A NUMERICAL STUDY OF SCHUMANN RESONANCE AND LIGHTNING DISCHARGE ON MARS WITH FDTD AND TLM METHOD,

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Introduction: Natural electromagnetic waves generated near the surface by electrostatic discharges in dust devils could be trapped in the resonant cavity formed by the surface and lower ionosphere of mars. In this paper we have calculated Schumann resonance value in extremely low frequency and lightning discharge on martian surface. The finite difference time-domain (FDTD) and transmission Line Matrix (TLM) method is used drive lightning discharge on mars. The FDTD and TLM technique are good used to analyze ELF propagation on planetary atmosphere used to determine Schumann resonance [1]. The study of the propagation of extremely low frequency (ELF) waves is essential for the electromagnetic sounding investigation planned for some of the future missions [2]. The extremely low frequency, i.e., 3-3000 Hz electromagnetic waves are weakly attenuated and can propagate around the globe it is producing global resonance, it also generated by electric discharges in the planetary atmosphere [3]. Theoretically the Schumann frequencies on martian environment is given by,

$$fn = \frac{c}{2\pi R_M} \sqrt{n(n+1)\left(1 - \frac{h}{R_M}\right)}$$

Where,
C is speed of light in vacuum,
R_m is radius of mars,
h is height of surface to ionosphere,
n is integer value.

The ion concentrations expected in lower atmosphere was not high enough to have effect on electrical conductivity. The electrical conductivity was directly calculated from electron density and collision frequency between electrons and C_{o2}. The lightning discharge play an important role in the chemistry, energetics and dynamics of planetary atmospheres [4]. The height of upper boundary is increasing then Schumann resonance frequency decreases. The charge gets separated and will create the electric field. The electric field is main source for a lightning to take on the mars surface

[5]. Our results compared with the other method that available experimental and theoretical data will be discussed in the conference.

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