

Precise positioning on the seafloor

Akira Asada[1], Tetsuichiro Yabuki[2]

[1] IIS, [2] Japan Hydro. Depart.

To detect seafloor crustal deformation, the position of sea-bottom transponders on the Kumano Trough is repeatedly observed using a GPS/Acoustic measurement system. Current results show a scatter of 4 cm standard deviation for repeated horizontal positioning from drifting survey vessel. To realize precise acoustic ranging, we developed new techniques, automatically detecting and correcting the Doppler shift of acoustic signals due to ship's drifting and attitude motion, and theoretically forming a one-wavelength-pulse in cross correlation between transmission and reception coded signals. Furthermore, by using GPS surface positioning, acoustic ranging and sound speed profiling data, the temporal changes of sound speed profile were estimated with sufficient accuracy for acoustic positioning.

We report the activity in the development of the observation system of seafloor crustal deformation for understanding mechanism of interplate earthquakes at subduction plate boundaries around Japan. Currently, the method for the seafloor geodesy is under development in order to overcome several difficulties. The position of the sea-bottom transponders at the vicinity of the Nankai Trough and the Japan Trench is observed using a GPS/Acoustic measurement system. Current results from processed data show a scatter of 4 cm standard deviation for repeated horizontal positioning from drifting survey vessel. We developed new techniques to realize precise acoustic ranging, automatically detecting and correcting the Doppler shift of acoustic propagation signal due to ship's drifting and attitude motion, and theoretically forming a pulse of one wavelength in cross correlation between transmission and reception of long-coded signals. Furthermore, by using GPS surface positioning, acoustic ranging and sound speed profiling data, the temporal changes of sound speed profile were estimated with sufficient accuracy for acoustic positioning.