

Ocean tidal analysis with decade-scale tide gauge data in East Antarctica

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Recently ocean tides around Antarctica attract lots of attention due to some subjects, accurate satellite remote sensing missions (GRACE and ICESat) and the discovery of tidal controlled stick-slip discharge of ice stream and ice shelf flow.

Ocean tide models become to be high accuracy due to the assimilation of TOPEX/Poseidon altimeter data. The model estimates around Antarctica, however, are less accurate than these for the global ocean since the altimeters have no coverage poleward of 66S. The observations of ocean tide around Antarctica take on increasing importance.

The sparse network of tide gauges and bottom pressure recorders extends around Antarctica. Several of the stations have acquired decade-scale long time series of tidal data. These long data are useful to enhance determination accuracy of tidal constituents. The interannual tidal variation may be related to global environmental changes.

In this study, we conducted harmonic analysis of tidal data acquired at four stations (Syowa, Mawson, Davis, Casey) in East Antarctica for about 15 years, and obtained year-to-year tidal factors for the diurnal and semi-diurnal waves. We compare several ocean tide models to the observed tide with variance in mind. In our exploratory analysis, periodic fluctuations for 6-8 years was found in some tidal constituents. The interannual variation of the constituents is discussed also.

Keywords: ocean tide, Antarctica, tide gauge, interannual variation