Spatial variation of stress field in the middle part of Kyushu Island from stress tensor inversion

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In the upper crust of Kyushu district, Japan, an area with high seismic activity is found. This area is called Beppu-Shimabara graben because of existence many normal faults in this region. Many active volcanoes exist (i.e. Unzen, Aso, Kuju, Beppu), and historical large earthquakes occurred in this region. However, it is not always confirmed whether this region behave as a graben formation or not. In addition, there is an active fault system at the south of the graben. The name of this is Futagawa-Hinagu Fault system. The seismicity is highest among parts of Kyushu. The major mechanism of earthquakes around the system is strike slip type. Peoples is concerning with occurrence of large earthquake on the fault. Generally, extensional (minimum) stress is in north-south direction in Kyushu. Only direction of maximum principal stress changes region to region. It is key to understand interaction between this fault system and Beppu-Shimabara graben for probability evaluation of earthquake occurrence of the fault. Recently, Nakao et al. (2007) estimated spatial distribution of strain rate field in Kyushu area from GPS data. The area in which higher strain rate dominates not in extension but share is found in Beppu-Shimabara graben. This can explain high seismic activity in this region. They also revealed notable contraction in east-west appear around Aso volcano. In this study, we investigated stress field in the seismigenic zone of the middle Kyushu. The stress field is important to understand deformation of the crust. Elastic and anelastic feature of crust could be inferred from both of stress and strain field. We performed stress tensor inversion by using polarity data of first motion at direct P wave arrival. Directions of principal stresses are obtained at spatially distributed grid points every 10 km interval. At each grid point, we corrected polarity data of events occurred nearer than 10 km apart from grid point and carried out the stress tensor inversion. Directions of maximum and minimum principal stresses at the grid points are plotted in Fig. 3. The minimum axes are generally oriented in north-south direction. However, the maximum stresses in Beppu-Shimabara graben incline vertical direction while those have direction in east-west. It implies normal faulting would dominantly occur in Beppu-Shimabara graben. This stress field change requires a mechanism either relaxing the stress in east west direction or vertically loading in this region.