Simultaneous Imaging of O^+, Mg^+, and Fe^+ Ion Densities In the E- and F-region Ionosphere

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The High Resolution Airglow and Aurora Spectroscopy (HIRAAS) experiment was launched from Vandenberg AFB, CA aboard the *Advanced Research and Global Observation Satellite (ARGOS)* on 23 February 1999 at 2:29:55 AM Pacific Standard Time. The ARGOS is in a sun synchronous, circular orbit at an altitude of 843 Km. The ARGOS operated from mid-May 1999 through March 2002. The HIRAAS experiment contains the Low Resolution Airglow and Aurora Spectrograph (LORAAS) and the Ionospheric Spectroscopy and Atmospheric Chemistry (ISAAC) instruments. Both instruments gathered limb scans over the 750–100 Km altitude range. The LORAAS observe limb profiles of the 911 Å emission during the daytime; this emission is produced by radiative recombination of F-region O^+ ions and electrons and therefore are useful for characterizing the ion density distribution in the F-region. The ISAAC instrument observed the middle ultraviolet passband 1800-3200 Å at 3.8 Å resolution; of interest here are the Mg^+ emissions at 2800 Å and the Fe^+ emission near 2600 Å. The Mg+ and Fe^+ ions are produced by meteor ablation below 90 km and are transported into the F-region where they persist for several days. These ions are excellent tracers of dynamics in the E and lower F-region. Maps of the densities of these species show compact structures, ~1-10 km thick, that may either be small scale patches or blobs. Some of these compact structures have been observed well into the F-region.

We present the first latitude versus altitude maps of the densities of all three species. The O^+ maps are produced by tomographically inverting the O I 911 Å radiance profiles. The species densities of the meteoritic ions are determined by scaling the radiance maps, as the viewing geometry minimized overlap between contiguous limb scans.