

How far does the growth of the eastern Tibetan Plateau influence South China? Evidence from regional focal mechanisms

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The growth of the eastern Tibetan plateau compresses the western boundary of the Sichuan basin, westmost section of South China. It has been widely accepted that most of South China is influenced by the growth of the Tibetan plateau, based on geodynamical measurements, e.g., GPS and tectonic stresses. The measurements indicate that the maximal horizontal tectonic stress of South China is in a roughly NWW-SEE direction, indicating that the area is controlled by compression in NWW-SEE, identical to the compression direction of the Tibetan plateau to the Sichuan basin. However, the tectonic stress field of South China has not been well verified by data of focal mechanisms because no large earthquakes occurred inside South China. In recent years, there were several moderate earthquakes with magnitudes of >4.5 that occurred in/around Chongqing, eastern Sichuan basin, well recorded by many seismic stations. These earthquakes shine lights on the tectonic stress field in the crust of South China. We determined focal mechanisms of two earthquakes and also collected focal mechanisms of other earthquakes in the region. The focal mechanism results show that the western part of Chongqing where the Huayingshan fault is located, is mainly controlled by compressional stress in roughly E–W direction, which is similar to the stress environment in South China, as expected. However, the central and eastern part of Chongqing where the Qiyaoshan fault is located, is mainly controlled by compressional stress in roughly N–S direction, which is different from the well-accepted background (roughly NWW-SEE) stress environment in South China. All these data indicate that the areas from the central and eastern part of the Chongqing to Hubei–Hunan plain are in a special dynamic state, different from the previously accepted tectonic stress field. In fact, the areas are in a transition zone between two global tectonic domains: Tethyan and circum-Pacific tectonic domains. The distinctive present stresses imply that the region from central and eastern Chongqing to the Hubei–Hunan plain seems not to have been affected by the tectonism of the two global tectonic domains in the present. Therefore, the growth of the eastern Tibetan Plateau influences South China no further than the Qiyaoshan fault, ~350 km east of the Tibetan plateau and the Sichuan Basin boundary.