

Determination of UT1 by VLBI

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Abstract. Very Long Baseline Interferometry (VLBI) is the only space geodetic technique which is capable of estimating the Earth's phase of rotation, expressed as Universal Time UT1, over time scales of a few days or longer. Satellite-observing techniques like the Global Navigation Satellite Systems (GNSS) are suffering from the fact that Earth rotation is indistinguishable from a rotation of the satellite orbit nodes, which requires the imposition of special procedures to extract UT1 or length of day information. Whereas 24 hour VLBI network sessions are carried out at about three days per week, the hour-long one-baseline intensive sessions ('Intensives') are observed from Monday to Friday (INT1) on the baseline Wettzell (Germany) to Kokee Park (Hawaii, U.S.A.), and from Saturday to Sunday on the baseline Tsukuba (Japan) to Wettzell (INT2). Additionally, INT3 sessions are carried out on Mondays between Wettzell, Tsukuba, and Ny-Alesund (Norway), and ultra-rapid e-Intensives between Europe and Japan also include the baseline Metsähovi (Finland) to Kashima (Japan). The Intensives have been set up to determine daily estimates of UT1 and to be used for UT1 predictions. Because of the short duration and the limited number of stations the observations can nowadays be e-transferred to the correlators, or to a node close to the correlator, and the estimates of UT1 are available shortly after the last observation thus allowing the results to be used for prediction purposes.

Keywords. UT1, VLBI, intensive sessions

1. Outline

The sensitivity of a VLBI baseline or network to UT1 is proportional to the East-West extend of the configuration. At present UT1 can be determined with an accuracy of 6-7 μ s from regular 24 hour sessions and 10-15 μ s from intensive sessions. We reported about state-of-the-art measurements of UT1 in different baseline or network configurations and showed examples of current investigations on the following topics:

- UT1 provided by the IVS
- 24 hours sessions, intensive sessions, e-VLBI
- Impact of errors in nutation on dUT1 from intensive sessions
- Impact of a priori troposphere gradients on dUT1 from intensive sessions
- Comparison of geodetic and atmospheric excitation with sub-diurnal periods

2. Conclusions

VLBI provides a unique capability to directly access the rotation phase of the Earth. As VLBI is the only technique to determine UT1 with high precision it is difficult to judge the accuracy of the obtained results.