Current topic for a Master's Thesis

Analysis of VLBI intensive sessions with the DGFI Orbit and Geodetic parameter estimation Software (DOGS)

Very Long Baseline Interferometry (VLBI) is a geodetic space technique which is based on the measurement of delays between the arrival times of extra-galactic radio signals at distinct antennas. If the global distribution of antennas during a measurement campaign ("session") is sufficiently uniform, VLBI is capable of estimating the positions of the radio sources ("quasars"), the coordinates of the observing antennas, and the full set of Earth Orientation Parameters (EOP). The latter comprise offsets and drifts of polar motion, the difference ΔUT1 = UT1 – UTC and its derivative "length of day" (LOD), as well as the celestial pole offsets.

DGFI-TUM is an operational Analysis Center (AC) of the International VLBI Service for Geodesy and Astrometry (IVS). As such, we routinely analyse the "rapid turnaround" sessions, which are scheduled twice a week, contain about 10-12 antennas and last 24h. The analysis is performed using our DGFI Orbit and Geodetic parameter estimation Software (DOGS). For these observation campaigns, all the above (and supplementary) geodetic parameters can be estimated. However, the latency time between the measurements and the final solutions is rather long (about 2 weeks). To at least reduce the latency for ΔUT1, daily so-called "intensive" sessions have been introduced. These campaigns observe the time delays for a single East-West "baseline", which is the vector between two observing antennas located at similar latitude (see Figure). Intensive sessions only last 1h, but if the observed baseline is long enough, ΔUT1 can be estimated both reliably and fast.

Due to the reduced number of participating antennas and observations, the parametrization for the analysis of intensive sessions is different from that of the rapid turnaround sessions. As a consequence, the usual procedure and software setup cannot be simply applied to the intensives. In this Master's Thesis, a dedicated analysis approach shall be developed, implemented and validated.

Networks of the three intensive sessions (from Hellmers et al., 2019).

Main tasks:

- Investigation of an adapted parametrization strategy for analyzing intensive sessions with DOGS.
- Assessment of precision and accuracy of the resulting parameter ΔUT1: Validation with respect to the intensive solutions of other ACs and DGFI's rapid turnaround solution.
- Comparison of the properties and results from three different intensive session types (INT1, INT2, INT3; see Figure) with 2-3 stations.

References:

Hellmers, H., Thaller, D., Bloßfeld, M., Kehm, A., and Girdiuk, A.: Combination of VLBI Intensive Sessions with GNSS for generating low latency Earth Rotation Parameters, Advances in Geosciences, 50, 49–56, 2019.

Institute: Deutsches Geodätisches Forschungsinstitut der TUM (DGFI-TUM)
Supervisors: Dipl.-Math. Matthias Glomsda / Prof. Dr. Florian Seitz
Contact: matthias.glomsda@tum.de; phone: 089/23031-1292