

Imaging observation of spatial structure of sporadic E layer by Magnesium Ion Imager on the sounding rocket S-520-29

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To study the spatial structure of midlatitude sporadic E (Es) layers, the vacuum ultraviolet resonant scattering by magnesium ions (Mg^+) in an Es layer was observed with the Magnesium Ion Imager (MII) on the sounding rocket S-520-29. Since the Es layer is formed by the convergence of metallic ions that have slow ion-electron recombination rates, the distribution of Mg^+ , which is one of the dominant species among the metallic ions, is thought to reflect the spatial structure of the Es layer. It is suggested that the spatial structure of the Es layer is closely related to various ionospheric phenomena such as the field aligned irregularity and the E-F coupling. Therefore, it is expected that imaging observations of the Mg^+ distribution will provide new knowledge in the spatial structure of the Es layer.

The sounding rocket S-310-38 was launched from the Uchinoura Space Center in Kagoshima, Japan, on 6 February 2008 for the same purpose and the two-dimensional horizontal structure of Mg^+ in an Es layer was observed for the first time. While this result demonstrates the usefulness of Mg^+ imaging for understanding the spatial structure of Es layers, the attitude of the sounding rocket, especially the zenith angle of the rocket axis was unusually tilted and the area of meaningful observation was limited.

In the sounding rocket S-520-29 experiment conducted on 17 August 2014, the MII was improved since the S-310-38 experiment and an attitude control system by gas jet was implemented. Unfortunately, the attitude control did not work as expected, but the Mg^+ distribution was successfully observed and important information on the spatial structure of the Es layer was obtained.