Observations of first TLE's events over Indian Sub-continent

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We are reporting first ever observation of Transient Luminous Events (TLE's) over Indian Sub-continent observed during 2012-2013. We are continually operating TLE detection camera system since April 2012 at Allahabad (Geographic lat.29.36^0 N, long.79.46^0 E) India. We observed first sprite event on 11th April 2012 and since then we have total 15 event days till September 2013. The observed TLE events are mostly sprite with two events of gigantic jets, one blue jet and two possible events of halos. Event days mostly correspond to pre to post monsoon season (April to September months) in north India. The event detection range varies from 210 to 540 km surrounding Allahabad. Along with optical observations, we have also used ULF, VLF and GLD360, WWLLN lightning data in order to qualify and quantify parameters of the parent lightning discharge associated with the TLEs and their effects on lower ionosphere/atmosphere.

1. Details about TLE research in India

Transient Luminous Events (TLEs) are short lived flash of light observed above large thunderstorms in the stratosphere and mesosphere regions of Earth's atmosphere. These optical emissions include sprites, elves, blue jets, etc. TLEs are very energetic and more powerful than lightning. The possibility of discharges above a thundercloud at high altitudes was predicted by [1] based on electric field computations due to the residual charges of the cloud just after a positive cloud-to-ground (+CG) discharge. The observations of spectacular optical flashes of TLEs by [2] initiated experimental and theoretical studies in this area

TLEs research in India started when, Indian institute of Geomagnetism (IIG) and DTU space Denmark, inters into collaboration in 2010 and first TLEs observation setup installed at IIG HQ Navi Mumbai in 2011. Due to background light pollution, TLE observation setup moved to a better location at Allahabad (north-middle India) in 2012. Since, then continuous observations started at Allahabad and on 11th April 2012, first sprite observed there. The observation of sprits raised new science questions about the characteristics and types of TLE producing cloud system and lightning discharged. It was suggested that TLEs especially sprites are observed are usually found over Mesoscale Convective Systems (MCS) [3], and Indian thunder clouds do not form MCS system.

The TLEs observation set up in India are the part of global ground based observational support for the satellite mission ASIM and TARANIS to be launched in 2016.

2. Summary

TLEs are newly discovered phenomenon in atmospheric science and are important in order to understand electrical coupling between different regions of earth's and over all to understand Global electric circuit (GEC) [4]. Observations of other TLEs, such as gigantic jet (first observation over land), blue jet and halos has made this site interesting for TLEs observations and open new science question about the generation mechanisms, which is still not well understood.

3. References

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