The importance of accurate a priori information for VLBI Intensive sessions

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Abstract. So-called Intensive sessions, also referred to as Intensives, are routinely observed one-hour sessions with two to three stations with the primary goal of deriving the Earth's phase of rotation with low latency. Due to the highly restricted number of observations, only a few parameters of interest can be estimated, including zenith wet delays per station, clock offsets, as well as the parameter of main interest, the difference between Universal Time (UT1) and Coordinated Universal Time (UTC). Thus, the remaining EOP, namely polar motion and nutation, and the station coordinates are fixed to their a priori value making the precision of the UT1-UTC estimates strongly dependent on their accuracy. In this study, the impact of realistic errors in the a priori information of polar motion, nutation, and station coordinates (in north-south, east-west or up-down direction) on the UT1-UTC estimate of Intensive sessions are investigated by applying rigorous simulations. To get a global picture, we generated a 10x10 degree grid of artificial VLBI antennas and scheduled and simulated over 240000 Intensive sessions where different errors were introduced in the simulation process. We find that in contrast to errors in the north-south or east-west components of the station coordinates, an error in the station height only slightly affects the UT1-UTC determination. In general, equatorial baselines are very sensitive to any a priori error, as are baselines with a midpoint close to the equatorial plane as well as very long ones. On the other hand, long east-west oriented baselines that enclose a small angle with the equatorial plane seem to be most resistant against errors in the a priori values. This study shows that the contributions from erroneous a priori information, in general, are not negligible and need to be accounted for when investigating the accuracy of the UT1-UTC estimates from Intensive sessions.