

Multiple Satellite Observations of Oxygen Torus in the Inner Magnetosphere

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A recent study employing the Arase and Van Allen Probes A satellites at different MLT revealed an event in which the inner magnetospheric O⁺ density enhancement (known as the dense oxygen torus) does not extend over all MLT. Rather, the torus is skewed toward the dawn sector, being described more precisely as a crescent-shaped torus or a pinched torus [Nosé et al., 2018]. In the reported event of 24 April 2017, Arase flying in the morning sector detected an enhancement of the average plasma mass up to ~3.5 amu around L=4.9–5.2, while Van Allen Probe A flying in the afternoon sector observed no clear enhancements in the average plasma mass. In the present study, we focus on simultaneous observations of the magnetic field and plasma waves made by the Arase and Van Allen Probes A and B satellites on 12 September 2017. For this event the orbital configuration of the satellites is opposite to that in the study by Nosé et al. [2018]; that is, Arase is in the afternoon and the Van Allen Probes are in the morning. It is found that only Probe B observed a clear enhancement in the average plasma mass up to ~4 amu around L=3.5 and MLT=9.0 hr. This result demonstrates that the crescent-shaped O⁺ torus is not a unique (single-event) occurrence, and thus may be a general feature of the density enhancement in the inner magnetosphere.