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GRAVITY TIDES OBSERVED AT SYOWA AND ASUKA STATIONS, ANTARCTICA (ABSTRACT)

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Tidal gravity observations were made at Syowa and Asuka Stations, Antarctica, by the 28th Japanese Antarctic Research Expedition (JARE-28). LaCoste & Romberg type G gravity meters were used with electrostatic feedback amplifiers. The tidal output voltage records were sampled at intervals of 30 min for both stations. The data with stable drift were selected and calibrated to tidal gravity variation. The number of selected data is 2976 from April 1 to June 1, 1987 for Syowa Station and is 8736 from June 2 to November 30, 1987 for Asuka Station.

The admittance parameters of gravity change for atmospheric pressure and temperature variations are obtained as -0.311 μgal/mbar (1 μgal/mbar$=10^{-10}$m^2/kg) and 0.003 μgal/°C (1 μgal/°C$=10^{-8}$ m/s^2 °C) for Syowa Station, and -0.264 μgal/mbar and 0.029 μgal/°C for Asuka Station, respectively. When we consider appropriate elastic constants of ice, the above admittance parameter of atmospheric pressure change can be explained by both the upward attraction and loading deformation of the ice sheet by air mass for an extent of 30 km covering the site.

δ-factors which are corrected for oceanic tidal loading effects range from 1.130 (K_1) to 1.250 (M_2) for Syowa Station, and from 1.134 (P_1) to 1.330 (K_2) for Asuka Station, respectively. For diurnal tides, there is no significant difference between the obtained δ-factors at both stations. They are consistent with the theoretical values calculated by WAHR for the 1066A earth model. For semi-diurnal tides, however, the δ-factors at both stations are 1–17% larger than the WAHR's theoretical prediction values. The δ-factors for semi-diurnal tides at Asuka Station on the ice sheet (about 1000 m thick) are as a whole larger than those at Syowa Station on the bare rock of East Ongul Island in Lützow-Holm Bay. We presume that the tidal deformation of the ice sheet may be systematically larger than the ice-free area when we interpret the obtained result, but detailed examination of the earth models including surface ice layers has to be made for accurate interpretation of the tidal gravity observation in the Antarctic region.

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