Geophysical Research Abstracts, Vol. 9, 03868, 2007
SRef-ID:

Intracontinental Transpressional Mountain Building and Coupled Basin Development in the Gobi Altai Region, Mongolia

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Late Cenozoic crustal reactivation in the Gobi Altai region of southern Mongolia is expressed by youthful (<8Ma) transpressional mountain ranges separated by intracontinental clastic basins. The region has a basin and range physiography characterised by WNW striking restraining bend and thrust block mountains linked to E-W sinistral strike-slip faults surrounded by low desert basins. Widespread seismicity, surface fault scarps, sharply defined mountain fronts with flanking alluvial fan complexes, and uplifted and preserved peneplains, indicate that the region is actively deforming. The Gobi Altai is probably the world's best region to study the coupled relationships between intracontinental, intraplate transpressional mountain building and sedimentary basin development. However, in order to understand modern tectonic activity in the Gobi Altai region, it is necessary to document the crustal events that formed and deformed the basement rocks and cover sequences prior to Late Cenozoic reactivation.

Our research results in the Gobi Altai indicate that terrane accretion and polyphase contractional deformation in the mid-late Palaeozoic was followed by a Jurassic-Early Cretaceous period of crustal extension and volcanism perhaps similar in regional extent to the North American Basin and Range province. This major extensional event is overprinted and obscured by younger transpressional uplift and has previously not been documented in the Gobi Altai. However, in the Nemegt-Altun Uul range in the southern Gobi Altai, normal faults (partly reactivated to un-reactivated) bound a partially exhumed Cretaceous metamorphic core complex. This is the first documented example of a modern restraining bend constructed on top of an older extensional core complex. Likewise, in the northern Gobi Altai, Jurassic-Cretaceous rift-related normal

faults are passively uplifted in the Ih Bogd restraining bend indicating that the modern restraining bend is constructed on previously stretched crust.

Gobi Altai basins are dominated by Jurassic-Cretaceous rift fill and volcanic eruptives, which are overlapped by lesser accumulations of upper Cenozoic alluvial fan and fluvial basin fill derived from adjacent actively forming transpressional mountain ranges. Analysis of regional SRTM topographic data and derived slope smoothness characteristics allows for the first clear discrimination of upper Cenozoic alluvial deposits in the region. The largest fans are adjacent to the mountain fronts with greatest relief. There is a strong positive correlation between the location of the largest fan complexes and range bounding thrust faults that are most northwesterly striking and at a high angle to regional SHmax. Thus the fan complexes serve as a proxy for locating the active faults in the region with contractional components of displacement responsible for relief generation. Strong orogen-basin coupling is also indicated where fan complexes are faulted, uplifted and eroding, as bounding ranges thrust outwards and widen, leading to local basin inversion and alluvial depocentre migration.