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RESULTS OF ATOMIC OXYGEN AND ITS EFFECTS OBSERVATIONS ONBOARD SLATS

Abstract

JAXA has proposed a brand-new concept for satellites in Low Earth Orbit (LEO). The Super Low Altitude Test Satellite (SLATS), also known as TSUBAME, is the first Earth observation satellite to occupy a Super-Low Orbit or Very Low Earth Orbit (VLEO), below 300 km. SLATS was launched on December 23, 2017 and finished its operation on October 1, 2019. The purposes of SLATS are (1) testing the maintenance of the satellite's altitude with its ion engine against high atmospheric drag at a super-low altitude, (2) acquiring data on atmospheric density and atomic oxygen (AO), and (3) testing optical Earth observation. We have onboarded the AMO instrument for acquiring data for AO. The AMO has two sensors—the Atomic Oxygen Fluence Sensor (AOFS) and the Materials Degradation Monitor (MDM). The AOFS obtains AO environment data in SLATS' orbit and consists of eight sensor Heads (AOFS-H) and one electronic readout. To measure AO, six Thermoelectric Quartz Crystal Microbalances (TQCMs) with polyimide sensors (AOFS-Hs) were mounted on several satellite locations. The MDM observes the degradation of material candidates for use in super-low altitude satellites. This final paper summarizes the insights gained on the effects of neutral atmosphere obtained from the observations of SLATS. This knowledge will contribute to the future design and operation of VLEO satellites.