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The relationship between S-wave reflectors and deep low-frequency earthquakes in the northern Kinki district, south western Japan

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[U+3000]Microearthquake activities continuously occur in the northern Kinki district, southwestern Japan, in particular north of the Arima-Takatsuki Tectonic Line (Iio, 1996). Waveforms of microearthquakes that occur in this district show distinct reflected S waves (Katao, 2002). Katao et al. (2007) conducted a reflection analysis and estimated the distribution of S wave reflection points using data observed at 10 permanent stations. They found a planar distribution of the S wave reflection points at a depth of 20 – 30 km. But, the detailed shape of S wave reflector is unknown. Aoki et al. (2016) conducted a high-resolution analysis by using data from 128 seismic stations with an average spacing of about 5 km, and they found that S wave reflector is dipping to the north and that isolated intraplate low-frequency earthquakes (LFEs) occurred near the edge of the S wave reflector. They think that this reflector is the fluid path and isolated intraplate LFEs are related to fluids. The relationship between LFEs and fluids have been studied by various papers (Kamatani et al., 2004, Ohmi et al., 2002 etc.)
[U+3000]Aoki et al. (2016) assumed homogeneous horizontal structure, although the estimated S wave reflector is dipping. If the reflector is actually dipping, reflecting points of seismic waves and the location of S wave reflector differ from those that were estimated supposing the homogeneous horizontal structure. In this study, we have estimated the accurate location of S wave reflector considering inclined structure, in order to investigate the relationship between the dipping S wave reflector and LFEs. We found another S wave reflector (reflector W) in the east of the S wave reflector estimated by Aoki et al. (2016) (reflector E). This reflector is also dipping to the north with the same angle with the reflector W and isolated intraplate LFEs occurred near the edge of the S wave reflector. These S wave reflectors are located beneath different fault zones and are jointed in the shallower part. Epicenters of isolated LFEs are located immediately above the edge of the reflector E, and high 3He/4He ration are detected around the epicenter (Umeda et al., 2007). According to previous studies, the crustal fluid by dehydration from Philippine Sea Plate exists near these epicenters and we infer from these results that this crustal fluid arouses isolated LFEs and forms the S wave reflector. The reflector W is also formed by crustal fluid because this reflector joins the reflector E.