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Ground-Based GPS Sensing of Azimuthal Variations in Precipitable Water Vapor

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Current models for troposphere delay employed by GPS software packages map the total zenith delay to the line-of-sight delay of the individual satellite-receiver link under the assumption of azimuthal homogeneity. This could be a poor approximation for many sites, in particular, those located at an ocean front or next to a mountain range. We have modified the GIPSY-OASIS 11 software package to include a simple non-symmetric mapping function (MacMillan, 1995) which introduces two new parameters. in this paper wc usc point-positioning techniques (Zumberge et al., 1997) to demonstrate how solving for the two new parameters as well as for zenith troposphere delay result in significant improvements to all aspects of GPS-based geodesy. Comparisons with collocated Water Vapor Radiometers at several sites indicate also improved accuracy for the estimates of zenith troposphere delay.

As a result, it is now possible to generate an azimuthal structure of the troposphere delay from a single receiver. Theses delays include contributions from both the dry gases and Precipitable Water Vapor (PWV). Unfortunately, a measurements of local pressure at the site is not enough to extract the azimuthal structure of PWV from the azimuthal structure of the total delay. We will discuss this issue and present several options for the extraction of azimuthally asymmetric estimates of PWV. These estimates arc evaluated by comparisons with co] located, W W/-based estimates of line-of-sites wet delays.

References

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