Vol. 89 No. 4 pp. 1409–1410 ACTA GEOLOGICA SINICA (English Edition) Aug 2015

Research Advances

Evolution of the Late Cenozoic Tectonic Stress Regime in the Tianshui Basin, Northeast Tibetan Plateau

CHEN Peng[1], SHI Wei[1, *], YANG Jiaxi[2] and LI Jiangyu[1]

1 *Institute of Geomechanics, Chinese Academy of Geological Sciences, Beijing 100081, China*
2 *College of Earth Science and Resources, Chang'an University, Xi'an 710054, Shaanxi, China*

The Tianshui Basin, located inside the western Qinling orogenic belt and northeastern margin of the Tibetan Plateau (Fig. 1), is a NE-trending Late Cenozoic basin, which documents the neotectonic response of the northeastward growth of Tibetan Plateau. This basin was filled with the Late Cenozoic sediments, including the Ganquan Formation (22–9.2 Ma), Raodian Formation (9.2–7.4 Ma), Yangjizhai Formation (7.4–3.6 Ma) and Lamashan Formation (3.6–2.6 Ma). It has undergone a multiple-stage intracontinental deformation since the Late Cenozoic due to the evolution of tectonic stress regime, which was previously interpreted by tectonic escaping models or crustal flow models.

On the basis of field structural measurements and

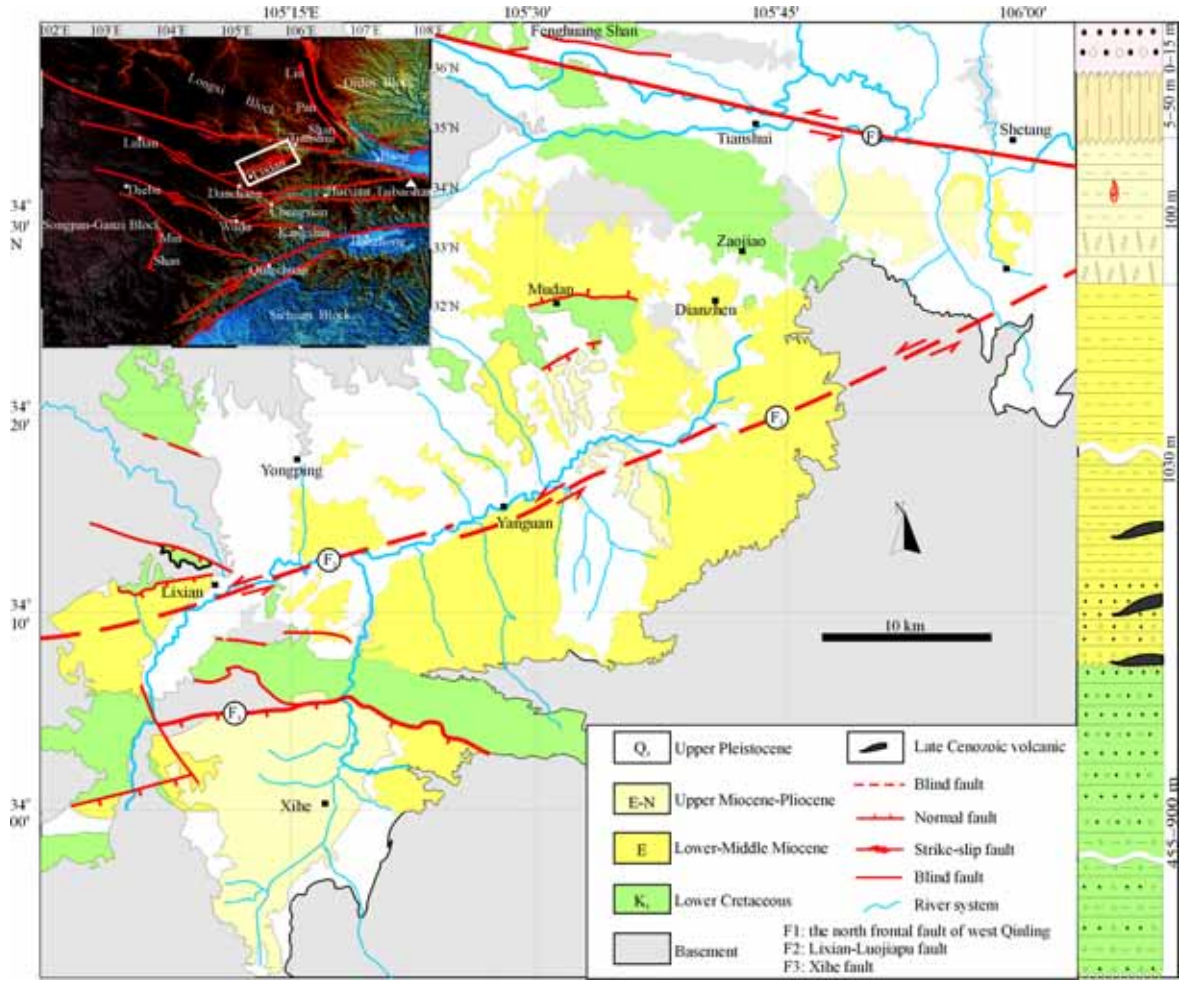

Fig. 1. Sketch geological map of northeastern Tibetan Plateau and simplified geological map of the Tianshui Basin (geological map modified from the regional geological map of Tianshui area (1:250000) and DEM data from http://gdem.ersdac.jspacesystems.or.jp/).

* Corresponding author. E-mail: weishinmg@hotmail.com

analysis, coupling with the previous chronologic and sedimentologic studies, this study preliminarily proposed a deformation process and tectonic stress field sequences for this basin, and further rebuilt the Late Cenozoic tectonic evolutional history. The three-stage tectonic evolution sequences are proposed as follows. The first stage began from the Early Miocene to Late Miocene, when sedimentary basin developed due to NW–SE extension, accompanied with the eruption of alkaline ultramafic volcanic rocks. The following Late Miocene to Early or middle Pleistocene NE-SW compression resulted in the basin inversion, and its driving mechanism probably resulted from the northeastward growth of the Tibetan Plateau, in accordance with the approximate coeval and profound tectonic deformation in the whole northeastern margin of Tibetan Plateau. Finally, a transpressional regime (nearly N–S extension and E–W compression) was dominated in this region since the Late Pleistocene, when the horizontal strike-slip rate of the north fault in western Qinling (F_1) and Lixian-Luojiabao fault was 2.8 mm/a and 0.95 mm/a, respectively. The basin extruded eastwards limitedly and rotated clockwise, which is interpreted to result from the clockwise rotation of regional shortening direction. This is consistent with the stress condition of the arcuate structures (Haiyuan fault, Xiangshan-Tianjinshan fault, Yantongshan fault and Luoshan-Niushoushan fault) since the Late Pleistocene in the northeastern Tibetan Plateau.

Acknowledgments

This study was supported by the study grants from China Geological Survey (No. 1212011120100, 1212011120099 and 1212011220259).