles (see figure below).

