Satellite Laser Ranging and GNSS observations in the Shimosato Hydrographic Observatory, Japan

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The Shimosato Hydrographic Observatory (SHO) of Japan Coast Guard, located in the southernmost part of Wakayama Prefecture, operates Satellite Laser Ranging (SLR) observations since 1982 as well as continuous GNSS observation. Collected SLR and GNSS data are transferred to the International Laser Ranging Service (ILRS) and the International GNSS Service (IGS), respectively. The transferred data contribute to the construction and development of the International Terrestrial Reference Frame (ITRF). The SHO which operates two kinds of global geodetic techniques is now one of the Global Geodetic Observing System (GGOS) sites.

In order to enhance the usability of the SLR observation system, the SHO has updated its laser ranging equipment in 2018. We installed a laser oscillator with changeable pulse repetition rate up to 1 kHz (i.e., kilohertz laser), by which we can collect the ranging data at a higher rate than by the former one with a pulse repetition rate of 5 Hz. The relevant updates on the control devices contribute to the simplification of SLR operation.

In this presentation, we first describe the summary of our laser ranging system update in the SHO, and then show the geodetic results of SLR and GNSS positioning at the SHO. The SLR monthly positions were calculated using LAGEOS-1 and LAGEOS-2 ranging data with the analysis software C5++ (Otsubo et al., 2016, Earth Planets Space). The results clearly reproduced the coseismic displacements due to the 2004 southeastern off Kii Peninsula earthquakes (M7.4 and M6.9) and the 2011 Tohoku-oki earthquake (M9.0). In addition, significant postseismic displacements following the Tohoku-oki earthquake were also obtained.
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