



Cluster observations of equatorial magnetosonic waves: the Chirikov resonance overlap criteria

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Magnetosonic waves play an important role on the overall dynamics of relativistic radiation belt electrons. Numerical codes modelling the evolution of the radiation belts often account for wave-particle interaction with magnetosonic waves. The diffusion coefficients incorporated in these codes are generally estimated based on the results of statistical surveys of the occurrence and amplitude of these waves. These statistical models assume that the spectrum of the magnetosonic waves can be considered as continuous in frequency space. However, it is known that magnetosonic waves exhibit a discrete spectrum consisting of a number of harmonics of the proton gyro-frequency. Therefore, this assumption can only be valid if the discrete nature of the waves fulfil the Chirikov overlap criterion. Otherwise the assumption of a continuous frequency spectrum could produce erroneous results. This study uses observations of equatorial magnetosonic waves made during the Cluster Inner Magnetospheric Campaign to determine whether the discrete nature of the waves always fulfil the Chirikov overlap criterion. It is shown that while the majority of magnetosonic waves observed by Cluster fulfil the Chirikov overlap criterion, there are cases that do not fulfil the Chirikov overlap criterion. In addition, it is widely accepted that magnetosonic waves are predominantly confined close to the magnetic equator of the terrestrial magnetosphere. This study also demonstrates the validity of this assumption.