Spatio-Temporal Variability of the Equatorial and Low Latitude Ionosphere – Results from the Indian Ionospheric Tomography Experiment, CRABEX.

Sudha Ravindran[1], N Mridula[1], R Sridharan[1], R S Dabas[2], A D Sarma[3] and Rajnish Sarma[4]
[1]*Space Physics Laboratory, Vikram Sarabhai Space Centre, Trivandrum, India*
[2] *National Physical Laboratory, New Delhi, India*
[3]*NERTU, Osmania University, Hyderabad, India*
[4]*Master Control Facility, Bhopal, India*

Ionospheric tomography is a relatively new and simple technique used to study the spatial and temporal variability in the ionosphere. It essentially consists of a satellite and three or more ground stations located in a line under the path of the satellite. The total electron content (TEC) along many intersecting paths between the ground stations and the satellite are used to reconstruct an image of electron density in a plane defined by the satellite orbit and the ground using appropriate inversion algorithms. A number of tomographic network chains have been set up worldwide during the past two decades which have demonstrated the usefulness of this technique to delineate the large and small scale structures in the ionosphere.

The Indian ionospheric tomography experiment CRABEX (Coherent Radio Beacon Experiment), is aimed at investigating the equatorial ionospheric processes like equatorial ionization anomaly (EIA), equatorial spread F (ESF) and equatorial electrojet (EEJ), and their inter relationship. As a part of this program, a network of five stations covering the region from Trivandrum (8.5°N) to Delhi (28.8°N) along the 77-78° E meridian has been set up, which is known as the CRABNET (CRABEX Network). The data from the CRABNET stations are used to generate the tomographic images of the equatorial and low latitude ionosphere. The *foF2* values estimated from these images are seen to agree reasonably well with those observed using co-located ionosondes, thus confirming the accuracy of these images. Examples of images depicting the temporal evolution of EIA and its day-to-day variability under different geophysical conditions are presented. It is seen that the fully developed EIA crest is aligned approximately along the geomagnetic field lines. The EIA parameters like strength and location of crest is seen to be well correlated with EEJ strength. The disturbed time behavior of the equatorial ionosphere is also studied. An important aspect, which is observed is that even on days with minor geomagnetic disturbance, the location of EIA crests show large latitudinal variation. The paper also presents the meridional structures of ESF irregularities, which cannot be otherwise mapped with any ground-based experiments.