

GNSS Precise Point Positioning Workshop: Reaching Full Potential

Multiple constellation PPP with RTKLIB v.2.4.2

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Abstract

By using multiple GNSS constellations and many visible GNSS satellites, we expect far improvement of PPP (precise point positioning) performance regarding availability, accuracy and convergence latency especially in severe environment like at urban canyon compared to conventional single constellation, that is, GPS-only PPP. We promise such the multiple constellation PPP will bring many precise GNSS applications like precision agriculture, tsunami monitoring and GNSS meteorology to many users all over the world. RTKLIB is an open source program package for GNSS positioning, which has been developed and maintained by the author until 2006. The latest version RTKLIB v.2.4.2 was released at the end of March 2013. RTKLIB v.2.4.2 supports both post-processing and real-time standard and precise positioning with all of the currently available GNSS satellites including GPS, GLONASS, Galileo, QZSS, BeiDou and SBAS. It is also able to handle the latest versions of RINEX (3.02 draft), RTCM MSM (multiple signal message) and SSR (state space representation) correction information messages (3.2 and draft) and BINEX in addition to standard GNSS data and product formats especially for supports of recently introduced GNSS satellites. For the multiple constellation PPP, the functions to estimate or calibrate the receiver ISBs (inter system biases) are also added in v.2.4.2. At this moment, GPS, GLONASS, Galileo and QZSS except for BeiDou can be incorporated in PPP modes by RTKLIB v.2.4.2. To test and demonstrate the multiple constellation PPP with RTKLIB v.2.4.2, we are going to conduct several PPP experiments in both of post-processing and real-time modes. For such multiple constellation PPP, we necessarily require precise ephemerides and clocks for many satellites estimated based upon uniform coordinates and time systems. However, at this moment, such products for PPP are not available even by IGS (International GNSS service). So we alternatively generate the precise orbit and clock products for the PPP experiment using MADOCA (Multi-GNSS advanced demonstration tool for orbit and clock analysis). MADOCA is an accurate GNSS data processing engine recently designed and developed by JAXA (Japan Aerospace Exploration Agency) from scratch for a wide-area cm-class augmentation service via the QZSS LEX (L-band experimental) channel. In the presentation, we provide the PPP features and models supported by RTKLIB v.2.4.1 as well as a brief introduction of MADOCA. The performance evaluation results of multiple constellation PPP with RTKLIB v.2.4.2 and the products generated by MADOCA are also presented with the detailed formation of the experiment.