

Precise orbit determination of SLR and altimetry satellites using ITRS2020 realizations

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In 2022, three new realizations of the International Terrestrial Reference System (ITRS), namely, ITRF2020, DTRF2020 and JTRF2020 are to be published. Compared to the 2014 realizations of the ITRS, they are based on a 6-year longer data time span (extended by 2015.0-2021.0), observations from new tracking stations, improved modelling of geophysical and other effects as well as technique-specific biases. Additionally, long-term mean satellite laser ranging (SLR) range biases were determined and applied for the 2020 realizations of the ITRS. A precise and stable reference frame realization is the basis for the computation of precise satellite orbits. In this study, we hence discuss the application of the new ITRS2020 realizations for precise orbit determination of some spherical SLR satellites at the altitude between 690 and 19135 km, as well as of four non-spherical (altimetry) satellites at the altitude of about 1300 km. We investigate the impact of the new ITRS realizations on the root-mean-square (RMS) and mean fits of SLR observations and remaining range biases. For altimetry satellites, we additionally investigate the impact on the RMS and mean of the sea surface height crossover differences as well as geographically correlated errors. We also compare the results derived with the new 2020 realizations to those derived with the previous (SLRF2014) realization of the ITRS.