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THE CLEFT ION PLASMA ENVIRONMENT AT LOW SOLAR ACTIVITY (EXTENDED ABSTRACT)

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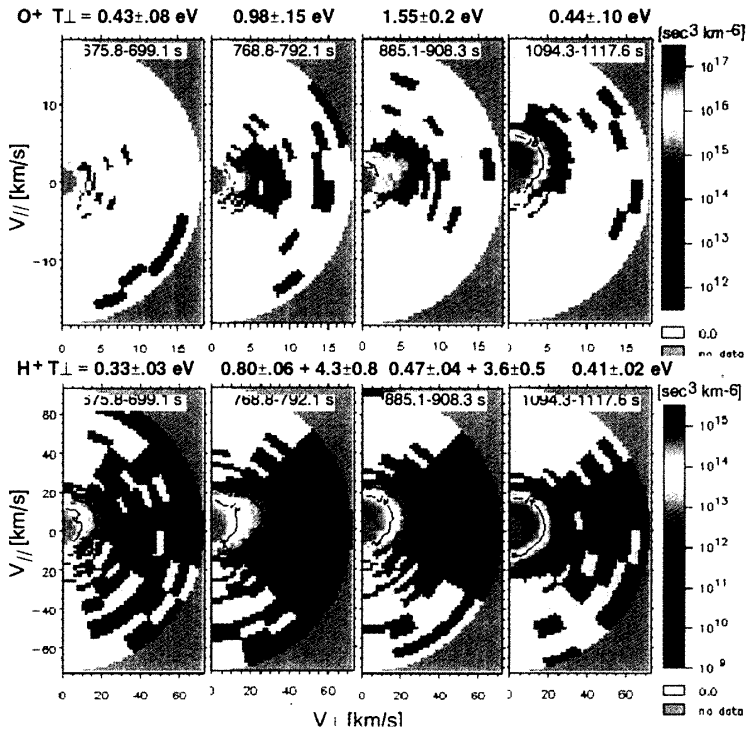
Low energy (0.3–25 eV) ion plasma composition and three-dimensional differential velocity distribution measurements have been made from the Sounding of the Cleft Ion Fountain Energization Region (SCIFER) mission. SCIFER traveled poleward into the dayside prenoon cleft region under conditions of low solar activity. Upleg measurements show that the subcleft topside had a rapid density



Selected energy-pitch angle distributions and perpendicular temperatures (core and tail in some cases).

fall-off with altitude ($n_e \leq 300\ cm^{-3}$ at 1400 km altitude), and that the payload floating potential changed from typical ionospheric negative values of about a volt, to zero or positive values consistent with $n_e \leq 1000\ cm^{-3}$ in sunlight. As the payload moved poleward and approached apogee, the ion plasma flux abruptly increased. Observations of Langmuir waves at the electron plasma frequency show the plasma density increased by a factor of 6 over a scale length of $\sim$1 km. The plasma density boundary coincided with passage into the cleft region, as judged from the appearance of field-perpendicular ion heating to $T\perp \sim 1$ eV, with upward bulk flows of several km/s for H^+, and 1–2 km/s for O^+, and warm superthermal tails in the core H^+ with characteristic energy $\sim$4 eV. An inverse association was observed between ion temperature and plasma density, consistent with heating by current-driven waves. The heated cleft plasma was H^+-dominated in this region, in stark contrast to the O^+ domination observed from 3000–6000 km altitude by DE-1 and Akebono near solar maximum.

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