豊後水道、日向灘領域における長期的スロースリップ、低周波地震に関連したb値の時空間分布

Spatial and temporal distributions of *b*-values related to long-term slow-slip and low-frequency earthquakes in the Bungo Channel and Hyuga-nada regions, Japan

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Long-term slow-slip events (SSEs) and low-frequency earthquakes (LFEs) repeatedly occur in the area encompassing the Bungo Channel and Hyuga-nada region in Japan (e.g., Shelly et al., 2006; Ide et al., 2007; Ozawa et al., 2013; Ozawa, 2017). SSEs are slow earthquake events with a duration of months to years, characterized by a type of slip that is considered transitional between the fast rupture of regular earthquakes and stable sliding along a plate interface, and have characteristics sensitive to stress states near the plate interface (e.g., Obara and Kato, 2016). In addition, since LFEs are also thought to occur at the plate interface, it would be useful to infer the stress state in this region. This study focuses on the stress-dependent characteristics of the *b*-value of regular earthquakes, SSEs, and LFEs, as well as the spatio-temporal relationships between *b*-values and these events in this area, using the Japan Unified high-resolution relocated Catalog for Earthquakes (JUICE) (Yano et al., 2017). The *b*-value, which represents the relative proportion of large to small earthquakes (Gutenberg and Richter, 1944), is inversely related to differential stress or effective stress (e.g., Scholz, 1968, 2015; Wyss, 1973; Urbancic, 1992). As a result, the *b*-values are moderate to low (b = 0.6–1.1) in regions with a high incidence of long-term SSEs. This spatial anomaly in *b*-values is attributed to a partial release of the accumulated stress in regions with relatively high differential stress that are characterized by SSEs. In addition, the *b*-values in the Bungo Channel region are relatively higher than those in the Hyuga-nada region. It was also found that the difference of the *b*-values in the vertical direction within the plate for the Bungo Channel region is larger than that for the Hyuga-nada region. These findings support a generation model of LFEs by Nakajima and Hasegawa (2016), in which undrained conditions in the overlying plate are a key factor for generating LFEs. On the other hand, the *b*-values increase and decrease before and during periods of enhanced LFE activity in the Bungo Channel, respectively. The increase and following decrease in *b* -values are thought to reflect episodes of low and high shear strength along the plate interface, which were caused by the presence of abundant fluids supplied from the subducting slab under undrained conditions above the plate interface and the decreased pore pressure related to fluid consumptions by the generation of the LFEs, respectively.

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