GPS antenna calibration for national geodetic surveys in Japan

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It is well known that a height error over several centimeters can arise if different antenna types are mixed in GPS surveying. This is caused by the difference between phase characteristics of each antenna type. In Japan, GPS antenna calibration has been carried out for GEONET, the dense GPS network for monitoring crustal deformation. On the contrary, not enough calibration has been done for general surveys; Only the L1 antenna offset in height components in the calibration table published by National Geodetic Survey (NGS) has been used. Since 2002 April, however, accompanied with the revision of the geodetic reference frame of Japan, coordinates of the control stations including GEONET have been published. Although availability of GEONET data as control points will make GPS surveying more efficient, it could magnify the phase characteristics problem when different antenna types are mixed. Therefore, the conventional antenna calibration method should be carefully reviewed.

The purpose of this paper is to consider an adequate antenna calibration method for general GPS surveying. The experiments are done in the following way: First, field GPS observations are performed at the test field at GSI, where reference and test antennas are set on five pillars separated about 2 meters, respectively. Dorne-margolin T chokering antennas are used as the reference antenna. The observations are done in at least two days (48 hours) with two known baselines. Two to three test antennas of the same type are averaged to obtain final antenna offsets. The analyses are done by Bernese GPS Software 4.2. The results for test antennas of four different types are compared with the NGS correction table. RMS repeatabilities are 1 to 3 mm in both the offsets and the elevation dependent PCV, which is consistent with the NGS results.

Second, we will asses the effect of PCV correction with GPS data in Japan. The relationship with zenith delays will be also mentioned because they have a correlation with PCV. The field GPS data taken at Mt. Fuji in 2002 will be analyzed to confirm the effect of PCV correction at a typical mountainous area.