

Equivalent Circuit Model and Resonance in the Magnetotail

陳方玉與林崇安

中央大學地球物理研究所、大氣物理系
 本文建立起一種新的磁尾等效電路
 模式，此中考慮了行星際磁場(IMF)之擾
 動變化及中性片電阻(R)對磁層穩定
 性之影響。本模式得出：當 R 增大時，磁尾
 將有共振現象發生，其週期約為8分鐘，
 而磁層之不穩定性，除受IMF變化量之
 影響外，將隨 R 之增大而增大。Ballif et al.
 (1969)及Garrett(1974)分析人造衛星資料所得之
 結果可證實本模式所提出之共振現象
 及磁層不穩定性之存在。

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Jiang-Yu Chen and Chung-An Lin

— Abstract

Based on the special configuration of the magnetotail, a new equivalent circuit model is proposed. The capacitance and inductance in our model are due to the dielectric property of high density plasma in the plasma sheet and the Faraday effect of total solenoidal currents around the magnetotail lobe, respectively. Taking into account of the neutral-sheet resistance (R) and the fluctuations of interplanetary magnetic field (IMF), we have shown that only if $R > R_c \approx 0.1652$ (critical resistance), the forced resonance with period of 8 min. will occur in the magnetotail. Consequently, the magnetospheric instability depends not only on the amplitude of the IMF variations, but also on the neutral-sheet resistance. The forced resonance phenomena and magnetospheric instability presented in this paper is supported by the observation results of Ballif et al. (1969) and Garrett et al. (1974).