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Global Hybrid and Full Particle Simulations of Lunar-type Moons

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Saturn's magnetosphere provides an ideal laboratory for developing a complete understanding of lunar type interactions. The current state of knowledge of lunar interaction with Saturn's plasma is in flux as Cassini data is revealing new details about such interactions. With additional flybys planned, this trend is expected to continue. Global kinetic simulations are valuable tools in the study of the interaction of the inert moons with the Saturn's plasma. While global hybrid simulations of Saturn moon's such as Rhea have been performed, there is a recognized need for fully kinetic particle-in-cell (PIC) simulations to properly capture the physics of wake refilling, surface sputtering, and others. In this presentation, we show our preliminary results from global full particle simulations of Rhea and compare the results with our hybrid simulations. In particular, we highlight the importance of electron kinetic effects and discuss the potential implications of our findings for modeling of other lunar-type moons.