

Precise Orbit Determination of BDS satellites based on China Laser Ranging Network

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Abstract: The accuracy of Satellite Laser Ranging (SLR) can reach 1cm. There is no carrier phase ambiguity and clock difference are not affected by the ionosphere, which can be used as a measurement technology independent of GNSS observation technology. SLR can also be used independently to accurately orbit satellites with laser rear angular reflectors. The precise orbit of the satellites with Laser Retroflect Arrays for SLR can be determined using only SLR. The work of SLR observation of Beidou Navigation Satellite System (BDS) is mainly handled by several stations of China SLR network, and the number of the routine observation of foreign SLR stations is small. This paper focuses on evaluating the precision orbit determination accuracy of BDS satellites based on China SLR network. the observation data of China SLR stations are used to compute the precision orbit and the forecast orbit and evaluate the accuracy of GEO, IGSO and MEO satellite. The results show that the accuracy of precision orbit GEO is about 20m and 0.4m for 3D and radial components for 3-day arcs, respectively; the accuracy of IGSO is about 2.5m and 0.2m for 3D and radial components for 5-day arcs, respectively; the accuracy of MEO is about 1.5m and 0.2m for 3D and radial components for 5-day arcs, respectively. The forecast accuracy of GEO is about 28.0m for 1-day, 44.0m for 2-day and 60.0m for 3-day; The forecast accuracy of IGSO is about 2.9m for 1-day, 3.5m for 2-day and 4.3m for 3-day; The forecast accuracy of MEO is about 2.0m for 1-day, 2.5m for 2-day and 3.0m for 3-day. The results show that the high precision orbit of the navigation satellites can be achieved with the small and sparse SLR data.

Keywords : Satellite Laser Ranging; Beidou Navigation Satellite System; Precise Orbit Determination; BDS