



Hourly ultra-rapid orbit product for multi-GNSS real-time precise point positioning

Xinghan Chen (1,2), Xingxing Li (1), Maorong Ge (1), Yongqiang Yuan (2), Keke Zhang (2), and Harald Schuh (1)

(1) German Research Centre for Geosciences GFZ, Telegrafenberg, Potsdam, Germany (xchen@gfz-potsdam.de), (2) School of Geodesy and Geomatics, Wuhan University, Wuhan, China

Currently, with the rapid development of multi-constellation Global Navigation Satellite Systems (GNSS), the real-time positioning and navigation are undergoing dramatic changes with potential for better performance. To provide more precise and reliable ultra-rapid orbit product is critical for multi-GNSS real-time positioning, especially for the two merging constellations Beidou and Galileo which are still under construction. In this contribution, the hourly multi-GNSS ultra-rapid orbit products are developed based on the GPS+GLONASS+Beidou+Galileo observations from CDDIS+IGN+BKG archives. We evaluated the impact of different arc lengths on orbit accuracy of different satellites systems. In order to enhance the solution strength and achieve the best orbit accuracy, the arc length of 72 hours is required for Beidou and Galileo processing while the arc length of 24 hours is sufficient for GPS and GLONASS processing. Meanwhile, the precise orbit determination (POD) processing should be as fast as possible and the update interval should be as short as possible to reduce the orbit prediction length and guarantee the accuracy of the predicted orbit. Therefore, we proposed a parallel processing strategy with multiple servers to improve the computation efficiency. Even for the 72 hours processing, the four-system POD can be completed within one hour and thus hourly multi-GNSS orbit update is achievable. Our results also show that the proposed POD strategy and product with high accuracy and efficiency can significantly improve the PPP performance.