VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ, FAKULTA STAVEBNÍ
ÚSTAV GEODÉZIE

Seminář s mezinárodní účastí

Družicové metody v geodézii a katastru

Sborník referátů

BRNO 2.2.2017

Seminář s mezinárodní účastí

Družicové metody v geodézii a katastru

Josef Weigel a Alena Berková
(editoři)

Vydal

ECON publishing, s.r.o.
Pod Nemocnicí 590/23, 625 00 Brno
e-mail: econ@atlas.cz
tel.: 602 755 541
www.econ.cz

v roce 2017 jako svoji 75. publikaci v systému ISBN.

Vydání první.

Redakce: doc. Ing. Josef Weigel, CSc., Ing. Alena Berková
Grafické zpracování: Ing. Alena Berková
Tisk: FAST VUT

ISBN 978-80-86433-64-6

GNSS DATA ANALYSIS FOR GEODESY AND ATMOSPHERIC RESEARCH AT THE INSTITUTE OF GEODESY AND GEOINFORMATICS

Krzysztof Sośnica[1], Witold Rohm, Jan Kapłon, Jarosław Bosy, Tomasz Hadaś, Karina Wilgan, Paweł Hordyniec, Kamil Kaźmierski, Grzegorz Bury, Mateusz Drożdżewski, Elżbieta Lasota, Estera Trzcina, Iwona Kudłacik, Jan Sierny, Andrzej Borkowski

The GNSS technique and the applications of precise GNSS observations become more and more important for current geodetic and atmospheric studies. Analysis of GNSS observations allows, e.g., for establishing and densification of global, regional and national reference frames, determining of Earth rotation parameters, precise positioning and navigation, precise orbit determination of low Earth orbiters, as well as the recovery of the water vapor content in the troposphere and electron density variations in ionosphere. Obtaining high-quality GNSS products requires a proper analysis and sophisticated methods of the mitigation of various systematic errors in GNSS observations, as well as high-quality a priori orbits and clocks. Moreover, new GNSS systems, such as Galileo, GLONASS, BeiDou and QZSS on one hand impose new challenges for data analysts due to various orbit types, signal frequencies and data formats, but on the other hand, new systems create opportunities of a development of innovative data processing methods and obtaining high-quality products, which was virtually impossible before.

This paper presents an overview of the activities related to the GNSS data analysis at the Institute of Geodesy and Geoinformatics (IGG) of the Wrocław University of Environmental and Life Sciences. The activities of the IGG GNSS&METEO Working Group concentrate in particular on: (1) integrated water vapor recovery from real-time and near real-time GNSS solutions [1,2], (2) integration of GNSS products and numerical weather models [3,4], (3) recovery of the total electron content (TEC) in the ionosphere and mitigation of the impact of TEC variations on GNSS positioning [5,6], (4) analysis of atmospheric occultation of GNSS signals between low orbiting and high orbiting satellites [7], (5) real-time precise point positioning using multi-GNSS signals [8,9], (6) evaluation of orbit quality and precise orbit determination of GNSS satellites using satellite laser ranging (SLR) observations [10,11]. The challenges related to data processing of the newly-deployed GNSS systems, such as Galileo and BeiDou with the quality assessment of multi-GNSS orbits and clocks and their impact on positioning, will be addressed, as well.

Literature

[1] DOUŠA J., DICK G., KAČMAŘÍK M., BROŽKOVÁ R., ZUS F., BRENOT H., STOYCHEVA A., MÖLLER G., KAPŁON J., 2016, Benchmark campaign and case study episode in central Europe for development and assessment of advanced GNSS tropospheric models and products, Atmospheric Measurement Techniques, Vol. 9 No. 7, s. 2989-3008

---

[1] Krzysztof Sośnica, Dr hab. inż., Institute of Geodesy and Geoinformatics, Wrocław University of Enviromental and Life Sciences, ul. Grunwaldzka 53, 50-357 Wrocław, Poland, tel.: +48 71 3205683, e-mail: krzysztof.sosnica@up.wroc.pl

[2] HORDYNIEC P., BOSY J., ROHM W. 2015 Assessment of errors in precipitable water data derived from global navigation satellite system observations. Journal of Atmospheric and Solar-Terrestrial Physics, Vol. 129 No. , Amsterdam, the Netherlands 2015, pp. 69-77, doi: 10.1016/j.jastp.2015.04.012

[3] WILGAN K., HURTER F., GEIGER A., ROHM W., BOSY J., 2016, Tropospheric refractivity and zenith path delays from least-squares collocation of meteorological and GNSS data, Journal of Geodesy, doi: 10.1007/s00190-016-0942-5

[4] WILGAN K., ROHM W., BOSY J. Multi-observation meteorological and GNSS data comparison with Numerical Weather Prediction model. Atmospheric Research, Vol. 156 No. , Amsterdam, the Netherlands 2015, pp. 29-42, doi:10.1016/j.atmosres.2014.12.011

[5] KRYPIAK-GREGORCZYK A., KAPŁON J., WIELGOSZ P., SOŚNICA K., HADAŚ T., KWAŚNIAK D., 2015, Processing of regional networks with single-frequency GPS data supported with high-resolution regional ionosphere model. 16th Czech-Polish Workshop "On Recent Geodynamics of the Sudety Mts. and Adjacent Areas", Srebrna Góra, Poland, November 5-7, 2015, pp. 37

[6] HERNÁNDEZ-PAJARES M., MONTE-MORENO E., GARCÍA-RIGO A., YANG H., WIELGOSZ P., HADAŚ T., ORUS-PÉREZ R., PRIETO-CERDEIRA R., BENIGUEL Y., SINGH T., 2015, Recent progress in characterizing multiscale ionospheric phenomena with GNSS and applications: Solar Flare over-ionization & Medium Scale Travelling Ionospheric Disturbances. SGI meeting, TU Berlin, Germany, 07-08 July 2015

[7] HORDYNIEC P., HUANG C-Y., ROHM W., LIU C-Y. 2016 Radio Occultation Toolbox (ROWUELS) - Recent Development in Raytracing Algorithms. IAG Commission 4 Positioning and Applications Symposium, Wroclaw University of Environmental and Life Sciences, Wroclaw, Poland, September 4-7, 2016

[8] HADAŚ T., BOSY J., 2015, IGS RTS precise orbits and clocks verification and quality degradation over time. GPS Solutions, Vol. 19 No. 1, Berlin - Heidelberg 2015, pp. 93-105. doi: 10.1007/s10291-014-0369-5

[9] KAŻMIERSKI K., HADAŚ T., SOŚNICA K. 2016 Real-time multi-GNSS products for the Precise Point Positioning. IAG Commission 4 Positioning and Applications Symposium, Wroclaw University of Environmental and Life Sciences, Wroclaw, Poland, September 4-7, 2016

[10] SOŚNICA K., THALLER D., DACH R., STEIGENBERGER P., BEUTLER G., ARNOLD D., JÄGGI A., 2015, Satellite laser ranging to GPS and GLONASS. Journal of Geodesy, Vol. 89 No. 7, Berlin Heidelberg 2015, pp. 725-743, doi: 10.1007/s00190-015-0810-8

[11] SOŚNICA K., PRANGE L., KAŻMIERSKI K., BURY G., DROŻDŻEWSKI M., HADAŚ T., THALLER D., 2016, SLR signature effect for Galileo with a focus on satellites launched into incorrect orbital planes. 20th International Workshop on Laser Ranging, Potsdam, Germany, October 09-14, 2016

Recenzováno: 3. 1. 2017

OBSAH