2.12 (1.9)

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SESSION Session 1: satellite tracking and scheduling

TYPE Presentation

TITLE Title: GOVUS – a new on-line tool for the evaluation of SLR observations to GPS, GLONASS, Galileo, BeiDou and QZSS

ABSTRACT

In the last decade, we have been witnessing a radical development of the new GNSS constellations. Besides the well-known GPS and GLONASS systems, newly developed systems such as Galileo, BeiDou and QZSS, become increasingly important. Thanks to adapting of the new generations of GNSS satellites to the SLR requirements, SLR became a valuable source of data. On the other hand, the constantly increasing number of the SLR targets imposes a great challenge for the ILRS tracking stations. In March 2017 a new ILRS Associated Analysis Center (ACC) was established with the main focus on the identification of systematic errors in SLR observations to new GNSS constellations, as well as for the assessment of the quality of multi-GNSS orbit products. The main service offered by the new ILRS ACC is the multi-GNSS Orbit Validation Visualizer Using SLR (GOVUS). The system performs a near real-time SLR validation of multi-GNSS microwave-based precise orbit products delivered by the Center for Orbit Determination in Europe (CODE) in the framework of the IGS MGEX project and covers five different GNSS systems: GPS, GLONASS, Galileo, QZSS, BeiDou MEO and IGSO. GOVUS allows for analyzing and visualizing the validation results using the dedicated on-line applications. The computational algorithms make use of the modified Bernese GNSS Software and provide fully automatic validation of new orbit products as a daily routine.

GOVUS system is a useful tool for the both, the ILRS and multi-GNSS community. The dataset of nearly half a million archival SLR residuals, which covers the time span since 2012, is being updated every day. The current and the past performance of the 40 ILRS stations, in terms of quantity and quality of data, can be easily investigated in the aspect of the GNSS tracking and finding systematic biases. Moreover, the validation results of 61 GNSS satellites from 5 systems, can be analyzed on the web browser without installation of any additional software. We present a comprehensive overview of the functionality and the structure of the developed system, as well as examples of analyses performed using the service modules. The analysis of the laser stations' performance reveals a heterogeneity of the SLR dataset in the context of the accuracy, the station systematics and compliance with the ILRS priorities list. The dependencies between the SLR residuals and particular stations' equipment will also be examined, e.g., the single and multi-photon mode of signal detection, differences between event and interval timers, 10Hz and kHz stations' performance.