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An analysis of sea level and gravity variations after the 2004 Sumatra Earthquake at Syowa Station, Antarctica

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The Indian Ocean Tsunami reached at Syowa Station, Antarctica after about 12 hours of the 2004 Sumatra Earthquake. In this study, we analyze ocean bottom pressure gauge (BPG) records at Syowa Station maintained by Japan Coast Guard, which sampling intervals of 5 minutes and 30 seconds. In mHz band spectrum, we detected many peaks, which maximum power is around 0.3 mHz. Frequencies of these peaks coincide with that of signals detected simultaneously from sea level variation records by GPS and gravity records by a superconducting gravimeter (SG) on calm days (Nawa et al., 2003). Therefore, we try to reduce the sea level variation effects from SG records, the Earth's free oscillations of the 2004 Sumatra Earthquake, by applying a transfer function method using the BPG records as the input. As a result, we successfully reduced the sea level variation effects from low-frequency free oscillations spectra, especially at frequencies around 0.3 mHz near ${}_0S_2$ mode. And we show ultralow frequency sea level variation at frequencies lower than about 5 micro-Hz. A possible cause of this variation is global seiches excited by the earthquake but further study concerning it is needed.

Keywords: sea level, gravity, seiche, SG, tide gauge, free oscillations

References

[1] K. Nawa et al., Geophys. Res. Lett. 30 (7), 1402 (2003).