ACTIVE FAULTS AND FOLDS IN THE KYRGYZ CENTRAL TIEN SHAN MOUNTAINS


INTRODUCTION

As part of a multidisciplinary NSF Continental Dynamics investigation to understand intracontinental/mountian building processes in the Tien Shan, Central Asia, we have produced a map of active faults and selected folds of the Kyrgyz central Tien Shan. Based on seismic-moment tensors (Mohr and Deng, 1986), GPS observations (Kalabshahmatov et al., 1992), and geology (e.g., Avraaz et al., 1993), it has been inferred that 1/3 to 1/2 of the India/Asia collision occurs in the 2500 by 400 km wide intracontinental belt, 1000 to 2000 km from the plate boundary. Mountain peaks above 7 km and vertical structural relief of up to 10 km on an early Cenozoic surface exemplify vigorous tectonic activity throughout the late Cenozoic (Makarov, 1977; Sadibakasov, 1990).

The active faults and landforms on our map provoke intriguing hypotheses for the kinematics and evolution of crustal deformation across the central Tien Shan. Features of interest include: 1) widespread occurrence of active structures of both north and south vergence, at essentially every basin/range boundary and many other locations; 2) comparable magnitudes of late Pleistocene surface offsets across structures between the northern range front and intermontane basins, suggesting an equal partitioning of strain; 3) widespread evidence for basinward migration of fault detachment and ramps; 4) en echelon anticline geometries, recorded in deformed Neogene basin strata and fluvial terraces, at both frontal and intermontane basin margins; 5) evidence for oblique structures, in particular left-reverse structures near the right-lateral Tazik Fergana fault; and 5) evidence for a continuous evolution of the mountain range throughout the late Cenozoic, characterized by similarity in the style of deformation, evolution of structurally controlled basins, and propagation of faults and folds that created the range.

We have assigned the following ages to active structures: late Cenozoic (violet), Quaternary (green), late Pleistocene/Holocene (red). For this preliminary map and classification, we assume that all structures deforming Cenozoic sedimentary basin deposits have been active since Neogene time, despite the tenacious nature of regional stratigraphic correlation and late Quaternary deposition in these units. Structures classified "late Cenozoic" deform basin sediments but lack geomorphic or stratigraphic evidence for significant Quaternary activity. "Quaternary" structures (green) have stratigraphic and/or geomorphic evidence for more recent activity, such as offset Pleistocene conglomerates or a located hanging-wall escarpment. Many structures classified "Quaternary" have been active in the late Pleistocene, but lack evidence of significant cumulative offset or recent events. Evidence for "late Pleistocene/Holocene" structures (red) includes spectacular vertical scarp development across late Quaternary fans and terraces, lateral offsets of streams and moraines, and uplifted and folded terraces. Many of these structures have produced scarce cutting record and modern deposits and surfaces, and will be excavated for paleoseismic investigation next field season.

REFERENCES


Avouac, J.P., Tapponnier, P., Bai, M., You, H., and Wang, G., 1993, Active thrusting and folding along the northern margin of the Kochkorka Basin, will be used to determine subsurface ramp-flat geometries, and rates of Quaternary shortening at basin margins across the central Tien Shan. We plan to date terraces younger than 100 ka by using differential GPS, which allows rapid measurement and centimeter-scale precision. We plan to date terraces younger than

THE IMAGE

The map base is a mosaic of three LANDSAT MSS scenes. Resolution after resampling is approximately 250 meters. The image is a false color display: RED = band 7 (0.95 m), GREEN = band 5 (0.70 m), BLUE = band 4 (0.53 m). Image mosaicing and processing were done in Adobe Photoshop.