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The stress field of the southern part of Hyuga-nada region, deduced from onshore and offshore seismic observations

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In Hyuga-nada region, the Philippine Sea (PHS) plate is subducting beneath the Eurasian (EU) plate (the southwest Japan arc) along the Nankai trough at a rate of about 5 cm per year. In this region, microearthquake activity is very high. Big earthquakes (M7 class) have occurred at intervals of about dozens of years, and so plate coupling varies dozens of kilometers specially. It is important to understand seismic activity, stress field, and structure in such region in order to understand seismic cycle. According to the previous study of Uehira et al. (2007), there is a good correlation between the slip distribution at large earthquakes and the angle between maximum principal axis and the plate boundary in northern part of Hyuga-nada region. We performed extraordinary seismic observations for 75 days from April to July 2006, and for 73 days from April to July 2008. 23 and 26 pop-up type ocean-bottom seismometers were deployed above hypocentral region in Hyuga-nada using Nagasaki-maru in 2006 and 2008, respectively. And three data loggers were deployed on land in order to compensate a regular seismic network. We used these data and permanent stations for this analysis. In order to obtain precise hypocenter distribution, focal mechanisms, and a 3D seismic velocity structure around the Hyuga-nada region, we used Double-Difference (DD) Tomography method developed by Zhang and Thurber (2003). We obtained that earthquakes of various focal mechanisms, such as a normal fault type, a reverse (thrust) fault type, occurred. So, the stress field was estimated using a stress tensor inversion method by polarity of first arrivals from earthquakes [Horiuchi et al. (1995)]. The direction of minimum principal axis of the PHS slab is almost parallel to the direction of subduction. This means that stress field of the PHS slab is down-dip tension. The direction of maximum principal axis is almost perpendicular to the plate boundary, so it is suspected that the shear stress of plate boundary is very small.

Keywords: stress field, ocean bottom seismic observation, Hyuga-nada