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SESSION Session 3: Accuracy and scheduling

TYPE Poster

TITLE Sensitivity of SLR observations to horizontal gradients of the tropospheric delay

ABSTRACT

Satellite laser ranging is only the one space geodetic technique which currently does not consider horizontal gradients of the troposphere delay. This neglect may have a negative impact on SLR products. SLR observations are sensitive mainly to the hydrostatic part of troposphere delay. In comparison to microwave-based space observation techniques, the variability of the impact of non-hydrostatic delay is very small and does not require estimating additional parameters in case of SLR. This paper shows the potential of SLR for the recovery and validation of atmospheric asymmetry above SLR stations. We use observations to passive geodetic satellites: LAGEOS-1 and LAGEOS-2. The horizontal gradients are estimated as additional parameters in standard SLR solution with the North and East components using Chen-Herring mapping function. We compare new products of SLR solutions with Linear Horizontal Gradients (LHG) derived from the European Centre of Medium Range Weather Forecast (ECMWF) and GNSS horizontal gradients obtained from the solutions provided by the Center for Orbit Determination in Europe (CODE) for SLR-GNSS co-located stations. SLR provides observation only under cloudless weather conditions, which results in a much smaller number of observations when compared, e.g., to GNSS. Due to a limited number of SLR observations we estimate horizontal gradient parameters once per 7 days. The long-term analysis of SLR horizontal gradients shows a moderate agreement with GNSS, a good agreement with hydrostatic part of LHG and a moderate agreement with non-hydrostatic part of LHG at the level of: 47 %, 74 %, 54 %, respectively. In a result, the SLR horizontal gradients can be used as a tool for the validation and extraction of long-term horizontal gradients of the troposphere delay as well as for the assessment of the atmosphere asymmetry over SLR stations.