Comparison of the stress change due to slow slip events and the seismicity in the Bungo channel area during 2002-2004

Kei Minegishi[1], *Jun Kawahara[2], Kei Katsumata[3]

1. Graduate School of Science and Engineering, Ibaraki University, 2. Faculty of Science, Ibaraki University, 3. Institute of Seismology and Volcanology, Hokkaido University

Beneath the Bungo channel and the surrounding area, the southwestern Japan, repeated occurrence of two types of slow slip events (SSEs) is observed: long- and short-term SSEs. During 2002-2004, a long-term SSE occurred just beneath the channel. It was accompanied by several short-term SSEs, which occurred during 2003-2004 beneath a wider area including the western Shikoku (Hirose and Obara, 2005; Ozawa et al., 2007). Katsumata (2011) investigated the seismicity around this area and found seismic quiescence at around (33.55^{O}N, 132.85^{O}E) and seismic activation at around (33.30^{O}N, 132.15^{O}E). He inferred that they were induced by the stress change due to the long-term SSE. In the present study, we re-investigated the seismicity around this area and compared the seismic quiescence and activation with the stress change due to the 2002-2004 SSEs.

The analysis of the seismicity closely followed Katsumata (2011). Using an earthquake catalog compiled by the Japan Meteorological Agency, we selected 3216 earthquakes with M >= 2.0 occurring during 1998-2007 in a region with the latitudes between 31˚N and 35˚N, the longitudes between 130˚E to 135˚E, and the depths between 30 and 100 km. We applied ZMAP (Wiemer and Wyss, 1994) to the earthquakes, thereby estimating the spatial distribution of z-values. Although Katsumata (2011) fixed Tw, the length of a time window defining z-values, to 2 years, we varied it between 0.5 and 2 years. When Tw = 2 years, we reconfirmed the seismic quiescence (high z) and seismic activation (low z) during 2002-2004 pointed out by Katsumata (2011). The area of the seismic quiescence partly overlapped the area beneath which the short-term SSEs occurred. For shorter Tw, we observed that the seismicity pattern could change in a short time interval, but positive z-values remained predominant around the Bungo channel area during 2002-2004.

We next estimated the spatial distribution of Coulomb stress change (ΔCFF), using the fault parameters of the SSEs given by Hirose and Obara (2005). We summed up the ΔCFF values obtained for the respective SSEs that occurred within a given period. Concerning the long-term SSE, we inferred the slip occurring within each year from the time evolution of moment magnitude of the SSE estimated by Ozawa et al. (2007). The fault parameters of the receiver earthquakes were chosen on the basis of the typical focal mechanisms of the earthquakes occurring beneath the areas of seismic quiescence and activation. The obtained ΔCFF patterns showed a complex nature. Nevertheless, the areas of seismic quiescence and activation respectively overlap the areas of negative and positive ΔCFF on the whole. This again implies the possibility that the stress change due to the long- and short-term SSEs during 2002-2004 induced the seismic quiescence and activation.

Acknowledgments.
We used the earthquake catalog compiled by the Japan Meteorological Agency. ZMAP (Wiemer and Wyss, 1994) and MICAP-G (Naito and Yoshikawa, 1999) were used for data analyses.

References.
Katsumata (2011), JpGU, SCG058-20.

Hirose and Obara (2005), Earth Planets Space, 57, 961-972.
Naito and Yoshikawa (1999), Zisin 2, 52, 101-103.
Ozawa et al. (2007), J. Geophys. Res., 112, B05409, doi:10.1029/2006JB004643.
Wiemer and Wyss (1994), Bull. Seism. Soc. Am., 84, 900-916.

Keywords: seismicity, slow slip event, Coulomb stress change, Bungo channel

