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Possibility Study of common tropospheric parameters as another ‘local ties’ of TRF

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The terrestrial reference frame (TRF) is commonly realized by a combination of space geodetic techniques. During the combination ‘global ties’, i.e. common global parameters, like the Earth Orientation Parameters (EOP), can be directly used, while ‘local ties’, i.e. common coordinates at colocation sites, have to consider the distances between the reference points of the various devices. The all observation of ground-based space geodetic techniques is through the atmosphere and consequently common atmospheric parameters for colocation sites might be used to link the techniques as well. But what are the common atmospheric parameters? We study the systematic errors between tropospheric parameters obtained by different techniques. By tropospheric parameters estimates and comparison of SLR/GNSS/VLBI/DORIS colocation sites, we find that GNSS and VLBI Zenith Tropospheric Delay (ZTD) show a very good agreement, but there are significant offsets between SLR and GNSS which are not constant over time. Compared with the strategy used in GNSS, our SLR orbit determination didn’t consider estimating the ZTD parameters. Then we add the ZTD parameters in our estimation and the result shows that the new strategy can not only improve the orbit accuracy (mm-level) but also can explain the ZTD offsets existed in SLR and GNSS which is of great help to applying tropospheric ties for a combination of the space geodetic techniques.