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$\sim$ 15 Ma thrusting along the North Altyn Fault: implications for Mid-Miocene reorganization of the Altyn Tagh fault system, northeastern Tibetan Plateau.

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Defining the northern margin of the Tibetan Plateau, the Altyn Tagh Fault system (ATFs) exerts a crucial role in accommodating intracontinental deformation during the India-Asia convergence. The North Altyn fault (NAF), demarcating the western boundary of the ATFs in the Altun Shan region, was testified to exist a structural shift from sinistral along-strike slipping to thrusting during the Cenozoic era. However, the exact timing of the shift remains an issue to be refined. In this study, we conducted LA-ICP-MS based apatite fission track dating at massifs of both the hanging wall and footwall along the NAF, to shed light on dating the thrusting-related exhumation of the NAF. The results show that the hanging wall massifs of the NAF present a quasi-isothermal quiescence during the early Cenozoic, followed by a rapid cooling phase with mean cooling rate of 6.66 $\pm$ 0.72 $^{\circ}$C / Ma since $\sim$15 Ma, resulting from accelerated exhumation which has been interpreted to mark intense vertical uplift of the NAF. Significantly younger age ($\sim$5 Ma) but higher rate (15.33 $\pm$ 2.10 $^{\circ}$C / Ma) of rapid-cooling event occurred at the footwall compared to the hanging wall suggests a northward propagation of thrusting into the interior Tarim basin. Combining previous studies, we attribute the structural shift of the NAF from along-strike slipping to thrusting to the Mid-Miocene kinematic reorganization of the ATFs, supporting to the two-stage evolution model of the AFTs that: (1) during $\sim$50-15 Ma, the NAF acted as a part of the Altyn Tagh fault experiencing along-strike slipping, with the Altun Shan elevated north within big restraining-double-bends; and (2) after $\sim$15 Ma, the Altyn Tagh fault cut through the double-bends with significant thrusting along the NAF, circumscribing the present triangle-shaped Altun Shan featured with uplifting south beginning at $\sim$15 Ma.