LI Dewei, 2013. Lower Crustal Flow from Ganges Basin in to the Tibetan Plateau since the Miocene: Effects and Mechanism. *Acta Geologica Sinica* (English Edition), 87(supp.): 362-363

Lower Crustal Flow from Ganges Basin in to the Tibetan Plateau since the Miocene: Effects and Mechanism

LI Dewei

Faculty of Earth Sciences,Center for Tibetan Plateau Studies and Disaster Research Center, China University of Geosciences, Wuhan, 430074, China

Lower crustal flow from the Ganges Basin into the Tibetan Plateau since the Miocene, constrains the tectonic pattern and earthquake distribution of the Plateau in middle and eastern Asia (Li dewei, 1992, 1993, 1995, 2003, 2004, 2008a, 2008b, 2010a, 2010b, 2012; Li dewei，et al., 2009). The main tectonic development is summarized below.

1) Crustal thinning beneath the Ganges Basin and crustal thickening of the entire Tibetan Plateau.

2) Marked lower crustal thinning and marked thickening of the upper crust due to thick sediment accumulation from the Himalayas to the Ganges Basin with marked lower-crust thickening, strong erosion of the upper crust, and partial erosion of middle crust in the Himalayas.

3) Uplift of the Tibetan Plateau as a whole, accompanied by formation of a composite orogenic belt and thermo-upwelling extension.

4) Topographic inversion between eastern and western China with gradual formation of large-scale river systems with origins from the Tibetan Plateau.

5) Formation of Himalayan metamorphic core complexes and multiple types of extensional tectonic systems in the northern Himalayas with synchronous formation of thrust faults between the Ganges Basin and the Himalayas by potential energy expansion.

6) Exposure of granulite and eclogite from the core of the Himalayas.

7) Active uplift of the Tibetan Plateau with passive compression of the Tarim, Qaidam, and Junggar Basins, Tianshan Mountains, and adjacent areas.

8) Middle and upper crust thermo-upwelling and extension due to convergence of thermal fluid material due to the flowing northward in the lower crust under the Tibetan Plateau, producing nearly E-W-striking extensional tectonics.

9) Wide spread Adakitic granite and volcanic rocks from melting caused by thickening of the lower crust of the Tibetan Plateau.

10) Formation of a nearly N-S-striking graben in the upper crust due to northward flow of thermal fluid material in the lower crust that were blocked around the Tarim and Qaidam Basins to become eastward and westward lateral flows.

11) Blocking lower crustal flow of the Tibetan Plateau by crystallized basement under the Tarim, Hexi Corridor, and Sichuan Basins with reactivation of thrust faults along basin-mountain boundaries.

12) Outflow of excess middle and lower crust material in the Tibetan Plateau through Hengduan Mountain, Pamir, eastern Kunlun-western Qinlin syntaxes, and formation of “deep thermal rivers” with some earthquakes at 75–90 km.

13) Horizontal accommodation between the Tibetan Plateau and peripheral basins by conjugate strike-slip faulting.

14) Development of low velocity - low resistivity layer in the lower crust of the Tibetan Plateau, indicating weaker lower crustal flow in the north than in the south of the Plateau.

15) Development of giant conjugate strike-slip shear zones along the E- and W-sides of the Ganges Basin and the Tibetan Plateau, and the NNW-trending right-lateral strike-slip shear zone (commonly called the north-south tectonic belt which is connected with the 90°E ridge of the Indian Ocean) in the E-side of the Plateau with a right-lateral displacement of 1100-1300km since the Miocene, indicating the northward expansion of the Ganges Basin.

16) Intracontinental tectonics superimposed on Tethyan tectonics with results of the east–west trending to northward arcuation of the Xijinwulan - Jinshajiang ophiolite mélange belt, the Longmucuo - Shuanghu - Jitang - Lancangjiang ophiolite m é lange belt, the Bangonghu - Nujiang ophiolite mélange belt, and the Yarlung Zangbu ophiolite mélange belt.

17) Formation of the huge earthquake triangle area including the Tibetan Plateau confined by MBT, NNW-

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

trending right-lateral strike-slip shear zone and NNE-trending left-lateral strike-slip shear zone, with earthquakes generally progressively weaker from south to north, and most earthquakes occurring in shear zones, also indicating the northward expansion of the Ganges Basin.

18) Coincidence in directions between lower crustal flow and surface movement based on GPS measurements in the Tibetan Plateau.

19) Formation of enormous polymetallic ore deposits in Miocene in southern Tibetan Plateau.

20) Gradual development of glaciers in Tibetan Plateau, and finally forming the "water tower" of Asia.

21) Important accumulations of oil/gas in the Miocene Ganges, Tarim, and Qaidam Basins.

22) Gradual formation of Asia monsoon, and desertification of NW-China.

23) Super drought - volcanism - earthquake - flooding disaster chains associated with late Himalayan movement, Qinghai-Tibetan movement and Kunlun-Yellow River movement, with numerous angular unconformities in related basins.

24) Formation of numerous "thermal rivers" due to uneven lower crustal flow, one of which caused the "2004-2009 thermal disaster chain" in the eastern Tibetan Plateau. Frequent occurrences of multi-year droughts, freezing, earthquakes, ejection-type long-runout landslides, floods, mudslides, etc.

25) Abnormal flow under the Xiaojiang-Xianshuihe River tectonic belt at the present time, thermal disaster chain occurring since 2009 in Yunnan and surrounding areas, with a great probability of strong earthquakes occurring in the Xiaojiang-Xianshuihe river tectonic belt within the next five years.

The power source and the tectonic setting for the lower crustal flow in the Ganges Basin may be due to diapirism of thickened asthenosphere. The increased thermal flow material in the asthenosphere under the Ganges basin laminar flow (not convection) from asthenosphere under the spreading center in the Indian Ocean. Northward laminar flow of the asthenosphere from the ocean ridge is caused by upwelling of the plate-like deep mantle magma. The mantle plate differs from the mantle plume.

Key words: lower crust flow, relevance between basin and orogenic belt, disaster chain, mechanism, the Tibetan plateau

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 with English abstract).

Li Dewei, 1993. The style of continental tectonics and model of continental dynamics. *Progress in Earth Science*, 8(5):88-93 (in Chinese with English abstract).

Li Dewei, 1995. On continent tectonics and continental dynamics. *Earth Science-Journal of China University of Geosciences*, 20(1):19-26 (in Chinese with English abstract).

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 with English abstract).

Li Dewei, 2004. Late Cenozoic intraplate orogeny and dynamic metallogeny in the southern Qinghai-Tibet Plateau. *Earth Science Frontiers*, 11(4):361-370 (in Chinese with English abstract).

Li Dewei, 2008a. Continental lower crustal flow: channel flow and laminar flow. *Earth Science Frontiers,* 15(3):.130-139.

Li Dewei, 2008b. Three-stage tectonic evolution and metallogenic evolution in the Qinghai-Tibet Plateau and its adjacent area. *Earth Science-Journal of China University of Geosciences*, 33(6):723-742 (in Chinese with English abstract).

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

Li Dewei, 2010a. Temporal-Spatial Structure of Intraplate Uplift in the Qinghai-Tibet Plateau. *Acta Geologica Sinica(English Edition)* , 2010, 84(1): 105–134.

Li Dewei, 2010b. Regularity and mechanism of East Kunlun, Wenchuan, and Yushu earthquakes –and on genesis and prediction of continental earthquakes. *Earth Science Frontiers*. 2010, 17(5) :179 - 192(in Chinese with English abstract).

Li Dewei, 2012. Preliminary discusstion On Earth's Natural Hazard System. *Geological Science and Technology Information*，31 (5): 69-75(in Chinese with English abstract).