

# Detection of asperities on a large fault using stress drops of small earthquakes

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Many large earthquakes including the next Tokai earthquake are presumed to take place in a near future along subduction zones around Japan. However, there are little information on the structures and characteristics of the faults, such as the locations and the sizes of asperities, since many of the previous events took place before the commencement of the modern seismological study. These characteristics are important clues to comprehension of the natures of an asperity itself, the earthquakes and the subduction process. We expect that they provide also information on what place should be observed for the prediction of the events. The information on the asperities also plays an important role to estimate strong ground motions associated with the earthquake.

Recently, Yamashita et al. (2004) have shown a possibility that there is a correlation between distributions of asperities and small earthquakes with high stress drops. In order to investigate the possibility further, we study a spacio-temporal distribution of stress drops of small earthquakes which occurred on the upper surface of the subducting slab in and around the source region of the Tokai earthquake. The stress drops are calculated from the seismic moments and corner frequencies of P waves. Using site responses which are obtained from wave form data of small events, we determine more than 120 events whose magnitude are larger than 3.

The obtained stress drops ranges from 1 to 30 MPa. They show a general trend increasing with the hypocentral depth, which agrees with observations of other subduction zones. Several earthquakes exhibit much higher stress drops than the general range. These high stress drop events cluster within two areas, the western and the central parts of Shizuoka Prefecture. These areas are near short-period seismic radiation areas reported by Kanda et al. (2004). It is very likely that the two areas represent peripheral parts of the asperities or the asperities themselves of the Tokai earthquake fault.

The stress drops of events in the western area increased with time since the beginning of 1990's. This temporal change probably represents a recovery of the stress after a stress release event in the area. Many researchers suggest that a slow slip took place there in 1987- 1991. It is likely that the temporal change in the stress drops represents the stress accumulation after the previous slow slip event. The results suggest that monitoring the stress drops of small earthquakes is an effective method to investigate asperities.