One Millimeter Horizontal Precision Over a 41 Km Baseline Using TurboRogue P-Codeless Data

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It is of interest to assess the effects of Anti-Spoofing (AS) on Global Positioning System (GPS) measurements, since AS has repeatedly been imposed on GPS signals in recent months and may be turned on permanently in the future. In the current study, two Rogue SNR-8000 (TurboRogue) GPS receivers were placed 41 km apart, The receivers were tracking GPS satellites in cross-correlation mode (P-Codeless mode), where one frequency band is used as a code reference for the other band. The standard four data types (dual band pseudorange and full wavelength carrier phase observable) maybe re-created after combination with the C/A band observable.

Precise GPS ephemerides were obtained from the daily processing of standard P-Code data from the GPS global network (FLINN) and held fixed in the analysis. The cross-correlation data from the 2 stations were cut off below an elevation angle of 20 degrees, since P-Codeless data below this angle is characterized by high system noise. The baseline vector was estimated for 9 days, yielding daily repeatabilities of 1 mm, 1 mm, and 8 mm in the north, east, and vertical directions after carrier phase integer ambiguity resolution. The phase resolution improved the East component by a factor of 3 and produced no significant improvements in the other components, roughly consistent with earlier phase ambiguity studies using P-code data, The vertical precision may be worse than expected since the data was cutoff at 20 degrees and since this component depends the most on the low elevation data. This study indicates that the GPS solutions for the horizontal components of static baselines up to 40 km are fairly independent of AS, assuming that the data quality is comparable to that obtained by the TurboRogue in P-Codeless mode. The vertical component is slightly worse compared to P-code solutions for comparable baselines and this may be a current limitation for GPS when AS is turned on.