Consideration of antenna phase calibration for new GEONET analysis

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Geospatial Information Authority of Japan (GSI) has been operating GEONET (GNSS Earth observation Network System) to estimate the daily coordinates for the purpose of monitoring crustal deformation in Japan. GEONET analysis strategy was updated four times, and we started 5th version from 2020. One of the improved points is the update of the reference frame to ITRF2014 from ITRF2005. Domes and monuments for GEONET stations are unique types of GSI. Therefore, we used original antenna phase calibration models based on ITRF2005up until now. In response to the update of reference frame, we calculated new models corresponding to ITRF2014. We will show the method of calculation of phase calibration models and results of daily coordinates based on the new GEONET analysis strategy.

We calculated phase calibration models using Bernese. We calculated combinations of two GNSS antennas “TPSCR.G5” and “TRM59800.80”, and three types of monuments. First of all, we installed rover stations, whose phase calibration models are unknown, on monuments without dome, and installed a reference station whose phase calibration model is known on a tripod. After 24-hour continuous observation, we covered rover station’s antenna with dome, and performed continuous observation again.

We took two steps to calculate phase calibration models, the calculation of baseline vectors from double difference data, and the estimation of phase center offsets and phase center variations. For the calculation of baseline vectors, we obtained the coordinates of the reference station by the static analysis from the TSKB station, which is registered to the International GNSS Service, using L1 wave of first day’s data. After that, we calculated baseline vectors between rover stations and the reference station by static analysis using L1 wave of first day’s data too. Note that we corrected ellipsoid height of rover stations by leveling results between the reference station and rover stations. Subsequently, we analyzed phase calibration models for each L1 and L2 wave using second day’s data (hereinafter called “Calculated model“). With regards to other antennas or combinations of domes and monuments, we estimated models by adding differences between “AOAD/M_T”’s phase calibration models corresponding to ITRF2005 and ITRF2014 to the current models (hereinafter called “Converted model“). In order to confirm the consistency of those two methods, we calculated the Converted model for all combinations.

As a result, differences between the Calculated model and the Converted model were within 1mm for both PCO and PCV in any combinations of antennas, domes and monuments, that is, we confirmed the consistency between two models obtained by two different ways.

Keywords: GNSS, Antenna phase calibration model

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