

TECTONIC DEFORMATION AND STRONG EARTHQUAKE ACTIVITIES ON THE EAST BORDER OF TIBET PLATEAU

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The tectonic deformation image of Asia Continent can be explained successfully by the model of collision between India secondary continent and Euro-Asia Plate (P. Molnar and P. Tapponnier, 1975). This paper mainly discusses the characteristics of tectonic deformation and strong earthquake activities on the east border of Tibet Plateau.

1 Characteristics of tectonic deformation on the east border of Tibet Plateau

Controlled by the flow of the plateau crust material, the movement of the east border of Tibet plateau is mainly horizontal so as to produce two slipping-block: one results from the slide out of Chuandian Rhombus Block along the SSE direction, the other results from the lateral extrusion of Chuangqing Block with the SEE direction. The slip rate of the north part of Chuandian Rhombus Block, the west region of Sichuan, is 5~8 mm/a; 2~3 mm/a on the south part (the center part of Yunan); the slip rate of Chuangqing is 3~5 mm/a and <1 mm/a on Longmenshan region (Tang Rongchang, 1993). The slipping features of the blocks directly decide the movement characters of different fault systems: the uniform sinistral shear movement on the east boundary fault of Chuandian Rhombus Block, from the geological viewpoint, the average horizontal slip rate is about 10 mm/a, and 5~8 mm/a on the Anninghe, Zemuhe and Xiaojiang faults. The dextral shear movement can be found on the west boundary faults composed by Jinshajiang and Honghe faults. Located at the dextral diagonal region between Honghe and Zhongdian faults, the northwestern region of Yunnan shows a tensile stress field with near EW direction and large graben valleys with near NS direction on the ground due to the dextral slip movements of these two faults and slip of Chuandian Rhombus Block along the SSE direction. The normal features of extension tectonic deformation region can be found in this region. Some inner faults (such as Amaniqing, Xiqinglingbeilu) of Chuangqing block show the character of sinistral shear movement with some components of normal slip movement. As the east boundary of Tibet plateau, Minshan and Longmenshan Mountains form the east wall of the plateau. Contrasting to the moving direction of Chuangqing block, the transition from horizontal movement to vertical movement produced the huge nappe reverse deformation in this region, and formed some front-Mount compensating press-sag basins such as Gonggaling, Zhangla and Chengdu. Because of the diversity of slip rate of different boundary faults, some clockwise rotating movement can be found in different sub-blocks.

2 The characters of seismicity

The seismicity of the east boundary of Tibet plateau shows some characters as follow: (1) The seismicity distributes densely along the boundary faults of the blocks, especially for the strong earthquakes with magnitude >6.0, nevertheless, there are seldom strong earthquakes in the blocks, which indicates that the blocks slip almost along the boundary faults to release energy with the form of earthquake. (2) The activities of small earthquake distribute densely not only along the boundary faults, but also in the blocks, the northwestern part of Yunnan and Mabian-Zhaotong regions (three sites). The densely belt of small earthquake in Chuangqing block with arc form might has something to do with the clockwise rotation of Chuangqing block. The small earthquake image with agglomerate form is due to the background of extension deformation in this area. The densely small earthquake belt of Mabian-Zhaotong probably has some causal relationship with the sinistral shear movement of Zemuhe and Xiaojiang faults, which induces the slip of Liangshan faulting block with SE direction. (3) According to statistics, 80% of strong earthquake with magnitude >6.0 in the east boundary area of the plateau almost belong to strike-slip type with horizontal P axis and vertical N axis, which mainly distributed on the arc-shape strike-slip fault systems, the adverse-type earthquake with horizontal P axis and vertical T axis mainly occurred on the Minshan-Longmenshan tectonic zone, the normal-type earthquake with vertical P axis mainly occurred on the northwestern region of Yunan and some pull-apart region of large strike-slip faults. All of these comport with the tectonic deformation characters since Quaternary. (4) The results from the investigations of fault movement and trenches, the recurrence interval of strong earthquake on the east border region of the plateau is from a hundred years to several hundred years, contrasting to a thousand years to several thousand years in Minshan-Longmenshan nappe reverse zone. Because the distance from this zone to Chengdu City is only about 50 km and some new evidences about fault activity and medium-strong earthquakes in the past can be found along this significant zone, as well as some GPS da-

ta which show that there is some recent movements on the zone, the further investigation on movement and seismic recurrence interval of Longmenshan tectonic zone will be significative to assessment on the future earthquake damage and affect in Chengdu plain--one of important economic passage-way in the southwestern region, China.

Key words: tectonic deformation; block slip; seismicity; the east border of Tibet plateau