

Path dependence of seismic wave scattering in the Hyuga-nada region

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Seismic wave scattering at high frequencies (>1Hz) is crucial to quantify random inhomogeneities in the lithosphere. Recent studies on seismic wave scattering estimated 3D distribution of random inhomogeneities in the crust and uppermost mantle, and revealed that strongly inhomogeneous medium exists at high seismicity region of microearthquakes (Takahashi et al., 2009) and at damaged zone of the huge earthquakes (Asano & Hasegawa, 2004). These results imply that random inhomogeneity is one of the essential structural properties related to the seismic activity and rupture process of large earthquakes. From Dec. 2008 to Jan. 2009, Japan Agency for Marine-Earth Science and Technology (JAMSTEC) deployed ocean bottom seismographs (OBSs) at Hyuga-nada region as a part of "Research concerning Interaction Between the Tokai, Tonankai and Nankai Earthquakes" funded by Ministry of Education, Culture, Sports, Science and Technology, Japan. This study examines path dependences of direct S-wave envelopes for intermediate depth earthquakes by using waveform data recorded by OBSs. Root mean squared envelopes used in this study are composed of two horizontal components of velocity seismograms at 4-8Hz, 8-16Hz and 16-32Hz. Preliminary analysis discovered abrupt changes of envelopes that suggest spatial variation of random inhomogeneities in the Hyuga-nada region. At OBSs deployed on thick low-velocity layer (Nakanishi et al. 2009, AGU), seismic waves show strongly broadened envelopes, and peak delay times of S-wave from its onset usually exceed 5 sec at all frequency bands. These envelopes imply that localized strong inhomogeneities exist in and around the low-velocity region. For the earthquakes beneath Suo-Nada, envelopes show clear lateral variation along the Nankai-trough. At northeastern side of off Cape Ashizuri, S-wave envelopes show clear onset and small peak delay times. On the other hand, collapsed wave trains are observed at the southwestern side. Since OBSs at the southwestern side usually observed clear S-wave onset with small duration time for other earthquakes, this path dependence means the existence of strongly inhomogeneous regions at uppermost mantle or lower part of crust beneath the Hyuga-nada region.