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On the computation of Zenith Total Delay Residual Fields by using Ground-Based GNSS estimates

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Tropospheric refraction is one of the major error sources in satellite-based positioning. The delay of radio signals caused by the troposphere ranges from 2m at the zenith to 20m at lower elevation angles, depending on pressure, temperature and humidity along the path of the signal transmission. If the delay is not properly modeled, positioning accuracy can degrade significantly. Empirical tropospheric models, with or without meteorological observations, are used to correct these delays but they are limited in accuracy and spatial resolution resulting in up to a few decimeters error in positioning solutions. The present availability of dense ground-based GNSS networks and the state of the art processing techniques enable precise estimation of Zenith Tropospheric Delays (ZTD) with different latency ranging from real time to post-processing. We will present a method for computing gridded ZTD residual fields interpolating, through Ordinary Kriging, the residuals between GPS-derived and model-computed ZTD at continuously operating GNSS stations. At a known user location, ZTD value (hereafter site-ZTD) can be obtained as the sum of gridded-ZTD residual and modeled-ZTD value. The performance of the method will be assessed comparing site-ZTD values against IGS tropospheric products at some European IGS stations.
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