



SEMINAR 專題演講



國立中央大學 太空科學與工程學系

Department of Space Science and Engineering, National Central University

Time

Friday, March 13, 2026
15:00 – 16:00

Oxygen Torus and Warm Plasma Cloak: A Review

Place

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S4-917 教室
Room S4-917,
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The talk reviews past observational studies of low-energy ion populations in the Earth's magnetosphere, known as the oxygen torus and the warm plasma cloak. These populations have been investigated since the early 1980s and have recently regained attention. The oxygen torus is characterized by enhanced O^+ ions at energies below several tens of eV near the plasmapause ($L = 3-5$), with a magnetic local time distribution skewed toward the dawn sector, whereas the warm plasma cloak consists primarily of field-aligned H^+ and O^+ ions with energies from ~ 10 eV to ~ 3 keV, extending from the nightside through dawn to the dayside at $L = 4-12$. Several formation mechanisms have been proposed for the oxygen torus, including ionospheric heating due to ring current-plasmasphere interactions, the geomagnetic mass spectrometer effect, and direct supply of low-energy O^+ ions from the nightside ionosphere followed by eastward drift. Recent observations favor the latter mechanism, although the relative importance of each process remains uncertain. The formation of the warm plasma cloak is generally attributed to ionospheric outflow transported through the magnetotail and subsequently convected earthward. Considering their energy and spatial distributions as well as plausible generation mechanisms, the oxygen torus and the warm plasma cloak appear to be distinct plasma populations. Their mutual relationship and the dominant formation process of the oxygen torus remain open questions, motivating future observations with improved ion composition measurements across a wide energy range.