Young Authors Award 2013
Citation for Krzysztof Sośnica

Krzysztof Jakub Sośnica

The IAG Young Authors Award 2013 is presented to Krzysztof Jakub Sośnica for his paper "Impact of loading displacements on SLR-derived parameters and on the consistency between GNSS and SLR results" written together with the co-authors and advisors Daniela Thaller, Rolf Dach, Adrian Jäggi, and Gerhard Beutler.

The work was published in the Journal of Geodesy, 2013, Volume 87, Issue 8, pp. 751-769. The article studies the impact of Ocean Tidal Loading (OTL), Atmospheric Tidal Loading (ATL), and Atmospheric Non-Tidal Loading (ANTL) on 12 years of Satellite Laser Ranging (SLR) data.

The international scientific community currently recommends applying OTL and ATL corrections at the observation level for IERS products, but not the ANTL corrections. The article shows, however, that the application of ANTL on the observation level does not only positively impact the long-term stability of the estimated station coordinates, but the quality of Earth Rotation Parameters, satellite orbits, and geocenter coordinates, as well.

ANTL corrections play in particular a crucial role in the combination of optical (SLR) and microwave (GNSS, VLBI, DORIS) observations because of the so-called Blue-Sky effect: SLR measurements require a cloudless sky, typically associated with high air pressure, which deforms the Earth's crust. Microwave observations, on the other hand, are weather-independent and therefore continuously available. The omission of ANTL corrections in the analysis of space geodetic data therefore leads to inconsistencies between SLR and GNSS solutions, up to 2.5 mm for inland stations. The application of ANTL corrections on the observation level does not only improve the stability of SLR solutions, but reduces the discrepancies between GNSS and SLR solutions due to the Blue-Sky effect, as well, which is confirmed by about 10% improvement of the estimated GNSS-SLR coordinate differences with respect to local tie vectors measured on ground at the co-located GNSS-SLR sites. These results indicate how to further improve the consistency between different space geodetic techniques. They are important in the context of GGOS, striving for a 1 mm accuracy and a 0.1 mm/y stability for the next generation of terrestrial reference frames.

Krzysztof Sośnica studied geodesy at the Wroclaw University of Environmental and Life Sciences from 2004 to 2009, when he graduated with a thesis on filtering airborne laser scanning data with wavelet algorithms. After additional IT studies in Wroclaw he joined the satellite geodesy research group at the Astronomical Institute of the University of Bern (AIUB). His research was devoted to the analysis of SLR data with the focus on Earth Rotation Parameters, on temporal variations of the Earth's gravity field, and on the improvement of the terrestrial reference frame. In 2014 he completed his work in Bern with a Ph.D. thesis entitled "Determination of Precise Satellite Orbits and Geodetic Parameters using Satellite Laser Ranging". After one year as a research associate at the AIUB he returned to Wroclaw University in spring 2015.

Young Authors Award 2014
Citation for Alvaro Santamaría Gómez

Alvaro Santamaría Gómez

The awardee, Alvaro Santamaría-Gómez, took his first steps in geodesy during his undergraduate degree in land surveying at the University of Salamanca in 2002 and then during his graduate degree in geodesy at the Technical University of Madrid in 2005. In 2006 he joined the geodetic department at the National Geographic Institute of Spain and in 2007 he started his PhD studies at the Geodesy Research Laboratory of the National Geographic Institute of France. His PhD research focused on the correction of vertical land motion in tide gauge records using GPS velocities. In 2012, while working on the awarded paper, he obtained a Marie Curie International Outgoing Fellowship at the University of La Rochelle and the University of Tasmania. The objective of his present research is to advance in the understanding of vertical land motion errors and its impact on sea level change estimates from tide gauges and satellite altimetry.

The award-winning paper presents an improvement of the method to estimate linear trends of vertical land motion (VLM) at tide gauges using mean sea level observations. Former methods were based on differences between pairs of tide gauge records or differences between a tide gauge record and its corresponding nearby satellite altimetry record. The improved method in this paper is based on double differences between pairs of tide gauge records and their corresponding nearby pairs of satellite altimetry records. The estimated relative VLM trend between redundant (multiple inter-connected) pairs of tide gauges is then adjusted while taking into account their spatial correlation. The VLM trend at each tide gauge is finally obtained by adjusting the origin or datum of the relative VLM estimates using vertical velocities from GPS stations co-located near some of the inter-connected tide gauges. One of the main advantages of this method is that the geocentric VLM of many inter-connected tide gauges can be estimated from a lower number of co-located GPS stations, i.e. more than one tide gauge per co-located GPS station. When redundant (multiple) GPS velocities are available their relative vertical velocities can be compared against the double-differenced results, resulting in an independent method to assess the quality of GPS vertical velocities to determine the VLM at the tide gauges. Furthermore, by using differences between pairs of altimetry records, the impact of relative geocentric sea-level trends between pairs of tide gauges is reduced while also reducing the spatially-correlated trend errors arising from altimeter bias drift, satellite orbits or sea-surface pressure. More than a thousand tide gauges were considered in the paper. However, due to the shortness of the satellite altimetry records, only pairs of tide gauge and satellite altimetry having an extremely high spatial correlation were used, which reduced the number of tide gauges used to 86. With the extension of the satellite altimetry data span in the future, the correlation threshold can be loosened resulting in more pairs of inter-connected tide gauges being included in the double differences. The estimated VLM at the tide gauges has a mean formal uncertainty of 0.7 mm/yr including the uncertainty of adjusting the datum of the relative VLM using sparse GPS velocities. With a larger number of tide gauge pairs and co-located GPS velocities, this uncertainty could be substantially reduced.