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Characteristics of global thunderstorm activities extracted from Schumann resonance observations at Agra, India

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Schumann resonance (SR) is one of the most exciting electromagnetic phenomena occurring in the earth-ionosphere cavity. It shows standing waves at ELF frequencies of 8, 14, 20, ...Hz as a result of resonance between direct and round-the-world ELF waves radiated from lightning discharges. Schumann resonance studies have found wide ranging applications recently in the fields of global thunderstorm activities, surface temperature, lower ionosphere, and forecast of mansoon etc.

In this paper Schumann resonance (SR) data obtained by employing a set of 3-component search coil magnetometer at tropical station Agra (geographic lat. 27.2oN, long. 78oE) are analysed for a period of 12 months between 01 March, 2011 and 29 February, 2012. By giving special attention to the study of first mode SR frequency corresponding to X-component (north-south) in general and to the Y-component (east-west) wherever necessary, various properties of global thunderstorm activities are deduced and interpreted. We show that global thunderstorm activities are concentrated in summer months with peak activity in August, 2011. This result is correlated with optical transient detector (OTD) data and a correlation coefficient of 0.67 is found. The peak activity occurring in the month of August, 2011 is supported by a study of monthly variation of frequency range dF (dF= fnmax ?fnmin) which shows a significant drop in the month of August. We further show that the general decrease in the first mode SR frequency observed at Agra and other Indian stations is due to minimum solar cycle period of 2008-09 (now increasing). We also study the diurnal variation of first mode frequency and interpret it in terms of variation in source-observer distance.