



Research Networking Programmes

Short Visit Grant or Exchange Visit Grant

(please tick the relevant box)

Scientific Report

The scientific report (WORD or PDF file – maximum of eight A4 pages) should be submitted online within one month of the event. It will be published on the ESF website.

Proposal Title: Thunderstorm effects on the atmosphere-ionosphere system

Application Reference N°: 7051

1) Purpose of the visit

The visit to DTU Space, Denmark was undertaken during the period 27 Sept 2015 to 09 Oct 2015. The purpose of this visit was follow up to the research collaboration established between Indian Institute of Geomagnetism (IIG) and DTU Space Denmark in 2011. The collaboration led to the setup of first Transient Luminous Events (TLE's) monitoring experiment in India and the subcontinent. The present TLE observation station in Indian operates from the site of Allahabad (lat 25.4 N; long 81.9 E) located in the Indo-Gangetic planes. Observations during the monsoon season of 2012 and onwards have led to a capture of more than 100 TLE's of all varieties. The first report of the observation of TLE's was published in the Indian journal of "Current Science" [Singh et al., First observations of transient luminous events in Indian subcontinent, Vol 107, No. 7, 107-108, 2014]. Last more than three years of TLE's observation in India let to the observation of all know forms of TLE's and rare events of observation of Gigantic jet for the first time over the land. A more complete analysis is of great interest to understand the morphology of the Indian thunderstorm because these are the first observations over Indian thunderstorms. The visit to DTU space was undertaken during 09 Sept - 09 Oct 2015 to fulfil the mentioned objective.

2) Description of the work carried out during the visit

Since the start of the collaboration in 2011, DTU space has been in continuous touch with our group at IIG with all the operational help to operate the TLE experiment

in India apart from the regular scientific discussions on the TLE's observed in India. During the stay at DTU Space major TLE's event of 'Gigantic Jet' which of significant scientific interest was discussed and worked on to publish in reputed scientific journals. The Gigantic Jets observed for the first time over the main land in Indo-Gangatic planes during 2013 and 2014 were analyzed with all supporting ground and space based meteorological observations.

3) Description of the main results obtained

The main result obtained in brief is as below:

It is now well established that upward electrical discharges widely known as 'Transient Luminous Events (TLE's)' are the manifestations of upward energy radiated by lightning discharges from thunderstorms and includes phenomena termed as starters, blue jets, red sprites, and gigantic jets. From the family of TLE's, the 'Gigantic Jets' (GJ's) arise from cloud top and the electrical discharge reaches up to ~70-90 km altitude touching the bottom of ionosphere. The gigantic jet hence bridges the gap between lower atmosphere and near earth space environment. The first gigantic jets were recorded on 15 September, 2001 at Arecibo Observatory, Puerto Rico and second report is from Taiwan. Following these GJs there have been several reports of GJs observations from different parts of the world. Most of GJs reported are predominantly associated with tropical storms over ocean and coasts. During the stay at DTU space we worked on the four gigantic Jet (GJs) events recorded during 2013 and 2014 exclusively recorded for the first time from thunderstorm system developed over the land surface from monsoon activity in the Indian subcontinent. The GJ's under investigation were also found to be of its first kind which was horizontally tilted. The morphology of monsoon time thunderstorms in the Indo-gangetic planes and the upward charge transfer were analyzed. All the four gigantic jets under investigation were found to be of positive polarity and hence are unique as majority of the jets reported are found to be of negative polarity. The calculated charge moment and current moment changes calculations from the global ELF sites are also analyzed. The obtained results will be compiled in the form of manuscript for communication to reputed scientific journal.

4) Future collaboration with host institution (if applicable)

Yes, the collaboration will continue as before

5) Projected publications / articles resulting or to result from the grant (ESF must be acknowledged in publications resulting from the grantee's work in relation with the grant)

One publication anticipated. ESF will be acknowledged.

6) Other comments (if any)

The duration of stay at DTU Space was 13 nights from 27 Sept to 09 Oct 2015