



## **Cenozoic evolution of the Pamir plateau recorded in surrounding basins, implications on Asian climate and land-sea distribution**

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The Cenozoic Pamir orogen formed in response to the India-Asia collision. Existing datasets shows that the range grew since ca. 25 Ma, however the early Cenozoic history remains particularly enigmatic. In that peculiar period, global climate changed from greenhouse to icehouse, the proto-Paratethys sea retreated out of Asia and continental aridification as well as monsoons established over Asia. These environmental changes are held responsible for major floral and faunal crises including the emergence of plant communities and the dispersion of key mammal groups from Asia onto other continents. However, the causal relationships between these events remains to be established because of the lack of accurate age constraints on their geological records. Here, we provide well-dated stratigraphic records using magneto- and bio-stratigraphy from the basins surrounding the Pamir. Southeast of the Pamir, along the Kunlun Shan into the southwestern Tarim Basin, Eocene marine deposits are continuously overlain by 41 to 15 Ma continental redbeds themselves overlain by conglomerates in a classic foreland sequence with upward increasing grain-size, accumulation rates and provenance proximity. However, North of the Pamir along the southwestern Tian Shan and West of the Pamir into the Afghan-Tadjik Basin, the entire Oligocene period appears to be missing from the record between the last marine and the first continental sediments dated to the Early Miocene. This supports a simple basin evolution model in response to initial Pamir indentation with Eocene foreland basin activation in the Southeast related to the Kunlun Shan northward thrusting, followed much later by early Miocene activation of the northern foreland basin related to the southwestern Tian Shan overthrusting. The coeval activation of a lithospheric right-lateral strike-slip system along the Pamir/Tarim boundary may have enabled to transfer deformation from the India-Asia collision zone to the Tian Shan and possibly the Talas Fergana fault. This simple model suggests the following two-stage paleoenvironmental evolution: (1) Late Eocene sea retreat linked to the onset of Pamir indentation in conjunction with global sea-level drop, decreasing CO<sub>2</sub> levels and ice-cap formation and (2) Early Miocene closure of the Tarim Basin by northward indentation of the Pamir plateau. This two stage evolution is consistent with the Eocene occurrence of continental aridity and Asian Monsoons and their Early Miocene intensification.