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Modeling stress field around the fault of the 1995 Kobe earthquake (M7.2) using focal mechanisms 2

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Recent numerous studies about stress field estimated from focal mechanism of microearthquakes succeeded to estimate stress field in seismogenic zone. They showed heterogeneous feature around the fault. Matsumoto et al. (2012) have developed a method that models stress field composed by regional stress field and inelastic deformation in the medium. Stress variation resulting from inelastic deformation in a medium can be expressed as equivalent body forces in the medium. Thus we applied the method to the focal mechanism data of the earthquake in the aftershock area of the 1995 Kobe earthquake. The tension and compression axes inferred from the focal mechanisms of the microearthquakes generally have the same direction that could coincide with principal direction of tectonic stress in this region. However, the axes of the focal mechanisms at some parts of the earthquake fault change their direction. We performed the method to the data with assumptions that are 1) slip of the microearthquake occurred on the pre-existing small fault in the direction of maximum share stress on the fault, 2) stress field consists of the regional stress and the moment tensors at the spatially distributed grid points along the fault. The maximum direction of the obtained regional principal stress is in ESE-WNW as expected from the general tendency of focal mechanisms. The estimated moment tensors became larger at the edges of the earthquake fault. In addition, that was also relative large at around the initiation point of the earthquake. The results of the moment tensors revealed interesting information about the stress field in the target region. The inelastic deformations at the both edges of the earthquake fault and at the middle of the fault, which might relate to the initiation and termination of the earthquake rapture.

Keywords: Stress field, Kobe earthquake, focal mechanism, inelastic deformation