Summary of 21st ILW Session 2

Improvements in the SLR Product Quality & Precise Orbit Determination

Monday, November 5, 2018, Canberra, Australia

Co-Chairs: Erricos C. Pavlis, Vincenza Luceri, Krzysztof Sośnica

The session dealt primarily with analysis-related topics relevant to the main theme of the session: the quality assessment of the ILRS products and the precision of the estimated orbits.

The session comprised of four groups of oral presentations and small number of poster presentations. The first group of oral presentations focused on the improvements of vital parameters for the accuracy of the ILRS products, touching on the estimation and monitoring of systematics, the accurate characterization of the target response of satellite arrays of primary interest (LAGEOS, LARES, Etalon, GNSS s/c), etc. The second group dealt with modeling improvements for the spacecraft, the geophysical models and corrections. A third group comprised of presentations that examined synergism between SLR and GNSS, through the SLR tracking of GNSS spacecraft. The final group of talks discussed the exploitation of SLR observations for geophysical model improvement and the establishment and monitoring of the terrestrial reference frame.

Vincenza Luceri: Progress on detection of SLR range biases to LAGEOS and Etalon satellites to improve the consistency of the scale realization between SLR and VLBI. Plans were presented on the preparation of a new Data Handling file including the biases identified from the ILRS ASC Pilot Project on "Station Systematic Error Monitoring—SSEM".

José Rodríguez: New station-specific center of mass (CoM) corrections for geodetic satellites: LAGEOS 1/2, Etalon 1/2, LARES, Starlette/Stella and Ajisai. Substantial differences of CoM values were detected for same multi-photon stations tracking Etalon and Ajisai with respect to the previous tables. A small but systematic difference between LAGEOS 1 and 2 forced us to adopt separate CoM corrections for two nearly identical spacecraft, justifying the ASC longstanding choice to estimate separate bias parameters for these two targets.

Andrey Pafnutyev: Validation and estimation of the laser retro-reflector array offsets for GLONASS-M on the basis of SLR data and IGS orbits provided by different analysis centers. Possible differences with respect to official values can be detected, however, the estimated offsets strongly depend on the GNSS orbits used.

Erricos C. Pavlis: Preparation of models and standards for SLR contribution to the future realization of ITRF. New models for the IERS secular pole (earlier used mean pole), gravity field models, progress in monitoring biases and in the preparation of new CoM tables.

Akihisa Hattori: New estimates of the solar radiation pressure coefficients for LAGEOS-1/2 and Ajisai. Analysis and explanation of the evolution of Ajisai's SRP coefficient in time.

Janina Boisits: Preparation of the zenith delay models and mapping functions adapted to SLR data, the so-called Vienna Mapping Function for optical wavelengths (VMFo) based on numerical weather models. Early tests indicate that the best solutions are obtained when using

the wet delay from the numerical model and the hydrostatic delay from the station pressure measurements.

Krzysztof Sośnica: Combination of SLR to Sentinel-3A/B data and SLR data to LAGEOS for the improvement of the determination of global geodetic parameters and identification of SLR biases. Demonstration of SLR-PPP (Precise Point Positioning) method including estimation of SLR station coordinates based on GPS-based Sentinel orbits without any network constraints imposed on SLR stations.

Grzegorz Bury: Improving macro-models of the non-gravitational forces for Galileo satellites using Galileo metadata. Demonstration of the SLR potential in validating empirical, physical and hybrid orbit models. SLR potential for orbit determination of Galileo spacecraft when the microwave-based orbits are not available.

Florian Andritsch: Progress in SLR data simulation to evaluate the potential of SLR-GNSS co-location onboard GNSS spacecraft.

Mathis Bloßfeld: Demonstrating the potential of combined SLR gravity field solutions at the SINEX level. Combination of solutions provided by different analysis centers using the variance component method to improve the consistency between SLR and GRACE products.

Ulrich Meyer: Demonstrated the potential of SLR-based and SLR+SWARM gravity field solutions for filling the gap between GRACE and GRACE-FO (Follow On) missions. Estimation of the ice mass depletion in Greenland for the time span of 23 years using consistent SLR gravity field solutions and the comparison to "GRACE K-band"-based results.

Fan Shao: Progress in developing SLR solutions at the Shanghai Astronomical Observatory: Estimation of Earth rotation parameters and SLR station coordinates on the basis of LAGEOS data.

Posters:

Five presentations were moved to a poster session due to the lack of oral slots and/or the appropriateness of the covered topics. The posters covered more or less the same areas that oral presentations covered. In particular:

A3 **Dimitrios Ampatzidis:** A combined solution of SLR, SLR to GNSS and microwave GNSS data at Normal Equations Level: Preliminary results and facts were presented.

A4 **Erricos C. Pavlis:** Expanded SLR target constellation for improved future ITRFs. Examining the improvement of SLR products from the expansion of the main target group to include selected GNSS targets.

A5 **Krzysztof Sośnica:** Network effects and handling of geocentre motion in SLR and GNSS solutions. Examined the trade-off between improved geocenter estimates and the correlation with GNSS-specific estimated parameters.

A6 **Xiaoya Wang:** A common mode error explore for GNSS/VLBI/SLR/DORIS based on PCA method.

A7 **Florent Deleflie:** A new model of the mean albedo of the earth: Estimation and validation from the GRACE mission and SLR satellites.