Evidence for a fluid-rich layer beneath the Nankai Trough megathrust fault off the Kii Peninsula inferred from receiver function inversion

Evidence for a fluid-rich layer beneath the Nankai Trough megathrust fault off the Kii Peninsula inferred from receiver function inversion

*悪原 岳[1]、望月 公廣[1]
*Takeshi Akuhara[1], Kimihiro Mochizuki[1]

1.東京大学大学地震研究所
1.Earthquake Research Institute, the University of Tokyo

Exploring fluid distribution on megathrust faults is an important issue, since the fluid affects frictional property and thus slip behaviors on the faults. Scattered teleseismic phases, or receiver functions (RFs), have made significant contributions to understand the fluid content of the subducting plates. Most recently, we developed a technique to compute RFs using data from ocean-bottom seismometers (OBSs) with the removal of the water reverberations and produced RF image beneath the offshore region around the Kii Peninsula [Akuhara and Mochizuki, 2015, JGR]. The image roughly suggests that a low-velocity zone (LVZ) exists along the plate interface beneath the offshore region, at seismogenic zone depth.
In this study, we conducted RF inversion analysis to assess the property of the LVZ quantitatively. We employed relatively high-frequency range (<4 Hz) for the analysis to separate P-to-S conversion phases (our targets) from sediment-related reverberations. The inversion analysis aimed to determine 1-D velocity structures beneath each OBS deployed around the Kii Peninsula which can well explain observed RFs. This optimization was realized by neighborhood algorithm [Sambridge, 1999]. The results elucidate the presence of thin low-velocity zone (LVZ) beneath, or along, the plate interface. Its average thickness among the sites is 2 km, and the P- and S-wave velocities are 3 and 2 km/s, respectively. We consider that this LVZ reflects incoming sediment layer, the upper part of the oceanic crust, or the combination of the both. In any case, fluid-rich property is strongly expected from the extremely low velocities. So far, we conducted the inversion analysis at only 5 sites out of whole 32 sites within our OBS network. We still see, however, the systematic spatial change in the LVZ properties: both thickness and velocities of the LVZ tend to decrease toward the rupture area boundary between the 1944 Tonankai and 1946 Nankai earthquake. Further investigation into the other sites may offer more insight into how fluid controls slip behavior of megathrust earthquakes.

キーワード：沈み込み帯、レシーバ関数
Keywords: subduction zone, receiver function

©2016. Japan Geoscience Union. All Right Reserved.