

Influence of sea level variations in seismic normal mode band on superconducting gravimeter observation at Syowa Station

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Abstract

The Earth's background free oscillations were detected from an analysis of SG records at Syowa Station, Antarctica for the first time (Nawa et al., 1998), and then the phenomenon was confirmed by analyses of global broadband seismometer network records. However, as pointed out by Suda et al.(1998), there exist some differences in spectrum features between Syowa Station and other sites. On the Syowa Station spectrum, their intensity is seasonally varying larger than shown by Nishida et al.(2000), they have high intensity at frequencies between 3 and 4 mHz, and in particular, they are visible even at frequencies down to 0.3 mHz and there are peaks that do not correspond to seismic normal modes. In order to investigate the possible atmospheric effect on the observed seasonal variation, we have made the correction for its effect with the similar method by Zurn and Widmer (1995). Although we confirmed some reduction of the noise level by this correction, peaks not corresponding to seismic normal modes were still observed. Therefore, it was thought that the oceanic effect is a possible candidate making these anomalous features in Syowa spectrum because of close to coastal line (Nawa et al., 1998b, 2000), but we could not discuss the possible excitation source on the observational evidence due to a lack of available data to used.

In 1998, Aoki et al.(2000) conducted differential GPS observations on the fast ice at the Syowa Station and detected the vertical displacement which were oceanic tidal variation and high frequency (3-6 minutes) variations in time domain. After his observation made, sea level variation records have been acquired at a sampling rate of 30 seconds with pressure gauge installed by Japan Coast Guard in January 1999. We analyze these data for investigating sea level variation spectrum in seismic normal mode band. As an analysis result, we have obtained very similar feature of temporal variations in spectrum as that observed from the SG data. This strongly suggests that a cause of anomalous features of Syowa SG spectrum is due to the influence of seiches in Lutzow-Holm Bay around the station.

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