

Precipitable Water Vapor Derived From Archived GPS Zenith Path Delay Estimates

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Operational processing of data from the GPS FLINN sites as part of the IGS effort has been ongoing at JPL since the summer of 1992. As a byproduct of the standard processing procedure, optimized to yield precise GPS satellite orbits and station locations, estimates of the zenith tropospheric path delay at each GPS site have been generated and archived. After removing the effect of the "dry" atmosphere (proportional to the surface pressure), the remaining "wet" path delay is a function of the water vapor content of the troposphere. These path delay data provide a potential source of nearly continuous estimates of precipitable water vapor in the atmosphere for a two year time span at over 30 GPS sites around the globe. Thus, these data could enable studies of diurnal through seasonal variability in water vapor as a function of geography and regional climate, and over time would aid in the study of climate change. We present here preliminary results of our effort to determine how accurate and precise these path delay estimates are, and how well we may recover precipitable water vapor from the path delay estimates.

We have assembled one-to-two year time series of path delay for a number of sites where VLBI or WVR are collocated. We intercompare the GPS estimates with those from these other techniques, where and when available. We also assess the effects on the GPS series of anti-spoofing and other systematic errors. We have found large biases, at times, between techniques, and we discuss their significance. We discuss the use of surface meteorological data and other related meteorological data sets to aid in the recovery of the precipitable water vapor from the path delay estimates. We focus, in particular, on the question of what effective atmospheric temperature to assume when in situ data are lacking. We address the problem of finding "truth" data sets with which to verify the quality of the water vapor time series recovered by GPS.

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