SLR validation of IGS Galileo orbits derived in the framework of the ITRF2020 realization

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The latest realization of the International Terrestrial Reference Frame, ITRF2020, incorporates for the first time, the observations of the European Galileo satellite system. Thanks to the effort of the ILRS stations, a large number of SLR observations has been collected to Galileo In-OrbitValidation (IOV) and Full Operational Capability (FOC) satellites, allowing for the orbit validation.

In this study, we show results from the Galileo orbit validation of different International GNSS Service (IGS) analysis centers, as well as the combined orbits from the 3rd IGS reprocessing campaign (Repro3) generated by the IGS Analysis Centre Coordinator (IGS ACC) at Geoscience Australia. We identify systematic errors related to the signature effect for IOV and FOC satellites that are equipped with different types of retroreflectors for SLR stations equipped with CSPAD, MCP, and PMT detectors. Finally, we compare the orbit quality from different IGS analysis centers, especially those that use zero-difference GNSS solutions with the clock estimation and double-differences that lead to an inferior quality of the orbit radial component. We summarize the recent progress in GNSS orbit modeling with the emphasis of the SLR contribution to the validation of GNSS orbits and the realization of the international terrestrial reference frames