Geophysical Research Abstracts, Vol. 8, 06486, 2006
SRef-ID:

Polyphase deformation and intraplate mountain building at the Nemegt Uul restraining bend in the Gobi Altai Mountains, Mongolia.

Stephen Rippington, Dickson Cunningham, Richard England
Crustal Processes Group, Department of Geology, University of Leicester, UK
(sjr32@le.ac.uk)

The Gobi Altai Mountains in Mongolia provide a superb natural laboratory for studying active processes of oblique deformation, strain partitioning and restraining bend nucleation and growth along major transpressional fault systems. Nemegt Uul is a recent uplifted mountain range formed at a restraining bend along the sinistral Gobi-Tien Shan fault system in southern Mongolia. Structural and lithological transects, mapping, and image analysis of Landsat images and DEMs carried out in 2004 and 2005, documented the 3D architecture of Nemegt Uul, highlighting the importance of polyphase deformation in the evolution of the region.

Nemegt Uul is a long (70 km), narrow (15 km) broadly east-west striking sigmoidal-shaped range with low mountain front sinuosity typical of active fault-bound mountain ranges. A 90m-pixel resolution DEM of Nemegt Uul indicates that higher elevations occur along the south side of the range and the overall topography is asymmetric. Larger alluvial fan complexes mantle the northern range front and drainage length asymmetries within Nemegt Uul suggest the range is tilted north, presumably due to larger thrust displacements in the south.

The basement rocks in the range consist of Palaeozoic greenschist-grade metasediments and metavolcanic successions cut by a variety of intrusive rocks and thrust to the north and south over range bounding Jurassic-Cretaceous clastic deposits. Ophiolitic rocks in the west of the range consistently thrust north over Palaeozoic metasediments, suggesting Nemegt Uul marks a major Palaeozoic suture zone. The study area has a complex history of polydeformation. At least two phases of folding and ductile thrusting are associated with Palaeozoic terrane accretion and ophiolite obduc-

tion in southern Mongolia. Brittle normal faults which cut Palaeozoic structures, and syn-sedimentary normal faults bounding Jurassic-Cretaceous basins indicate a phase of Mesozoic extension. The present-day architecture of Nemegt Uul, based on Late-Cenozoic fault geometries and kinematics, indicates that the range is a bivergent asymmetric positive flower structure. Late-Cenozoic strike-slip deformation is accommodated by oblique-slip thrust faults at the mountain fronts and within the range. One major Late-Cenozoic oblique-slip thrust fault connects the north and south fronts of the mountain, but changes its vergence along strike.

Most Palaeozoic, Mesozoic and Cenozoic faults in the range are east-west striking and closely parallel. Cenozoic thrusts generally do not reactivate Mesozoic normal faults. However, Mesozoic normal faults and Cenozoic oblique-slip thrusts reactivate, or are parallel to, a Palaeozoic inherited fabric. Earliest Cenozoic thrust faults formed parallel to the east-west structural grain in Nemegt Uul. However, within the restraining bend stepover, new southeast-northwest trending oblique-slip thrust faults later broke through the range, connecting the earlier east-west faults. This suggests that reactivation of the Palaeozoic fabric was important to original fault segmentation of the Gobi-Tien Shan fault system and restraining bend nucleation, but that its importance has decreased with continued uplift and growth of Nemegt Uul.