Geophysical Research Abstracts
Vol. 14, EGU2012-3014, 2012
EGU General Assembly 2012

Mountain building processes in intraplate, intracontinental oblique deformation belts: Lessons from the Gobi Altai, Mongolia

D. Cunningham
University of Leicester, Geology, Geology, Leicester, United Kingdom (wdc2@leicester.ac.uk)

The Gobi Altai is an intraplate, intracontinental transpressional orogen in southern Mongolia that formed in the Late Cenozoic as a distant response to the Indo-Eurasia collision. The modern range formed within crust constructed by successive terrane accretion and ocean suturing events and widespread granite plutonism throughout the Palaeozoic. Modern reactivation of the Gobi Altai crust and the kinematics of Quaternary faults are fundamentally controlled by Palaeozoic basement structural trends, the location of rigid Precambrian blocks, orientation of SHmax and possible thermal weakening of the lower crust due to an extensive history of Mesozoic-Cenozoic basaltic volcanism in the region, and the presence of thermally elevated asthenosphere under the Hangay Dome to the north.

Modern mountain building processes in the Gobi Altai typically involve reactivation of NW-striking basement structures in thrust mode and development of linking E-W left-lateral strike-slip faults which crosscut basement structures within an overall left-lateral transpressional regime. Restraining bends, other transpressional ridges and thrusted basement blocks are the main range type, but are discontinuously distributed and separated by internally drained basins filling with modern alluvial deposits. Unlike a contractional thrust belt, there is no orogenic foreland or hinterland, and thrusts are both NE and SW directed with no evidence for a basal decollement. Normal faults related to widespread Cretaceous rifting in the region are locally thrust reactivated in the NE Gobi Altai, but elsewhere appear to be unfavourably oriented for Late Cenozoic reactivation despite widespread topographic inversion of Cretaceous basin sequences. The diffuse historical seismicity in the region coupled with a complex system of interacting faults showing evidence for Quaternary movements, suggests that faults may be dormant for long periods and then reactivate. Large earthquakes may be episodic and spatially migrating, therefore inter-plate earthquake recurrence models are unlikely to apply. Because the Gobi Altai is an actively developing youthful mountain range in an arid region with low precipitation rates, the tectonic signal is very strongly expressed in the landscape. Mountain fronts active in the Quaternary are easily identified by a ‘quartet’ of geomorphological features including: 1) an aggrading alluvial fan complex directly at the front, 2) a visible fault scarp cutting Quaternary fan sediments, 3) low mountain front sinuosity, 4) low valley floor-width/valley-height ratios in rugged canyons exiting the range along the faulted front. The Gobi Altai provides an excellent opportunity to study the way a continental interior reactivates due to a distant continental collision. In addition, it offers important insights into how other more advanced intracontinental transpressional orogens may have developed during earlier stages of their evolution.