

Temporal Variation of the Compressive Direction in the Hypocentral Region after the 1999 Chi-Chi Earthquake, Taiwan

Wen-Nan Wu, Shu-Kun Hsu, Chung-Liang Lo, How-Wei Chen, Kou-Fong Ma
Institute of Geophysics, National Central University, Chung-Li, 320, Taiwan

Abstract

The state of tectonic stress variations in the hypocentral region of the 1999 Chi-Chi earthquake ($M_w 7.6$) is investigated by applying the stress inversion to the focal mechanisms reported from the Broadband Array in Taiwan for Seismology data center. First, the entire data sets before and after the Chi-Chi main shock are separately to perform the stress inversion. The result indicates that the direction of the maximum compressive axes, σ_1 , before the main shock is $N122^\circ$ and the after becomes $N302^\circ$, which both are consistent with the relative plate motion direction between Philippine Sea and Eurasian plates. The stress inversion is then carried out by accumulating the focal mechanisms of aftershock sequences as a function of time. In general, the direction of σ_1 changes instantly and returns to its regional background stress state of prior to the Chi-Chi main shock and becomes stable less than two year. The recovery time of stress anomaly comparing to the recurrent interval of the Chelungpu fault is very short. Moreover, the 245 focal mechanisms of aftershocks were divided into 11 equal number of event windows with non-overlapping scheme to implement the stress inversion and concluded that the temporal variation of the direction of σ_1 is significantly oscillatory, rather than smoothly as reported by previous study.