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Energetic ion distribution model in Saturn's inner magnetosphere

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Energetic particle intensities with several tens of keV to a few MeV in Saturn's inner magnetosphere have been observed by the Cassini spacecraft [e.g., Krimigis et al., 2005]. These observations show that energetic ions with several tens of keV are abundant outside 6-7 Rs, but they are absent between 5-6.5 Rs. Some authors suggest that this depletion of the energetic ions is likely due to charge exchange [e.g., Paranicas et al., 2008]. However, a quantitative investigation to the loss process has not been clarified well particularly in the inner magnetosphere through charge exchange focusing on energetic ions with several tens of keV. In this study, we examine characteristic ion distributions by solving a three-dimensional Fokker-Planck equation The advantages of this study by comparing with previous modeling studies are as follows:
1. focusing on charge exchange process quantitatively,
2. including not only energetic protons but also oxygen ions, and
3. including loss processes due to charge exchange, satellite and ring absorptions, Coulomb-interaction, and wave-particle interactions.
The main results are as follows:
1. The dominant loss process is charge exchange at the equator.
2. The observed energetic ions depleted region are validly explained by charge exchange.
In this presentation, we will mainly show these calculated results with showing characteristics of major loss processes quantitatively.

Keywords: Saturn, inner magnetosphere, charge exchange, loss process, Fokker-Planck equation