Orbit and Troposphere Results of A Real-rl'imc Prototype WADG PS System

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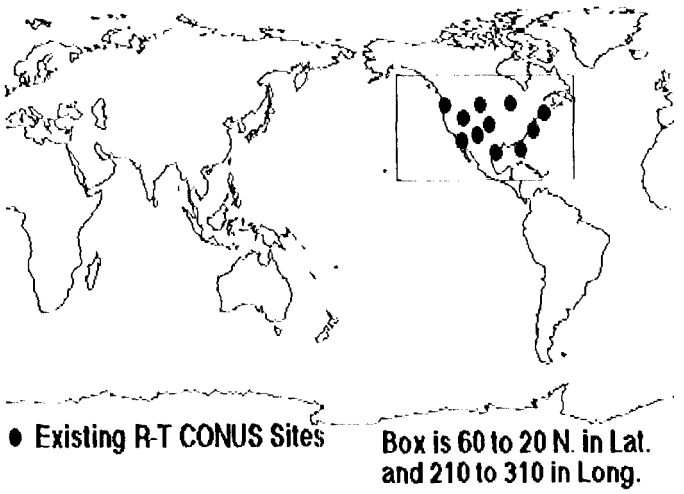
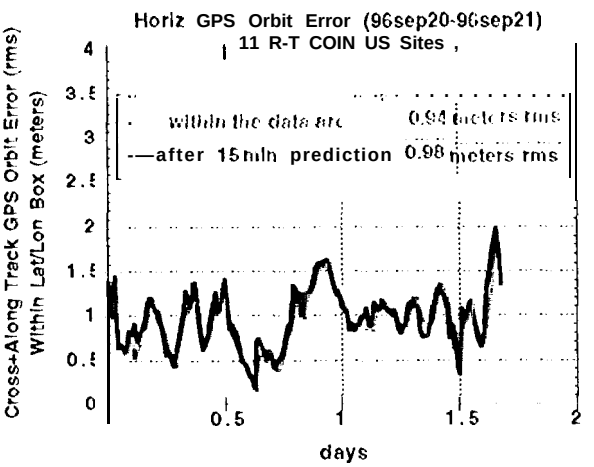
ABSTRACT

A wide area differential GPS (WADGPS) system, of which the Federal Aviation Administration's Wide Area Augmentation System (FAA's WAAS) is a particular example, consists of three components: the fast GPS pseudorange correction, the ionosphere correction, and the slow GPS orbit correction. While high accuracy users can eliminate the ionosphere error with dual frequency receivers, and the fast GPS pseudorange correction eliminates one component of the GPS orbit errors, the GPS orbit errors in cross and along-track remain a significant error for the user unless corrected for.

A prototype WADGPS system built around JPL's Gipsy Oasis II and RTG (Real-Time Gipsy) software has been developed. The system computes GPS orbits in real-time with data from 11 sites in the continental U.S. (CONUS). The orbits are evaluated by comparing them to precise IGS (International GPS Service) orbits over the CONUS network. Results show that the horizontal GPS orbit error is under 1 meter, while the vertical GPS orbit error is less than 40 cm, as below:





In addition, we show that by adding sites in Alaska, Hawaii, east Canada, and Bermuda, the horizontal GPS orbit error can be reduced to 80 cm. This is close to the expected network configuration for FAA's WAAS implementation. We also demonstrate the orbit accuracy that can be achieved with an 18-site global network. In these last two cases, the data is collected not in real-time but processed in a real-time mode.

Finally, as a by-product of the slow GPS orbit corrections, 1-2 cm accurate zenith troposphere delay estimates for each CONUS sites are being produced. These precise estimates are necessary for the fast GPS pseudorange correction process.

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This paper would be appropriate for the GPS Wide Area Augmentation System (WAAS) session.