Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

SGD21-09 Room:413 Time:April 28 11:15-11:30

Periodic displacement on continuous GPS observation in coastal area due to long term sea level elevation

OICHI, Kazuyoshi[1*]

[1]Hydrographic and Oceanographic Department, Japan Coast Guard

Since 1999, Hydrographic and Oceanographic Department carried out continuous GPS observation to survey the crustal deformation at the stations collocated with tidal stations or lighthouse etc. of Japan Coast Guard in south Kanto area. And precise positions in earth centered coordinates of these GPS stations are automatically determined by long baseline analysis from Simosato GPS station. Several stations show significant unexpected annual oscillation in its daily position series. On the other hand, hourly sea level data are available via Japan Oceanographic Data Center from tidal stations of Japan Coast Guard and Japan Meteorological Agency in this area. To eliminate annual oscillation from crustal deformation observation, correlation functions between daily precise position series of GPS stations and sea level height series of tidal stations are calculated. And I tried to evaluate an error from weight variation of sea water on precise GPS observations in coastal area.

Hydrographic and Oceanographic Department continuously observes 30 sec interval data at GPS stations in Izu islands area from 2002. And long baseline analysis from Simosato hydrographic observatory is performed with Bernese GPS Software and IGS final ephemerides. Calculated daily precise positions are utilized for crustal deformation monitoring. However, time series of calculated positions contains unexpected component other than crustal deformation. Particularly, Izu O-Shima station shows significant oscillation in a north-south direction. This oscillation is synchronous with four GPS stations of GSI in Izu O-Shima, and these show annual apparent cycle of expansion and contraction. Some oscillation of local load is suspected as cause of this deformation and move of sea water is considered as major component of these in coastal area. Analyzed positions of these stations are obtained as daily value, thus influence of major component of tide (diurnal or semidiurnal) is negligible, but long term component, for instance, annual change of sea level is inadequately considered. According to the sea level observations at adjacent tidal stations, annual oscillation of sea level shows its amplitude in tens of centimeters, thus long term component of sea water load change is expected as considerable.

To eliminate annual oscillation from GPS monitoring of crustal deformation, I tried to analyze strain caused by load change from sea level elevation. This analysis is performed with the time series of daily precise positions of four GPS stations: Izu O-Shima, Miyake Shima, Kozu Shima, Hachijo Shima, from 2002. Because of Miyake Shima, Kozu Shima and Hachijo Shima stations are collocated with tidal stations of JCG, correlation functions are calculated with time series of sea level in place of stations. And the Izu O-Shima station is collocated with lighthouse, thus analyzed with the Okada tidal station of JMA in Izu O-Shima.

Keywords: GPS, tidal observation, crustal deformation, sea level change, annual oscillation