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FLIGHT RESULTS OF SUPER LOW ALTITUDE TEST SATELLITE "TSUBAME/SLATS" AND  
FOLLOW-ON PLAN

**Abstract**

Super Low Altitude Test Satellite "TSUBAME/SLATS" was successfully launched on December 23, 2017 and continued descending toward very low altitudes. SLATS has operated for 111 days from 271.5 km to 167.4 km of very low earth orbit (VLEO) and completed its operation on October 1, 2019.

We are challenging to expand our fields of space activities toward these altitudes almost never been used for long-life remote sensing so far. VLEO provides new viewpoints for Earth observation, such as higher resolution imaging and less powerful SAR than before.

As JAXA's first demonstrator to operate in VLEO, SLATS has achieved the following major operational results and proved the potential of VLEO utilization. 1) Technology demonstration of VLEO operations such as high-precision orbit control methods using an ion engine. 2) An aerodynamic database is constructed based on measured data of atmospheric density. The SLATS data shows that the on-orbit environment was thinner than that predicted based on the conventional NRLMSISE model. 3) Long-term atomic oxygen (AO) data and material degradation data in the VLEO environment is acquired for the first time in the world, providing insight into evaluation and countermeasure technologies for AO. 4) Optical imaging from VLEO using an ion engine was successfully conducted for the first time in the world by a small and high-resolution panchromatic optical sensor in order to achieve under 1 m resolution. It is confirmed that the degradation impact on the image quality from atmospheric disturbances and ion engine operations is negligible.

On the other hand, there are still several issues to be resolved regarding practical applications. The main challenges are: 1) Operation lifetime in VLEO, 2) Quality of satellite data products and 3) Data transmission capacity. To realize various missions in VLEO, we are currently studying a new test satellite that follows SLATS.

This paper introduces flight results of SLATS and summary of conceptual study about JAXA's next VLEO satellite.