

Estimating tidal constituents in off-coastline coastal waters of Tokyo Bay from repeated shipborne GNSS observations

*XINYI WEI¹, Kaoru Ichikawa¹

1. kyushu university

Tides have been studied for a long time using coastal tide gauges, and satellite altimeters later enabled tide observations over the open ocean. However, sea-surface height (SSH) variability in off-coastline coastal waters remains poorly observed because the spatial coverage of tide gauges is limited and conventional altimetry degrades near the coastline. The objective of this study is to explore the feasibility of estimating tidal height variability and dominant tidal constituents in the off-coastline coastal waters of Tokyo Bay using repeated shipborne GNSS-derived SSH observations.

This study uses along-route shipborne GNSS-SSH from a regular ferry that repeatedly transits between offshore and the Tokyo Bay coastal zone. After checking location consistency across repeated transits, it constructs a quasi-stationary SSH time series for selected off-coastline coastal segments and apply harmonic tidal analysis to estimate the amplitudes and phases of major tidal constituents directly from the observations. The analysis will be extended to longer time series to improve constituent separation and to evaluate the estimated constituents against independent tidal references, aiming to better characterize tides in the off-coastline coastal zone of Tokyo Bay.

Keywords: off-coast coastline tides, shipborne GNSS, repeat ferry observation, Tokyo Bay