1. Introduction

A PPP application developed at UNB (University of New Brunswick), called GAPS (GPS Analysis and Positioning Software), has been designed and built in order to be useful as a tool for determining various parameters in addition to position, receiver clock error, and neutral atmosphere delay. These other estimated parameters include ionospheric delays, code biases, satellite clock errors, and code multipath among others. GAPS is a veritable "Swiss Army knife" for GPS data analysis. GAPS is available for use on the Internet via a Web interface at the address http://gaps.gps.unb.ca/.

GAPS’ applications can be summarized as follows:

- Precise point positioning;
- Ionospheric delay estimation;
- Differential code biases estimation;
- Code noise estimation;
- Receiver/satellite clock error estimation.

Because of the variety of applications, GAPS is not only a precise point positioning tool, but a GPS analysis tool. GAPS’ data processing is essentially based on a very complete error handling. This is done by means of the use of precise products (such as satellite orbits, clocks, and antenna information) and a comprehensive implementation in terms of observation modelling.

2. Application Descriptions

Precise point positioning (PPP) is one of the existing techniques to determine point coordinates using a GPS receiver. In this technique, observations realized by a single receiver are used in order to determine the three components of the position, as well as other parameters, such as the receiver clock error and total neutral atmosphere delay.

The technique is said to be “precise” because precise information, such as satellite orbits and clock errors, is used in the data processing.

The ionospheric delay estimation is based on carrier-phase observations only, which are processed using a filter capable of de-correlating ambiguities and biases from the delay, in order to provide reliable estimates.

3. Under Development

The current version of GAPS is written in MatLab, but the whole software is being re-designed and re-written in C++. The re-design of the software includes not only programming language issues, but also the modernization of the software for handling future GNSS observables; i.e., GPS L5, GLONASS and Galileo (the current version of GAPS already handles GPS L1C data).

The modernization of the software obviously includes handling the RINEX 3.00 data format, and UNB has put efforts into stimulating usage of the new format. Hourly data in R3.00 format from station UNB3 is being stored on the CDDIS ftp server, under: ftp://cddis.gsfc.nasa.gov/gps/data/rrinex3/000/08/.

4. Concluding remarks

In this poster, we have given an overview of GAPS capabilities for positioning and data analysis using IGS products. A comparison with IGS IONEX maps showed great potential for estimating precise un-biased ionospheric total electron count with GAPS. When using GAPS to compute code biases, the overall agreement with CODE solution is better than 4 cm, which shows that, with our PPP-based technique, we can match other bias-estimation techniques at the few cm level. When comparing our code noise estimation results with those obtained using software TECQ from UNAVCO, we found an agreement of the pseudo-ranage noise level to better than 5 cm. When using GAPS for estimating satellite pseudo-clocks and comparing them with final IGS codes, it was possible to find an agreement for between-satellite clock behavior of around 9 mm.

5. Acknowledgements

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