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SLR OBSERVATION OF TIANGONG-1

**Abstract**

Tiangong-1 ended its service in March 2016 and is expected to fall in March 2018. The joint satellite laser ranging observations from November 2017 have been organized by Purple Mountain Observatory. Tiangong-1 carries two reflectors - a larger one and a smaller one. In its SLR data, the relative distance between two lines from different reflectors can be used to estimate the rotational state. In data processing, a distance correction factor is added to correct the change of relative distance caused by different reflecting surfaces of the large reflector. And due to the limited range of the small reflector, the arcs with two data lines are smaller than observational arcs, and even much smaller than the rotation period, which leads to multiple solutions all with significant errors. However, the orientation of the rotational axis in space can be well estimated within the short arcs. Through calculating the precession of the rotational axis in several days which is caused by gravity-gradient torque, a more accurate rotational velocity can be estimated. Eventually the change of the rotational velocity can be obtained in the months before reentry.