Geophysical Research Abstracts
Vol. 20, EGU2018-2263-1, 2018
EGU General Assembly 2018

Seismic evidence of slab dehydration beneath western Shikoku, southwest Japan

Katsuhiko Shiomi (1), Tetsuya Takeda (2,3), and Tomotake Ueno (2)

(1) National Research Institute for Earth Science and Disaster Resilience, Tsukuba, Japan (shiomi@bosai.go.jp), (2) National Research Institute for Earth Science and Disaster Resilience, Tsukuba, Japan, (3) Ministry of Education, Culture, Sports, Science and Technology, Tokyo, Japan

Based on receiver function (RF) analyses, we investigated the spatial relationship between low-frequency earthquake (LFE) activity and subsurface structure beneath western Shikoku, southwest Japan, and concluded that these features were strongly affected by slab dehydration.

The Philippine Sea plate subducts beneath southwest Japan and this subduction causes recurrent megathrust earthquakes every 100 to 150 years. Along the down-dip side of the megathrust source region, the LFE is very active. To investigate the subsurface structure beneath western Shikoku, a linear seismograph array composed by 30 short-period sensors was installed for one year as a part of the research project for compound disaster mitigation on the great earthquakes and tsunamis around the Nankai Trough region organized by MEXT Japan. The survey line was orthogonal to iso-depths of the slab, and it was passed through above one of the dominant LFE clusters. Permanent stations near the survey line were also used in this study. By applying the harmonic decomposition analyses to the RFs, the dip direction of the oceanic Moho (OM) beneath each station were estimated. Because the P-to-S converted phase (Ps) amplitude from the up-dip of a dipping interface is relatively small, teleseismograms from the up-dip of subducting slab were excluded from the RF profile construction. According to this profile, the OM, inclined to the north with dip of 7-degree, was clearly imaged as the positive Ps amplitude alignment. In the northern part of the survey line, the flat continental Moho (CM) was detected at 30 km depth. At the area where the OM reached 40 km depth, the CM became shallower to the south and gradually unclear. The precisely detected LFEs were distributed to the deeper extension of the upper boundary of the PHS slab, which was detected as the negative Ps amplitude alignment. The harmonic analyses of RFs also indicated that the anisotropic feature just above the OM suddenly changed at the southern limit of LFE zone; the slow axes in the LFE zone were parallel to the plunge azimuth of the slab though those in the southern area were orthogonal. Checking the pressure and temperature condition along the OM, the phase transition with dehydration may occur in the oceanic crust (OC) near the southern edge of LFE zone. This implies that the change of anisotropic feature is caused by this phase transition process. The water dehydrated from the OC may cause the LFE activity. Unclear CM just above the LFE zone can be explained by the serpentinized wedge mantle with low seismic velocity.

Acknowledgement: This study was partially supported by JSPS KAKENHI Grant Number JP16H06475.