

An independent assessment of T2L2 results from the NASA SLR Network

Background: Based on the GGOS recommendations of network accuracy at 1 mm and network stability at 1 mm/year [Plag et al. 2009], the ILRS derived a recommendation of station time synchronization to within +/- 100 nanoseconds of UTC [Pearlman et al. 2002].

Historically, LAGEOS-1, -2 have been the only two satellites used in generating SLR ITRF station coordinate solutions. LAGEOS has a velocity of ~3mm/microsecond. A constant station time bias of 100 nanoseconds will induce a horizontal station position error up to 0.3 mm. Therefore; the ILRS recommendation of 100 nanosecond time synchronization achieves the 1 mm GGOS recommendation.

Using the T2L2 experiment on-board Jason-2, time biases in laser ranging station were monitored to an absolute accuracy of less than 100 nanoseconds [Belli et al. 2018]. Based on these T2L2 results, time bias corrections for the NASA SLR stations were added to the ILRS Data Handling file, for use by the ILRS Analysis Centers in generating the next SLR solution for ITRF (i.e. ITRF2020).

Abstract: An independent assessment of the T2L2 results from the NASA SLR network was performed using a combination of in-depth analysis of the T2L2 results; timing data from the daily NASA SLR station Laser Observation Reports (LORs); NASA SLR log files; and HITU pass-by-pass time bias results.

The T2L2 results indicated there were some sudden jumps in time biases from the NASA SLR stations which coincided with the installation of the NASA SLR Event Timer Modules (ETMs).

Based on the verification processes, we will attempt to answer the following questions:

Are the T2L2 time bias results for the NASA SLR sites accurate to better than 100 nanoseconds on a pass-by-pass basis?

Are there any flaws in the T2L2 results and if yes, are there any updates the ILRS Data Handling file needed?

Based on this analysis, what recommendations can be made to improve the accuracy of NASA SLR time synchronization?