

SGD001-P14

Room: Convention Hall

Time: May 27 17:15-18:45

On vertical deformations and long-term changes of mean sea level from GPS/tidal record - Preliminary report

Yuki Kuroishi^{1*}, Hiroshi Munekane¹

¹GSI of Japan

Geospatial Information Authority of Japan (GSI) has established and been operating 25 tide gauge stations nationwide, measuring the sea level in every 30 seconds. Long-term records of tidal observation will be useful in deducing the vertical deformations of the ground and/or to monitor changes of the mean sea level along the coasts. Tide gauges measure the sea level with reference to the ground and sea level changes observed shall be contaminated by the vertical deformations at the tide gauges if any. In addition, the tide gauge stations are not located in open sea and the sea levels respond to the tidal forces and to the ambient atmospheric pressure differently on a station by station basis. Accordingly, we must well understand such responses and estimate/remove the vertical deformations of the ground precisely if we want to detect the sea level changes from tidal records in an absolute sense.

GSI has also installed GPS antenna on top of the tide gauge station's huts and has been operating GPS continuous observation at all stations since 2004 to measure absolute vertical deformations of the ground. It is a challenging task, however, to derive accurate vertical deformations from GPS observations; the reference frame should be realized consistently and accurately; various errors in the GPS-derived vertical deformations such as troposphere-induced errors, and loading deformations induced by the mass redistributions of the atmosphere and the oceans should be mitigated. Special care, therefore, should be taken in the GPS analysis for the purpose.

We initiated study on understanding the vertical crustal movements and secular changes of mean sea level changes at the tide gauge stations from GPS and tidal observation. In the paper, we present preliminary results on mid-term trends of sea level at the tide gauge stations by tidal analysis software, BAYTAP with estimation of tidal parameters and atmospheric response function, and on re-analysis of GPS at the tide gauge stations with refined analysis strategies including consideration of loading effects of ocean tide, the atmosphere and land waters.

Keywords: tidal record, GPS, mean sea level, vertical deformations