



Long Neogene kinematic history and late Quaternary order-of-magnitude acceleration of the south Tianshan foldbelt, Kuqa basin, China

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The active south Tianshan foldbelt provides a remarkably long record of deformation, constrained by excellent outcrops, seismic imaging of growth strata and high-resolution magnetostratigraphy. We give several examples of how growth history is constrained by interactions of sedimentation and deformation. Near the high Tianshan mountain front Mesozoic and Cenozoic strata are involved in deformation that began at about 25-26Ma as documented by growth strata north of Kuqa. Toward the southern front of the foldbelt, Miocene through Holocene strata are folded in the Quilitage and Yaken anticlines which began growing above a thrust system that propagated at about 5.5Ma. Yaken anticline at the south edge of the eastern Kuqa foldbelt has only emerged as a topographic anticline in the last 0.2-0.3Ma associated with an acceleration of the Quilitage-Yaken thrust system. Structural restoration suggests a shortening of 15-20 km across the eastern Kuqa foldbelt. Considering that this shortening began about 25 Ma, the average shortening rate was about 0.7 mm/yr. Since the frontal thrust system underlying the Quilitage and Yaken anticlines has a shortening of 6 km that began about 5.5Ma, their average shortening rate is about 1.1 mm/yr. However the shortening rate on this frontal system from 5.5Ma to 0.2-0.3Ma is about 0.6mm/yr followed by an acceleration to 4-5mm/yr at about 0.2-0.3Ma causing the topographic emergence of these structures. These results indicate that shortening rates in the Kuqa foldbelt have increased by about an order of magnitude in the late Pliocene, which is consistent with more regional present-day geodetic shortening rates of about 9mm/yr across the southern Tianshan, which also indicate a substantial acceleration relative to Neogene shortening rates.