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Comparison of GNSS (EUREF) and VLBI (EVGA) tropospheric delays

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The troposphere is the main contributor of noise and systematic errors in the analysis of space-geodetic techniques at radio frequencies, such as GNSS and VLBI. Nevertheless, if sufficiently understood, the troposphere may provide a common parameter space for the combined analysis and may thus play an important role for the International Association of Geodesy's (IAG) Global Geodetic Observing System (GGOS). With tropospheric parameters we denote the group of parameters associated with the modeling of the dry and wet constituents of the non-dispersive atmosphere, namely tropospheric delays and tropospheric gradients. Among those parameters, tropospheric delays have been used to measure and model atmospheric water vapor, a key parameter of the greenhouse effect and a driving factor for various climate feedback mechanisms, which is usually insufficiently observed by other meteorological techniques.

Besides climate implications, the tropospheric delays provide a valuable basis for checking the consistency of individual contributions to a combined product (intra- as well as inter-technique-related). Various authors have determined and compared tropospheric delays among the space-geodetic techniques, but remaining discrepancies could not yet be completely assessed and explained. Our investigations are concerned with a closer look on the tropospheric delays obtained at European stations, which are associated with the European Reference Frame (EUREF) and the European part of the International Very Long Baseline Interferometry Service for Geodesy and Astrometry (IVS), called European VLBI Group for Geodesy and Astrometry (EVGA). Since 2012, time series of differences between the EUREF combined solution and the IVS combined solution are displayed on the EUREF Permanent Network's (EPN) webpage for nine stations at co-located sites (http://www.epncb.oma.be), covering the period from 1996 to present. Having in mind that interpolation due to different sampling rates is applied and no height difference corrections are applied, standard deviations for the difference time series between 4.0 and 6.5 mm look quite promising.

In this presentation we shortly review the combination processes for both, EUREF and EVGA, solutions and the differencing applied up to now. We investigate exemplarily possible improvements and evaluate the potential for an inter-technique combination.