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Possibility of an Alfvenic Wave Resonator in the Magnetosphere[1]
MANISH MITHAIWALA, NRC-NRL Postdoc, GURUDAS GANGULI, Naval Research Lab., LEONID RUDAKOV, Icarus Research Inc. — There has been recent activity in understanding the origin of high energy (>1 MeV) "killer electrons" in the Earth's magnetosphere. Previous work has identified the energization mechanism to be quasilinear diffusion involving whistler and ion-cyclotron waves[2], which are generated by temperature anisotropy. It is known that whistler waves, through reflection at the lower-hybrid resonance, can form a resonator. We find that in a multi-ion species environment, such as the Earth's magnetosphere, the bi-ion rotation[3] (cut-off) frequency and Buchsbaum (resonance) frequency are important for the propagation and evolution of Alfvenic waves near the ion-cyclotron frequency. Here we show that Alfvenic waves with ($k_\perp >> k_z$) can be captured by a magnetic cavity to form a strongly localized Magnetospheric Resonator which can interact with the electrons over a long time period and can lead to both energization and loss of the electrons. The Alfvenic waves can be generated by a ring distribution of one of the ion species. Ring ion distributions are known to form when the solar wind interacts with the magnetosphere or a comet interacts with the solar wind, and by the release of chemicals in the magnetosphere.

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[2]Mithaiwala, M.J. and W. Horton. JGR **110**. July 2005.
[3]Ganguli, G. and L. Rudakov. Phys. Plasmas **12**. April 2005.

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