



Late Quaternary slip rate of the South Heli Shan Fault (northern Hexi corridor, NW China) and its implications for northeastward growth of the Tibetan Plateau

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Based on field investigations, aerial-photos morphological analysis, topographic profiling, and optically stimulated luminescence (OSL) dating of alluvial surfaces, we estimate vertical components of the slip rate along the South Heli Shan thrust Fault, which lies on the northern margin of the Hexi corridor and the northeastern edge of the Tibetan Plateau. The fault consists of three segments with scarp heights ranging from less than 1 m to more than 14 m. OSL dating indicates that most of the alluvial fans cut by fault scarps formed during the transition from last glacial stage to present interglacial stage from \sim 19 ka to \sim 9 ka along southern Heli Shan, from \sim 27 ka to \sim 22 ka, along its northern margin. In addition, remnants of older alluvial fan have been abandoned after \sim 67 ka. Scarp heights increase from west to east and reach a maximum of more than 14 m near the eastern end. Using three approaches we calculate late Quaternary slip rates for each of three fault segments along the southern margin, and the fault on the northern flank. These approaches yield maximum vertical slip rates from 0.18 to 0.2 mm/a for western segment, 0.3 to 0.43 mm/a for central segment, 0.36 to 0.53 mm/a for eastern segment, and 0.21 mm/a for the Wutongjing fault, which lies on the north side of the Heli Shan. For a range of likely fault dips, these correspond to 0.1-0.2 mm/a of average horizontal shortening for western segment, and increase to 0.4-0.5 mm/a across the eastern segment of southern Heli Shan fault. Combining the height of eastern parts of the Heli Shan (Daqing Peak) above the Hei He (a major river that incised the western end of the range) and the vertical component of the slip rate of the eastern segment, we suggest that the Heli Shan was uplifted by motion on the south Heili Shan fault beginning sometime between 1 and 4 Ma, most likely since \sim 2 Ma. This age suggests that the Tibetan Plateau continues to grow northeastward across the Hexi Corridor.