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Application of ray-traced tropospheric delays in the analysis of VLBI Intensive sessions

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The IVS Intensive sessions are one-hour long, usually single-baseline VLBI sessions performed almost every day with the purpose of determining UT1-UTC. Due to their short duration and the limited geometrical distribution of the observations, the number of nuisance parameters that can be estimated in the data analysis – e.g. for the tropospheric delay – is limited. Normally, for the troposphere only one constant zenith wet delay per station is estimated. Since this is not enough to describe the actual variability in the troposphere, it limits the accuracy of the estimated UT1-UTC parameter. Hence, using external information about the tropospheric delays has a great potential of improving the accuracy of the Intensive sessions. In this work we apply a priori tropospheric delays obtained from ray-tracing through the ERA-Interim and ERA5 numerical weather models, and study how this affects the accuracy of the UT1-UTC estimates. To validate the results we compare with UT1-UTC estimated from simultaneous global 24-h VLBI sessions as well as with Length of Day estimates from GNSS. We show that the application of ray-traced tropospheric delays improves the agreement with the reference data by several microseconds. Furthermore, we investigate which types of Intensive sessions, e.g. which baselines, are affected at what level by using ray-traced delays.