WG1 MEETING – POTSDAM – SEP 2, 2016, 9:00-13:00 AGENDA AND ABSTRACTS

Galina Dick & Jan Dousa

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Session 3: Working Group 1

Sep 2, 2016

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10:15-10:30	Comparison of IWV from PPP and PNP strategies for December 2013	Guergana Guerova et al.
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Comparison of slant troposphere delays obtained from GNSS and ray-tracing through the WRF model

Jan Kaplon, Pawel Hordyniec, Witold Rohm

Abstract

The GNSS signal as it propagates from satellite to the receiver is subjected to the phase delay due to the presence of atmosphere. The GNSS signal troposphere phase delay is linked with the density of all gaseous constituencies, including one of the most important - water vapour. Hence, the remote sensing of water vapour content in the troposphere with high temporal and spatial resolution applying inverse modelling of GNSS signal is feasible. Even though this technique is quite mature the establishment of dense GNSS Continuously Operating Receiver Stations (CORS) and launching of new satellites constellations re-invented the ground based GNSS observations as an important meteorological data source, bringing new opportunities and challenges.

One of the challenges linked with GNSS meteorology processing, still unresolved word-wide, is estimation of direct satellite to receiver GNSS signal Slant Total Delay (STD), currently, only Zenith Troposphere Delay (ZTD) estimates are provided. Hence, important horizontal and vertical anisotropy of the troposphere around GNSS receiver is not resolved.

GNSS based slant delays include the a priori information of hydrostatic delay (ZHD), the estimated non-hydrostatic part (ZWD), local anisotropy (horizontal ZTD gradients: GN, GE) and post-fit residuals containing the systematic (site-dependent) errors: GNSS signal multipath and GNSS antenna PCV model residuals.

Paper presents the methodology of slant delay computation with precise-point-positioning technique (PPP), as well as the methodology of ray-tracing through the WRF (Weather Research and Forecasting) model data. It presents the systematic information found in GNSS observation post-fit residuals and the comparison of slant tropospheric delays derived from GNSS observations with delays resolved during the ray-tracing through the WRF model.

Comparison of IWV from PPP and PNP strategies for December 2013

Guergana Guerova[1], Tzvetan Simeonov[1,2] and Keranka Vassileva[3]

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Abstract

Traditionally, the GNSS processing is done using the Precise Network Processing (PNP) strategy but in the last years the Precise Point Positioning (PPP) strategy has emerged responding to the demand of high temporal resolution products with 5 to 15 minute update. Thus it is important to compare and two processing strategies. This work aims at comparison of Integrated Water Vapour (IWV) derived from 7 GNSS stations in Bulgaria operated by the BuliPOS network. The comparison is done for one month period in December 2013. The PPP processing was conducted during the STSM of Tzvetan Simeonov to University of Luxembourg using the Napeos software. For PNP strategy the Bernese v 5.0 is used.

Numerical weather model for improving BDS real-time precise point positioning

Cuixian Lu, Xingxing Li, Florian Zus, Galina Dick, Maorong Ge, Jens Wickert and Harald Schuh

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Abstract

In this study, we develop a numerical weather model (NWM) augmented PPP processing algorithm to improve BDS precise positioning. Tropospheric delay parameters, i.e., zenith delays, mapping functions, and horizontal delay gradients, derived from short-range forecasts from the Global Forecast System (GFS) of the National Centers for Environmental Prediction (NCEP) are applied into BDS real-time PPP. Observational data from stations that are capable of tracking the BDS constellation from the International GNSS Service (IGS) Multi-GNSS Experiments (MGEX) network are processed, with the introduced NWM augmented PPP and the standard PPP processing. The accuracy of tropospheric delays derived from NCEP is assessed against with the IGS final tropospheric delay products. The positioning results show that an improvement of convergence time up to 60.0 % and 66.7 % for the east and vertical components, respectively, can be achieved with the NWM augmented PPP solution compared to the standard PPP solutions, while only slight improvement of the solution convergence can be found for the north component. A positioning accuracy of 5.7 cm and 5.9 cm for the east component is achieved with the standard PPP that estimates gradients and the one that estimates no gradients, respectively, in comparison to 3.5 cm of the NWM augmented PPP, showing an improvement of 38.6 % and 40.1 %. Compared to the accuracy of 3.7 cm and 4.1 cm for the north component derived from the two standard PPP solutions, the one of the NWM augmented PPP solution is improved to 2.0 cm, about 45.9 % and 51.2 %. The positioning accuracy for the up component improves from 11.4 cm and 13.2 cm with the two standard PPP solutions to 8.0 cm with the NWM augmented PPP solution, an improvement of 29.8 % and 39.4 %, respectively.