**ABSTRACT** In order to analyze different technique data in one single analysis software, i.e. the Vienna VLBI Software (VieVS), we compute GNSS single differences between the ranges from two stations to a satellite, using phase measurements with most of the errors corrected by the c5++ software. With VieVS, we estimate site common parameters, i.e. zenith wet delays, troposphere gradients and clock parameters, applying inter-technique constraints as well as station coordinates. Applying common clock constraints depends on sharing and/or performance of the same clock during the sessions; which we assess by comparing the clock rates. For the station coordinates at the co-located sites, local tie vectors are introduced as fictitious observations. In this poster, we present the comparison results between the combination solutions and the single technique solutions in terms of station position repeatability to check combination performance during 15-day CONT14. In addition, we show a comparison of clock rates at co-location sites.

**2. Common Clock Check**

Fig 2 Clock rates of each site which are derived from single technique solutions (red: VLBI, blue: GNSS, purple: difference) during 15 days of CONT14 campaign. The clock of WTT2 is set as a reference clock.

**3. Combination Strategy**

- **Troposphere gradients**
  \[ \text{NGR}_{\text{GNSS}} - \text{NGR}_{\text{VLBI}} = 0 \pm 2 \text{cm} \]
  \[ \text{EGR}_{\text{GNSS}} - \text{EGR}_{\text{VLBI}} = 0 \pm 2 \text{cm} \]

- **Zenith Wet Delay (ZWD)**
  \[ \text{ZWD}_{\text{GNSS}} - \text{ZWD}_{\text{VLBI}} = \Delta \text{ZWD} \pm 1 \text{cm} \]

- **Local tie**
  \[ dx_{\text{GNSS}} - dx_{\text{VLBI}} = \Delta x - (x_{\text{GNSS}} - x_{\text{VLBI}}) \pm 3 \text{cm} \]

- **Clock rate**
  \[ clk_{\text{rate}}_{\text{GNSS}} - clk_{\text{rate}}_{\text{VLBI}} = 0 \pm 10 \text{cm/day} \]

For common parameters (troposphere gradients, ZWD, clock rates), we estimate parameters separately and apply common parameter constraints additionally (troposphere gradients and ZWD for all sites and clock rates for selected sites according to section 2). Moreover, we introduced local ties as fictitious observations. In this work, we only exploit known local survey measurements for a few stations (HRAO, Hob2, KOB, ONSA, WESZ, WTZR). This strategy can be also applied to twin/sibling telescope VLBI observations like we did for Hob2.

**CONT14 does not have official information on common frequency standards for co-location sites. Nevertheless, according to Kwak et al. (2015) [2], we have a possibility to find the co-located sites, which shared the same clocks, through comparing clock rates from single technique solutions.**

During CONT14 (15 days), the clock rates of each site except HRAO look comparable between two techniques mostly in the range of +/- 20 cm/day which corresponds to ~0.008 ps/s (Fig 2).

Meanwhile, clock offsets cannot be used for comparison because the cable delay variations and other instrumental delays are also absorbed into the parameters. We also do not consider quadratic terms in this study.

In Fig 2, some instant peaks indicate clock breaks at Hob2, KAT1, MATE and ZECK. We exclude those sites and HRAO for clock rate combination.

**5. Conclusions**

- **Comparing clock rates, we could assess if co-located instruments shared the clock.**
- **For combination, common parameters (ZWD, troposphere gradients, clock rates) were constrained between two techniques and local ties were introduced.**
- **The combination solutions mostly improve station position repeatability in comparison with single solutions.**
- **Common parameter constraints can be also applied in twin/sibling telescopes.**
- **The GNSS geometric model (near-field model) in VieVS needs to be improved.**
- **The partial derivatives with respect to EOP for GNSS need to be implemented in VieVS and then EOP can be also estimated.**