CHEN Guifan, LI Dewei, 2013. The Spatial Distribution Characteristics and Constraints of Earthquakes in Southern Part of the Qinghai-Tibet Plateau. *Acta Geologica Sinica* (English Edition), 87(supp.): 337-338.

The Spatial Distribution Characteristics and Constraints of Earthquakes in Southern Part of the Qinghai-Tibet Plateau

CHEN Guifan[1], LI Dewei[1, 2, *]

1 *Faculty of Earth Sciences, China University of Geosciences, Wuhan, Hubei 430074, China*
2 *Disaster Research Center, China University of Geosciences, Wuhan, Hubei 430074,China*

According to the previous researches on the spatial distribution of strong earthquakes in the Qinghai-Tibet Plateau, the seismic activity is closely related to active tectonics (e.g., active faults, rifts, graben, etc.), heat flow, low velocity and low resistance layer in the crust, regional stress field, etc. With the lower crustal melt from Ganges Basin flowing northwards since Miocene, the southern Qinghai-Tibet Plateau came into the process of intraplate orogeny and began to uplift slightly (Li Dewei, 2010). Crust-scale north-south intraplate extension occurred in the early to middle Miocene; however, in the late Miocene, part of the northward flow of the hot & soft lower crustal materials within the plateau converted to a west-east trending, which together with outward flow of crustal materials at the western and eastern syntaxis, had resulted in the development of the extensively distributed north-south extensional structures, e.g. a series of grabens formed by high-angle normal faults. These extensional structures have transected and reformed the preexisting east-trending faults, basins and other structures (Li Dewei, 1992). In this contribution, strong earthquake data of the southern Qinghai-Tibet Plateau were collected and analyzed for their spatial distribution. The findings are as follows: (1) Strong earthquakes are mostly distributed along active faults especially the north-trending grabens(e.g., two out of the three M8.0 earthquakes on record in the study area occurred in Gulu-Yangbajing-Yadong graben); (2) The fact of the presence of transmeridional tensile stress shown by focal mechanism solutions as well as of the predominance of normal fault plane solutions could further indicate the east-trending extension, where some earthquakes in the northeast part might show some strike-slip components, which is consistent with the global positioning system (GPS) velocity field; (3) Strong earthquakes correspond well with high heat flow which in this case are present as areas with strong hydrothermal activities exposed mostly in intersections of north-trending grabens and other fractures; (4) Statistical result shows that focal depths concentrate in two levels (10~15km, 30~35km), exactly above the crust layers with low velocity, high conduction or those with low resistivity. Therefore, distribution of strong earthquakes in southern Tibetan Plateau is constrained by multiple factors as north-trending grabens, terrestrial heat flow, low velocity & high conduction or low resistivity layer, regional stress field. Firstly, the low velocity & high conduction or low resistivity layer and high terrestrial heat flow together are required in the energy accumulating process of earthquake preparation. Secondly, the consistence of regional stress field and focal mechanism solutions suggest that the southern plateau overall is characteristic of its northwards movement with a eastward turning in the northeast part of Gangdise, which offers a unified stress field for the occurrence of earthquakes. Thirdly, the prominent north-trending grabens have now been deemed as the best location for seismic energy release. Besides, considering the forming time of these north-south (north-south-trending) grabens (Miocene), it can be further demonstrated that the different types of extensional tectonics in the Late Neocene Tibetan Plateau may not be result of delamination or gravitational collapse by the collisional orogeny nor could it be explained by plate collision, but rather were products of lower crustal flow and thermo-upwelling extension during the uplift of Qinghai-Tibet Plateau(Li Dewei, 1995, 2003, 2009).

Key words: Qinghai-Tibet Plateau; strong earthquake; graben; heat flow; low velocity layer; focal mechanism solution

References

Li Dewei, 1992. On tectonic asymmetrical evolution of the Himalayan orogenic belt. *Earth Science-Journal of China University of Geosciences*, 17(5): 539–545 (in Chinese).

Li Dewei, 1995. On continent tectonics and continental dynamics. *Earth Science-Journal of China University of*

* Corresponding author. E-mail: dewei89@sina.com

Geosciences, 20(1):19–26 (in Chinese).

Li Dewei, 2003. New model for the uplift of the Qinghai-Tibet plateau. *Earth Science-Journal of China University of Geosciences*, 28(6): 593–600 (in Chinese).

Li Dewei, Xia Yiping, and Xu Ligui, 2009. Intracontinental basin-orogen coupling and origins of basins and orogens–Examples from the Qinghai–Tibet Plateau and adjacent basins. *Earth Science Frontiers*, 16(3): 110–119 (in Chinese).

Li Dewei, 2010. Temporal-spatial structure of intraplate uplift in the Qinghai-Tibet Plateau. *Acta Geologica Sinica (English Edition)*, 84(1): 105–134.