

Impact of Tropospheric Ties in GNSS and VLBI Integrated Solution

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Abstract. International celestial and terrestrial reference frames (ICRF and ITRF) and Earth Orientation Parameters (EOP) are determined by the four space geodetic techniques, including Global Navigation Satellite Systems (GNSS) and Very Long Baseline Interferometry (VLBI). An integrated processing strategy with proper handling of the ties could exploit the benefits of each technique and improve the solution. Currently, only global ties (EOP) and local ties (station positions) are commonly used in the combined solution. For the microwave-based techniques, such as GNSS and VLBI, the tropospheric ties at co-locations can also be adopted. We present the challenges and benefits in applying tropospheric ties in the GNSS and VLBI integrated solution, including the 24-hour continuous (CONT) campaigns (CONT05 – CONT17) and the 1-hour Intensive (INT) sessions. We demonstrate that the tropospheric zenith delays of GNSS and VLBI agree at the level of 4 mm in terms of standard deviation, whereas the systematic bias could reach up to 5 mm. By properly handling the tropospheric ties, the TRF, CRF, and EOP estimates in the integrated solutions could all be improved significantly. As for the INT sessions, the UT1-UTC estimates benefit from tropospheric gradient ties, especially the east component.