

Stress rotation found in the aftershock area of the 2000 Western Tottori Earthquake and its temporal variation

*Takaki Iwata¹

1. Tokiwa University

A new statistical approach to estimating a spatial stress pattern has been developed [Iwata, 2018, submitted]. This approach uses P -wave first-motions (up or down) as a dataset. In the estimation, it is assumed that the orientation of a fault plane is distributed with a uniform random distribution and that the direction of fault slip is parallel to the direction of maximum shear stress on the fault plane (i.e., parallel to the direction of tangential stress). Under these two assumptions, the spatial stress pattern that fits the dataset of P -wave first-motions is estimated with a smoothness constraint on the spatial variation of stress pattern; the constraint is incorporated in a Bayesian framework.

This method was applied to the dataset that was taken from the aftershocks of the 2000 Western Tottori Earthquake. The dataset was retrieved from the one used in Kawanishi et al. [2009, JGR], which compiled P -wave first-motions recorded from October 15 to November 30 in 2000. The spatial variation in the estimated azimuth of the σ_1 -axis was detailed, and it shows that, around the southern part of the fault, the azimuth along the western side of the fault is larger whereas it is smaller along the eastern side. Because the Tottori earthquake has a left-lateral strike-slip motion, it is expected that the compressive stress changes parallel to the main fault occur along the western side of the fault in the southern edge and that the σ_1 -axis rotates in a clockwise direction or the increase of the azimuth. Similarly, counterclockwise rotation of the σ_1 -axis (or the decrease of the azimuth) is plausible along the eastern side. The revealed spatial variation of the stress rotation across the main fault agrees with this expectation.

Furthermore, the dataset was divided into two datasets from October 15 to November 4 and from November 4 to November 30 to make the two contain almost the same number of P -wave first-motions. Then, the approach was applied to these individually. For both of the datasets, the stress rotation as described above was found, and it is more remarkable for the latter dataset than the former dataset. This temporal change in the stress rotation may be associated with the postseismic slip of the 2000 Tottori Earthquake.

Keywords: stress field , stress rotation, spatial statistics, P -wave first-motion, Bayesian estimation, postseismic slip