Topic: Incorporating Plasma Waves in Models of the Radiation Belts and Ring Current

Project Title:
Ring Current Instabilities and Their Magnetospheric Consequences

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Project Information:
Our proposed research will use satellite data analysis, a comprehensive model of the inner magnetosphere, linear kinetic dispersion theory, hybrid and particle-in-cell (PIC) simulations, and test-particle computations to carry out an integrated study of how kinetic instabilities in the magnetospheric ring current arise, propagate, and scatter both ions and fast electrons. We intend to address two distinct kinetic modes: the Alfven-cyclotron instability which leads to EMIC waves, and the proton Bernstein mode instability which generates magnetosonic waves. We will use geosynchronous observations from Los alamos plasma instruments and the RAM-SCB self-consistent inner magnetospheric model to gain insight into the ion velocity distributions which drive such waves; using such distributions we will use hybrid and PIC codes to generate enhanced field fluctuations and determine how ions are scattered, and test-particle computations to calculate how such fields pitch-angle scatter and accelerate fast electrons. These computations will yield particle transport coefficients which will be fed back into the RAM-SCB code, thereby improving the representations of global transport by that code. This research would make fundamental scientific contributions to the LWS Focused Science Team "Incorporating Plasma Waves in Models of the Radiation Belts and Ring Current."

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Citations:

Summary: no summary

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Summary: no summary

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Summary: no summary

Citation: Liu, Kaijun; Winske, Dan; Gary, S. Peter; Reeves, Geoffrey D.; (2012), Relativistic electron scattering by large amplitude electromagnetic ion cyclotron waves: The role of phase bunching and trapping, Journal of Geophysical Research, Volume 117, Issue A6, doi: 10.1029/2011JA017476

Summary: no summary

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