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Implementation of PPP as new GNSS Observation Type in the Geomonitoring System GOCA

Early detection of significant movements in natural and artificial structures is crucial to prevent human, environmental and economic losses. For this reason, Geomonitoring in an active field. GNSS technics are also a filed in which lot of research and improvement have been made in recent years. GNSS technics have a great potential in the field of Geomonitoring. The aim of this master thesis is developing a software that allows Precise Point Positioning processing in the context of the geomonitoring project GOCA. With this implementation, potential of PPP with low cost receiver (U-Blox ZED-F9P) using different products and settings has been evaluated.

A PPP dialog-based software in C++ language has been developed. It allows both post-processing using RTKLIB and WaPPP as software engines and real-time with RTKLIB via TPC/IP connection and SSR corrections. Figure 1 shows the appearance of the developed software.

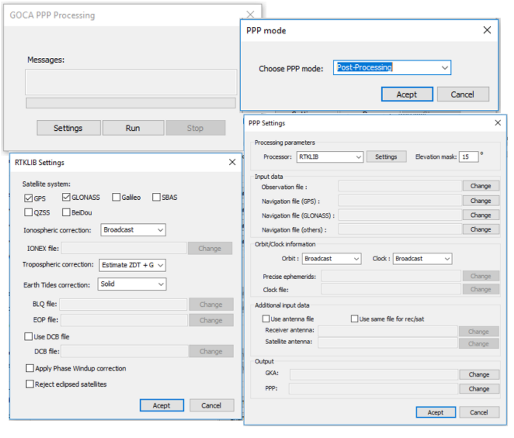

Fig. 1 The Visual Appearance of the PPP software

As output format, new GKA (GOCA format) has been designed to include PPP observations, including coordinates and cofactor matrix.

To different tests has been done in the pillar 300 of the B building in HSKA. Fisrt one consist on a 12-hour observation, with 1 second interval and the following processing using the developed software. Final and ultra-rapid IGS products were used and also ultra-rapid products with 30 second resampled data.The second one was a real-time processing, using SSR corrections via NTRIP protocol. Figure 2 shows obtained results.

	RTKLIB		
	lat	lon	h
Final products	49.016725	8.391810	190.459
Ultra-rapid products	49.016725	8.391811	190.478
Ultra-rapid products - 30s	49.016725	8.391813	190.412
Real-time	49.016725	8.391811	190.170

	WAPPP		
Final products	lat	lon	h
Ultra-rapid products	49.016724	8.391814	190.416
Ultra-rapid products - 30s	49.016725	8.391813	190.580
Real-time	49.016725	8.391813	190.609

Reference coordinates ITRF2014.2019.08		
lat	lon	h
49.016725	8.391813	190.491

Fig. 2 Obtained results

Some differences can be seen between results. RTKLIB is more influenced by number of data while WaPPP is more influenced by what kind of IGS products are used. In general lower errors are obtained using RTKLIB. Real-time is results are less consistent, specially in case of height, so more research is needed in this aspect.

The obtained results reaffirm the potential of the PPP technique, even using low cost receiver. Even some differences between different software engines or IGS products were found, the results allow us to conclude that PPP is a technique with many advantages in the field of geomonitoring, since it avoids the use of several receivers and good accuracies are obtained.

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