AN EVALUATION OF GPS-BASED ESTIMATES OF PRECIPITABLE WATER VAPOR FOR A VARIETY OF DATA LATENCY TIMES

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Low operational cost and high temporal resolution make GPS estimates of zenith path delay (ZPD) and zenith precipitable water vapor (ZPWV) highly attractive in many applications. The effectiveness with which GPS-based techniques can replace or augment the more established technologies of water vapor radiometers (WVR) and radiosondes is application dependent. Applications such as climatology, weather prediction and media calibration for radio science vary in their demand for accuracy, product delivery schedule and in their need for zenith properties or line of sight properties.

The accuracy of GPS-based estimates of ZPWV at a given sight depends on the data latency time. One can identify three general types of data processing scenarios based on decreasing levels of data latency: post-processing, near real time processing and real time processing. Post-processing utilizes data from a global network of ground stations and it supports the highest solution accuracy for the GPS orbits, clocks and media calibration, including ZPD. The time delay involved in collecting and processing data from a global network of receivers (say, a subset of the IGS network) can be one or two days. In near real time processing, a delay of several hours in processing may be needed in order to bring in a station with a good clock that can serve as a reference. In real time processing only data from the target station is processed. Each data processing scenario requires a special estimation strategy to address its unique problems associated with the quantity, quality and source of data.

This paper reviews the data processing strategies that can be employed for different latency times. The quality of the GPS-based ZPWV estimates is measured by comparing them to estimates from more established technologies like WVRs and radiosondes and by formal error analysis. The accuracies that are currently achievable with each strategy are presented together with an outline of possible future improvements.

Suggested Commission: J and F