

## Influences of Height Deviations of Antenna Attachments on Height Biases of Solutions

# Basara Miyahara[1], Yuki Hatanaka[2], Masayoshi Ishimoto[1], Kazushi Maruyama[1]

[1] GSI, [2] Geodetic Observation Center, Geographical Survey Inst.

It is essential for GPS analysis to correct phase center variations. There are several types of monuments in the GPS stations of GEONET. Because phase characteristics are different by the monument types as well as antenna types, individual models are needed to be applied for each types of monuments even though the antennas of the same type are used. The accuracy of GEONET solutions is dramatically improved by applying such PCV models (Hatanaka et al., 2001). The models are, however, not perfect and there are still un-modeled errors remaining.

The antennas of GEONET sites are attached not directly on the metal plates at tops of the pillars but on supports. The supports are designed so that the heights are adjustable within a range of a few cm. Because this height was not unified at the time of construction, it may be different from station to station. To evaluate influences of the variation of the height of the support on results of GPS analysis, a test observation campaign is carried out. The monuments used for the experiments are designed to have the same upper structures as the actual stations of GEONET. Each antenna was set on the monuments with changing the heights of the supports by day. Baseline vectors from the reference antenna to the sites were analyzed and compared with the ground truths.

The baselines were analyzed in two methods; the first using L1, without estimating tropospheric delay and with fixing ambiguities; the second using LC, with estimating tropospheric delay and without fixing ambiguities. The results by the first method agree well with the ground truths within 1 cm. The variation of the phase characteristics by changing the height of the support affects less significantly. On the other hand, the results of the second method show large deviations in height component from the ground truths. The deviations, which often exceed 1cm and reach 4cm for the worst cases, increase as the heights of the supports deviate from the standard heights. An example shows that the calculated height decreases by 3 cm in spite that the height of the support was raised by 2 cm. It is confirmed that the changes of the heights of the supports influence significantly for the second method. The amount of the influence also depends on the antenna type. The results of the similar experiments with chokering antennas (TRM29659.00) show much less deviations than those of the other types of antennas.