

On a correction method for nontidal ocean mass loading (2)

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The effect of nontidal ocean mass loading is investigated as a possible cause for the seasonal variability observed in the vertical components of GPS-derived site coordinates of tropical Pacific.

When estimating the loading effect due to nontidal ocean mass loading, a proper estimation of steric heights is critical. At the last meeting, we reported the result where we used the steric heights from the WOA94 model. However, we found the estimated loading effect does not explain observed variation properly. This incompatibility may be resulted because the steric heights from the WOA94, which is a composite model of many observations spanning very long years, do not represent temporal steric heights properly.

In this study, we first used the steric heights estimated from the direct temperature observations at the TAO-TRITON buoy and estimated the loading effect. The steric heights are derived by integrating the specific volume changes due to temperature and salinity changes. Salinity changes are inferred from the temperature values assuming a historic temperature/salinity relationship since no salinity observations are made at the buoys.

We assumed the linear relationship between GPS-derived vertical movements and the nontidal ocean mass changes at the nearest buoys and calculated the coherences and admittances between them. We used four sites, KRTM, KWJ1, TARW and TRUK for comparison. We observed high coherence for some periods at KRTM station which is located in the eastern part. However, at other stations located in the western part, we observed low coherences. This tendency may be related to the difference of the amount of precipitation. At TARW and TRUK, high coherences are observed in the limited time of year. A cause for these phenomena is unknown.

Next, we estimated the loading effect using the nontidal ocean mass changes from the global ocean circulation model. We used the output from the ECCO2 model (Fukumori, 2002), in which ocean circulation is driven by NCEP winds and TOPEX/POSEIDON sea level changes are assimilated. We found high coherences are observed at KWJ1, TRAW and TRUK stations, while low coherence is observed at KRTM. At KWJ1, TARW and TRUK, however, the amplitudes of the estimated loading effect are about 1/3 of observed vertical movements. In the presentation, we will show the estimated loading effects at other GPS sites, and compare them to the GPS-derived vertical movements.