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On the Determination of Antenna Phase Center Corrections in a Multi-GNSS Multi-Frequency Approach

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The accuracy of user positions estimated by precise point positioning (PPP) techniques depends – among others – on a consistent PCV model. Different investigations and modernizations of the infrastructure and the correction models can be noticed. Parallel to the introduction of a new International Terrestrial Reference Frame ITRF2008, by the IERS in May 2010, the model for the widely used antenna correction igs05.atx in the well known ANTEX format will be updated by a new one, called igs08.atx respectively. This new file should close the gap between pure GPS corrections and the need of Multi-GNSS constellation antenna corrections, which are demanded by a broader community. The GNSS modernization process includes the successful launch of a GPS II-F Satellite (PRN25) with the first operational L5 signal. In the near future new GLONASS-K Satellites were launched, supporting the transmission of the new L3 signal as well as interoperable acquisition methods (CDMA additional to FDMA) on this signal. Consequently for high-end applications based on carrier phase measurements, like PPP, a set of consistent absolute phase center variations (PCV) are necessary.

In this contribution we present a method for the determination of consistent antenna phase center corrections in a Multi-GNSS and Multi-Frequency approach. At the Institut für Erdmessung (ife) the PCV are traditionally parameterized by a spherical harmonic expansion and estimated by time differenced single differences on a short baseline. We investigated the impact of different processing strategies on (i) the correlation between the PCV values and (ii) on the values themselves. It could be shown that parameters of different GNSS only are linked by the differential receiver clock error with a magnitude of 1-2% inter-system correlations. Likewise inter-frequency correlations between L1 and L2 of 10-15% appear. Although they are higher, the parameters can be clearly separated from each other. A higher correlation level can be expected if the complete covariance information of the time differenced single differences are considered. In the same way the derived antenna phase center corrections were analyzed critically. Therefore we compare estimated spherical harmonic coefficients as well as the derived PCV Pattern. At the end we propose a concept for deriving a set of consistent Multiple-GNSS corrections in one common model for receiver antennas in post processing on the basis of field measurements on a robot.