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RTPP Analysis Results: Achievements and Challenges

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One of the key objectives of the IGS Real Time Pilot Project is the establishment of an experimental IGS Real Time Clock Service comprising individual Analysis Centre (AC) solutions and the investigation of strategies for generating a Real Time combination product. The latter is intended to provide a stable, reliable and high quality GNSS product.

Currently there are 4 ACs (BKG, DLR, ESA and NRCan) generating individual real time products, and a fifth (GMV) that is producing a product based on one-hour predictions. This paper will cover the evolution in the accuracies of the individual solutions and will show the impact that the participation in the RTPP has had on the ACs, serving not only as an external benchmark, but also as a discussion forum that has prompted their continued evolution and improvement.

In its role as RTPP AC coordinator, ESOC has been computing and disseminating a daily combination clock product since July 2008, based on daily submissions of clock RINEX and SP3 orbit files by the individual ACs. This exercise has helped to develop and validate the combination techniques and the RTPP products are stored at the CDDIS, IGN and KASI data centres with the designation "igt". The current satellite clock quality, of better than 0.2 ns RMS compared to the IGS rapids, comfortably exceeds the initial RTPP goal of 0.5 ns and gives a high confidence on the implemented method.

ESOC is currently working on the implementation of a Real Time combination product, from RTCM orbit and clock streams received in real time via BKG's NTRIP system. This service is expected to be ready in the March-April timeframe and be operational by mid 2010.

As well as discussing the status and evolution of the Real Time products, this paper will also focus on specific problems and challenges in the Real Time processing. For example, it has been found that GPS Block IIA satellites exhibit occasional glitches, where most receivers loose lock simultaneously. These events cause clock jumps in some of the Real Time AC solutions (and occasionally also in the IGS batch solutions), unless specific steps are taken to identify them.

The high quality of the RT combination product is demonstrated in several scenarios that represent typical applications of RT products. First of all, the performance of the PPP for IGS stations is shown, using a study of the accuracy curve as a function of the averaging time. Kinematic PPP for an IGS ground station is also performed and compared with the double-difference approach, typically used in RTK methods. The last application is POD of LEO satellites, with the use GPS measurements from the GOCE satellite in a very low Earth orbit and the JASON-2 satellite in a high LEO orbit.