Real Time PPP: from clock to position estimation.

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SUMMARY

We will present the real time PPP method, which requires the availability of real time precise orbits and corrections or errors of the satellites clocks. Currently, it is possible to use the predicted IGU ephemerides available by the IGS centers. However, the satellites clocks corrections available in the IGU do not present enough accuracy (3 ns ≅ 0.9 m) to accomplish real time PPP with centimeter accuracy. Therefore, it is necessary to develop appropriate methodologies for estimating the satellite clock corrections in real time with better quality. The estimation of satellite clock corrections can be performed based on a GNSS network of reference and adjustment of data in the PPP mode. Thus, all systematic effects involved with the GNSS satellite signals must be modeled appropriately for each station of the network. Once estimated the corrections of the satellite clocks in real time, it should be sent to the user, which will use them for application in the GNSS data processing from a particular station in real time PPP mode. To achieve these objectives, a system composed by two sofwares, one for estimating the satellite clock corrections based on data from a GNSS network and the other for the realization of the real time PPP was developed. The results were generated in real time and post-processed mode (simulating real time). The estimate of the satellites clocks corrections was generated based on the measurements of the pseudorange smoothed by carrier phase and also using the undifferenced pseudorange and phase with ambiguities estimation for each satellite available at each station. The daily precision of the estimated satellite clock corrections reached the order of 0.15 ns (≅ 0,05 m) and the application in the GNSS positioning shows that is possible to accomplish real time PPP in the kinematic mode with accuracy of the order of 10 to 20 cm.