Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

SCG085-01 会場: 201B 時間: 5月23日15:30-15:43

広帯域地震計による熊野沖超低周波イベント近傍観測

Nearby observation of very-low-frequency events off Kumano by broadband ocean bottom seismographs

伊藤 亜妃[1*], 杉岡裕子[1], 尾鼻浩一郎[1], 末次大輔[1], 小平秀一[1], 荒木英一郎[1], 石原靖[1], 木下正高[1], 金田義行[1], 深尾良夫[1]

Aki Ito[1*], Hiroko Sugioka[1], Koichiro Obana[1], Daisuke Suetsugu[1], Shuichi Kodaira[1], Eiichiro Araki[1], Yasushi Ishihara[1], Masataka Kinoshita[1], Yoshiyuki Kaneda[1], Yoshio Fukao[1]

[1]海洋研究開発機構

[1]JAMSTEC

Very-low-frequency (VLF) events have been observed near the trench axis along the Nankai trough. Previous studies based on F-net and Hi-net tiltmeter data have reported that seismic waves from VLF events are dominated by Rayleigh wave signal in a period range from 10 to 20 s and poorly contain frequency components higher than 2 Hz [Obara and Ito, 2005; Ito et al, 2007]. The mechanism so far suggested is reverse faulting in the shallow accretionary prism near the trough axis [Ito and Obara, 2006].

In order to study the detailed characteristics of the VLF events, we deployed three broadband ocean bottom seismographs (BBOBS) on the seafloor at depths of 2000-4000 m with an average spacing of 20 km in the Kumano basin from August 2008 to September 2009. Each BBOBS was equipped with the Guralp CMG-3T broadband sensor that could record ground motions at periods from 0.02 to 360 s.

The BBOBSs recorded numerous nearby VLF events, including a swarm from March 24 to 28, 20 09. A VLF signal has duration of a few minutes. Amplitudes of horizontal components are larger than those of the vertical components by a factor of five or more. Compared to local earthquakes, VLF signals lack energy at frequencies above 10 Hz and most of VLF signals do not show clear P and S arrivals. Although the VLF signals are dominant in a frequency range around 0.1 Hz as reported by previous studies, they are also rich in higher frequency components between 2 and 8 Hz, where the amplitudes are at least twice as large as those at frequencies around 0.1 Hz in two of the three BBOBSs. Apparent velocities of 2-8 Hz signals are about 1.6 km/s and those of the 0.1 Hz signals are much lower than it.

We picked onset times of about 90 VLF signals on the records of March 24 through 28 from three BBOBSs and from the end station (TT1OBS) of the seafloor cable array at the Kumano basin operated by Japan Meteorological Agency. Those events were also recognized as VLF events by National Research Institute for Earth Science and Disaster Prevention using the on-land seismic networks. A band-pass filter from 2 to 8 Hz was applied to the waveforms for the picking.

Assuming that the picked time is the onset of S-wave, we determined source locations of VLF events by a grid-search method using the 3-D velocity structure obtained by a previous seismic refraction survey [Nakanishi et al., 2002]. The VLF events are located in two clusters beneath the landward slope of the Nankai trough. One cluster is near the oceanward tip of the accretionary prism and the other located at a distance of about 30-40 km landward from the trough axis.

References

Ito, Y., and K. Obara (2006), Dynamic deformation of the accretionary prism excites very low frequency earthquakes, Geophys. Res. Lett., 33, L02311, doi:10.1029/2005GLGL025270.

Ito, Y., K. Obara, K. Shiomi, S. Sekine, and H. Hirose (2007), Slow earthquakes coincident with episodic tremors and slow slip events, Science, 315, 503-506, doi:10.1126/science.1134454.

Nakanishi, A., N. Takahashi, J. O. Park, S. Miura, S. Kodaira, Y., Kaneda, N. Hirata, T. Iwasaki, and M. Nakamura (2002), Crustal structure across the coseismic rupture zone of the 1994 Tonankai earthquakes, the central Nankai trough seismogenic zone, J. Geophys. Res., 107(B1), 20 07, doi:10.129/2001JB000424.

Obara, K., and Y. Ito (2005), Very low frequency earthquakes excited by the 2004 off the Kii peninsula earthquakes: A dynamic deformation process in the large accretionary prism, Earth Planets Space, 57, 321-326.