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Improved SLR orbit validation for Copernicus Sentinel-3 mission

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The European Copernicus Sentinel-3 mission, a jointly operated mission by ESA and EUMETSAT, consists of two satellites equipped with GPS and DORIS receivers, and a Laser Retro Reflector (LRR) array, which allows tracking the satellites by Satellite Laser Ranging (SLR). The SLR observations are mainly used for the validation of GPS- and/or DORIS-derived precise orbit solutions. The SLR residuals are derived from the simple difference between observed and computed range between SLR station and the satellite. Only a subset of the SLR stations tracking the satellites is normally used for this purpose. The subset consists of stations delivering good quality observations on a long-term. The station selection is regularly reviewed to guarantee a continuous quality for the orbit validation.

Instead of using only a subset of the stations it would be preferable to use as many laser tracking data as possible. Long-term and highly accurate orbit time series of low Earth orbiting satellites can be used to estimate station range biases. The SLR validation is significantly improved by adding these station range biases due to additional stations and due to the removal of SLR related systematic patterns.

In the Copernicus POD Service (CPOD), the SLR station range biases are estimated based on a combined Sentinel-3A and -3B orbits computed from different orbit providers (the CPOD Quality Working Group). Performance, quality, mission dependency and stability of these SLR station range biases are analysed based on operational CPOD orbits and orbit solutions delivered by the Copernicus POD Quality Working Group.