



Active fold-thrust belts in the foreland of eastern Tibet, the Longquan and Xiongpu anticlines in Sichuan, China

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The 2008 M7.9 Wenchuan earthquake ruptured from the Longmenshan fault system, which is the frontal thrust system in eastern Tibet. Further east toward the foreland area in the Sichuan basin, it sits two anticlinal structures, the Longquan and Xiongpu anticlines, which trends sub-parallel to the Longmenshan range with a distance of about 70-100 km to the mountain front. It is widely considered that these two anticlinal features are attributed to propagation of the eastward extrusion of the eastern Tibetan plateau, similar to the stress system the Wenchuan earthquake. In this study, we carried out field investigations on these two active anticlinal structures in order to characterize the bulk deformation of the anticlines. We also conducted fracture analysis and fault-slip data analysis, in an attempt to characterize the fracture developments of the rock and the paleostress states related to the faulting events associated growth of the anticlines.

We thus constructed a series of geological cross sections along these two anticlines. Our results show that the Longquan anticline is characterized by pop up structure with a dominant west-vergent thrust (i.e. backthrust) on the western limb. On the other hand to the eastern limb, an east-vergent thrust only well developed in the middle part of the anticline and die out toward the north and the south. For the Xiongpu anticline, it is characterized by a pre-dominant west-vergent backthrust system without developing an east-vergent thrust. A strike-slip fault and a series of N-S-trending pop-up thrusts cut across the Xiongpu anticline indicate a rather complex stress system with two dominant compression directions, NW-SE and E-W, subsequently or alternatively affected the area. Finally, the fracture analysis revealed that 2-3 pre-dominant bedding-perpendicular fracture sets are commonly developed in the massive sandstone layers. Most of them seemingly are of the characteristics of the mode I open joint, without clear relationship with the stress system associated with the regional anticlinal growth.