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Bottom Pressure Observation South off Omaezaki, Central Honshu

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Abstract

In August 1978, four seismographs were laid on the sea bed far south off Omaezaki, central Honshu. They are linked in series to the shore monitoring station by a submarine coaxial cable 160 km long, over which the signals are transmitted on real-time. At the far end of the cable approximately 2,200 meters deep and 110 km south-southwest of Omaezaki was also laid a bottom pressure sensor to observe tsunamis.

The transducer of the bottom pressure in a quartz resonator, of which the resonant frequency changes by 2 Hz with a pressure change of 1 mH_2O (10 kPa), Although two kinds of instrumental noises (thermally induced noise and drift) are observed, they are very small compared with those of other types of pressure sensors. The resolution is also sufficiently good.

The energy density of the bottom pressure disturbances caused by meteorological and oceanographic phenomena is less than that for the coastal sea level by a factor of about 10. This shows that the bottom pressure data are effective in pelagic tide analysis. The power spectrum of the tidal residuals of the bottom pressure is proportional to $f^{-5/3}$ (f : frequency).

The occurrence of short-period bottom temperature change could be detected by the use of the characteristics of thermally induced instrumental noise. Temporal bottom temperature observation was performed, and consistent relation was found between noise occurrence and temperature change. The bottom variations of this temperature and pressure are compared with the oceanographic conditions, especially with the route of the Kuroshio, and some qualitative correlation is observed among them.

The bottom pressure corresponds to the crustal level change on the assumption that both the mean sea level and the density profile are stationary. In the case of the pressure sensor used here, the drift of the instrument prevents from observing secular crustal level change, but great

short-period (several hours to several days) level change just prior to a great earthquake could be detected, because the threshold is maintained at 10 cmH_2O, which is comparable to the differential sea level observation of the same purpose between Tago and Omaezaki tide stations.

The authors have been interested in the bottom pressure data, and analyzed them form the above-mentioned various standpoints. This technical report present the resumé of the analyses, as well as the bottom pressure data. For Chapter 1 the reader is mainly referred to

Den, N., T. Iinuma, H. Matumoto, and M. Takahashi, 1980: Permanent ocean-bottom seismograph observation system. Tech. Rep. Meteorol. Res. Inst., No. 4, 233pp.

Takahashi, M., 1981: Telemetry bottom pressure observation system at a depth of 2,200 meter. J. Phys. Earth, 29, 77-88.

For Chapter 2, see mainly

Isozaki, I., N. Den, T. Iinuma, H. Matumoto, M. Takahashi, and T. Tsukakoshi, 1980: Deep sea pressure observation and its application to pelagic tide analysis. Pap. Meteorol. Geophys., 31, 87-96,

but newly obtained results by M. Okada are also included in this report.

For Chapter 3, see further

Takahashi, M., I. Isozaki, and H. Ishizaki, 1983: Thermal response of the bottom pressure sensor off the coast of the Tokai District, central Honshu, and its application to oceanographic analysis. Pap. Meteorol. Geophys., 33, 245-255.

Ishizaki, H., O. Asaoka, S. Konaga, and M. Takahashi, 1983: A direct measurement of near bottom current on the continental slope off Omaezaki, central Japan. Pap. Meteorol. Geophys., 33, 257-268.

For Chapter 4, see

Takahashi, M., 1981: Real-time observation of precursory crustal level change by use of bottom pressure. J. Phys. Farth, 29, 421-433,

but new data are added.

Appendices 7 and 8 are related to Chapter 1; 1-6, 10 and 11 are related to Chapter 2; 12 and 13 are related to Chapter 3; and 2-4 and 7-9 are related to Chapter 4.