Noise reduction and surface wave array dispersion measurements applied to NOMan's broadband OBS data

*Yuki Kawano[1], Takehi Isse[1], Hitoshi Kawakatsu[1], Akiko Takeo[1], Hajime Shiobara[1]

1. Earthquake Research Institute, The University of Tokyo

To achieve better performance of broadband ocean bottom seismometer (BBOBS) survey, we applied noise reduction analysis and dispersion measurements to the vertical component seismograms of the Normal Oceanic Mantle (NOMan) project arrays, which are previously analyzed by Takeo et al. (2018). Our noise reduction targets on the tilt noise that is significant for low-frequency (<0.1 Hz) BBOBS vertical records. Tilt noise is generated by the seafloor current which flows pass the BBOBS. It originally only dominates horizontal records, but the misalignment between the seismic sensor's vertical axis and gravitational direction allows projection of noisy horizontal tilt noise onto vertical records. Hence, vertical tilt noise can be estimated from the transfer function between horizontal and vertical records (Crawford and Webb, 2000). We developed a noise reduction method which is suitable for Japanese BBOBS based on the approach of Crawford and Webb (2000) and Bell et al. (2015). By performing noise reduction analysis, we achieved about 20 dB noise reduction at the frequency lower than 50 mHz and extracted lots of buried seismic signals. To verify the effect of noise reduction analysis, we compared array dispersion measurement results which derived from tilt noise removed and non-removed data. Using the method of Takeo et al. (2018), we measured average phase velocity and azimuthal anisotropy of fundamental mode Rayleigh waves to estimate isotropic and azimuthally anisotropic Vsv (βv) profiles. The results show that tilt noise removed data can provide us with more precise low-frequency measurements and the better-constrained structure at a depth of 80 km or deeper. Our results indicate that noise reduction preprocessing is important for improving Japanese BBOBS analysis.

Keywords: broadband ocean bottom seismometer, tilt noise, low frequency, surface wave array measurement

