

A comparison of survey-grade GNSS receivers by means of observation and coordinate domain approaches; traditional vs low-budget

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SUMMARY

In recent years, several low-cost GNSS receivers have entered the market. The specifications of some of these low-cost receivers seem to match the specifications of more expensive receivers from traditional manufacturers. In the present work, we compared a low-cost GNSS receiver to a traditional state-of-the-art GNSS receiver. The combined effect of multipath and noise on code observations and the ability to maintain lock on carrier phase observations have both been evaluated using a geometry-free observation domain approach. Based on kinematic measurements of a reference trajectory, we have compared the two receivers' capability when used in network Real Time Kinematic (RTK) mode and in Precise Point Positioning (PPP) based on post-processing. The low-cost receiver supplies dual-frequency observations to only 75% of all GPS-satellites due to lacking P(Y)-code tracking capabilities (as of autumn 2021). Also, the low-cost receiver experienced significantly more cycle-slips than the traditional receiver. We did however verify that many of the apparent cycle slips in carrier phase observations from the low-cost receiver were not due to loss of lock of the GNSS-signal but rather a recording/storage issue. The low-cost receiver did not perform as well as the traditional receiver in kinematic PPP using GPS and GLONASS only. When used in kinematic network RTK using GPS, GLONASS, Galileo and BeiDou, there were only small differences between the two receivers.

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