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Characteristics of ElectroMagnetic Ion Cyclotron (EMIC) waves observed at Indian Antarctic station Maitri

Aditi Upadhyay*(1), Bharati Kakad(1), Amar Kakad(1),Yoshiharu Omura(2), and Ashwini K. Sinha(1)
(1) Indian Institute of Geomagnetism, New Panvel (West), Navi Mumbai, India.
(2) Research Institute for Sustainable Humanosphere, Kyoto University, Kyoto, Japan.

1 Extended Abstract

The Electromagnetic Ion Cyclotron (EMIC) waves are the discreet electromagnetic emissions observed in the Earth's magnetosphere. The EMIC waves play an important role in the loss processes of highly energetic electrons (MeV range or killer electrons) in the Earth's inner magnetosphere. These waves are generate in the equatorial latitudes ($\pm 11^0$) and propagate along magnetic field lines to its footprint in the high latitude ionosphere. Their signatures can be recorded in both space as well as ground based magnetometers. These are observed as the Pc1 geomagnetic pulsations on ground and have frequency in the range 0.1- 5 Hz. In present study we have used Induction Coil Magnetometer (ICM) observations recorded at Indian Antarctic station Maitri (Geographic coordinates: 70.7^o S, 11.8^o E; Geomagnetic coordinates: 63.1^o S, 53.6^o E) during 2011-2017. This covers ascending as well as descending phase of the solar cycle 24 and allows us to examine the effect of extremely low solar activity on the EMIC wave occurrence and their characteristics. The sampling rate of the data can be set to 64 Hz or 256 Hz. Firstly, we have identified individual EMIC events based on its duration and power in the spectrogram and then we investigated their seasonal, solar flux, local time dependence. Overall, we find that the occurrence of EMIC is higher during magnetically disturbed days (53.1%) as compared to quiet days (41.1%). The dependence of EMIC occurrence on solar flux is clearly evident and they are more frequent during the descending phase of the solar cycle. The interesting observational feature is the peak occurrence of EMIC in noon-dusk sector, which is attributed to the presence of plasma plumes at that time in the Earth's magnetosphere. Further to understand the role of the ambient ionosphere in EMIC wave propagation, we have looked into the variation of electron densities derived from IRI-2006 model estimated ionospheric conductivities. We found that the ionospheric conductivities and electron densities important roles in controlling the seasonal occurrence of EMIC waves. The characteristics of EMIC waves retrieved from the ground observations is extremely important to understand the particle loss processes in Earth's magnetosphere. So far such comprehensive information of EMIC wave characteristics is not presented for the current solar cycle 24, which is significantly weaker compared to past solar cycles.

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