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Coriolis Drift in Saturn's Inner Magnetosphere

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Abstract

The theory of adiabatic particle motion in electromagnetic fields was developed well before the discovery of the terrestrial and Jovian radiation belts [1]. However, it has been intensively detailed and widely used to study the motion of trapped particles in magnetospheric systems since the 1960s [2,3,4]. In rapidly rotating magnetospheres, the diffusion equations describing the motion in the guiding center approximation were first revised in the late 1960s, then in the 1970s and 1980s [5,6,7,8]. It was important to take into account the perturbations caused by the *Coriolis* and *Centrifugal* forces on the trapped particle motion and correct the guiding center equations.

In this paper, we propose to examine the role of the *Coriolis* drift on the outward plasma transport in Saturn's magnetosphere. We will first present our theoretical approach and the main results obtained with our diffusion theory model when considering the interactions with neutrals and icy moons environment. Then, we will describe the implementation of inward and outward transports into our transport code. Simulations of outward transport will provide us the opportunity to discuss the origin of outward plasma flows, as well as how they balance the inward transport. We will discuss the results of comparisons between model and *Cassini* CAPS-ELS data sets in order to refine our understanding of the physical processes that drive the electron plasma populations within Saturn's magnetosphere.

References

[1] Alfvén (1950). *Cosmical Electrodynamics*. International Series of Monographs on Physics, Oxford: Clarendon Press, 1950.

[2] Northrop (1963). The adiabatic motion of charged particles. In *Inter-science tracts on physics and astronomy*.

[3] Roederer (1970). Dynamics of geomagnetically trapped radiation. *Physics and Chemistry in Space*, Berlin: Springer, 1970.

[4] Schulz and Lanzerotti (1974). Particle diffusion in the radiation belts. *Physics and Chemistry in Space*, Berlin: Springer, 1974.

[5] Hones and Bergeson (1965). Electric field generated by a rotating magnetized sphere. *Journal of Geophysical Research*, Vol. 70, Issue A10, p. 4951.

[6] Birmingham and Northrop (1968). Charged particle energization by an arbitrary moving magnet. *Journal of Geophysical Research*, Volume 73, Issue A1, p. 83.

[7] Birmingham and Northrop (1979). Theory of flux anisotropies in a guiding center plasma. *Journal of Geophysical Research*, Volume 84, Issue A1, pp. 41-45.

[8] Northrop and Birmingham (1982). Adiabatic charged particle motion in rapidly rotating magnetospheres. *Journal of Geophysical Research*, Volume 87, Issue A2, pp. 661-669.