Global Navigation Satellite Systems (GNSS) are important contributors to the realization of the International Terrestrial Reference System (ITRS). For the combination of different space geodetic techniques, terrestrial measurements between the corresponding reference points are necessary. Discrepancies between these so-called local ties on the one hand and the coordinate differences derived from space techniques on the other hand are a major limitation for the realization of the ITRS nowadays. In the past, these discrepancies have often been attributed to inaccurate terrestrial measurements. This paper shows that a major part of the differences can be explained by systematic GNSS-specific errors, if a global data analysis is simulated. One of the most important error sources for GNSS are interactions of the antenna with its immediate vicinity, primarily multipath. At the Geodetic Observatory Wettzell (Germany), up to six GNSS permanent sites are operated in parallel at a distance of only a few meters. This antenna array is ideal to study the impact of local effects on the various GNSS observables and linear combinations. Comparisons of solutions obtained from different GNSS observables reveal cm-level discrepancies. Individual receiver antenna calibrations have an impact on the estimated station positions on the level of several millimeters. As other error sources dominate, their application does not lead to an
improvement in all cases.

Stichworte:
Terrestrial reference frame; Local tie; Antenna phase center model; Global Positioning System; Multipath

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