VALIDATION OF ION DENSITY MEASUREMENT USING RPA ONBOARD SROSS-C2 SATELLITE

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Abstract

An aeronomy payload of Retarding Potential Analyser (RPA) consisting of an electron RPA, ion RPA and a potential Probe (PP), designed and developed at the National Physical Laboratory, New Delhi, was flown onboard the Indian satellite SROSS-C2 in May, 1994, for making in situ measurements of F-region ionospheric plasma over the Indian region. The objective of the mission was to investigate the characteristics and energetics of the equatorial and low latitude ionosphere / thermosphere over the Indian region. The SROSS-C2 was a spin-stabilized orbiting satellite placed in an elliptical orbit having orbit inclination of 46.3°. The payload made simultaneous sampling of electron and ion plasma in the altitude range of 420 -620 km for more than half a solar cycle from solar minimum to maximum of the 23 solar cycle activity. The latitudinal coverage was normally in the range of 5°N to 30°N. This was extended to 40°S to 40°N during campaign modes, when data was collected from ground stations located at higher latitudes. Several scientific investigations, such as latitudinal distribution, diurnal and seasonal behaviour, solar activity dependence and also special features like evening enhancement in temperatures, geomagnetic storm associated variations, have been carried out utilizing the electron, ion temperatures and ion density and ion composition derived from SROSS-C2 observations. The findings from these studies have been brought out. Recently, it has been observed that some discrepancies in absolute ion densities occur when compared with those derived from ground based ionsonde observations. So a rigorous study has been undertaken to resolve this uncertainty. It may be

mentioned here that this correction will in no way effect the scientific content or the conclusions presented so far, as this will only be a fixed bias in the derivation of the density parameter.

In the present study ground based observations made using ionosondes at Delhi (28.6°N, 77.2°E) and Trivandrum (8.55°N, 76.88°E) are utilized to validate the SROSS-C2 density measurements. In this particular study only those trajectories of SROSS-C2 are selected which cross the latitude of at least one of the above two stations. The ionosonde data (NmF2, hmF2) is extrapolated to SROSS-C2 altitude using IRI model. The difference in two values is examined in detail and is interpreted in terms of sensor efficiency factor, which is currently presumed to be 50%. The RPA sensors have planar geometry similar to those used by Hanson et. al.,of University of Texas at Dellas. Attempts are in progress to arrive at a more appropriate efficiency factor. This critical evaluation of SROSS-C2 ion density measurements will make the absolute values more meaningful.