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"Pioneer 10 and 11 (Jupiter and Saturn) Magnetometer Experiments"

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During this reporting period we have continued our studies of the interaction of a flowing plasma with Titan. This effort was suggested as a result of a study of the work conducted to date by other researchers in which it was concluded that the conditions at Titan were sufficiently different from those at Venus, in a plasma domain in which little is known, or assumptions to date regarding the flow of the plasma around the "obstacle" could give very inaccurate results. We have decided to use a Monte-Carlo simulation to determine the average flow field and pressure/temperature variations about Titan. The results are quite encouraging, but only the simplest of interaction configurations has been utilized to date. In future work we hope to include more realistic conditions,i.e., the effects of the magnetic field, mass loading, ionization, and charge exchange, etc. This work will be the subject of a PhD dissertation by the primary graduate student on this project, Gordon Wilson.

In a joint study with Barry Thomas (JPL/CIT) and Michael Regler (CIT), we have continued to pursue our efforts in terms of the low latitude cusp that resulted from models of the dayside Jovian magnetosphere. In this particular study, the best fit image dipole, tail and ring current configurations were kept fixed, and a polynomial expression for the remaining magnetic field was computer minimized. This polynomial expression was of second order in rectangular coordinates (SM) in which divergence free and symmetry conditions were imposed. The minimum residuals were similar to those obtained using a simple dawn-dusk sheet current, and field lines derived from the polynomial expression appeared to have characteristics that were definitely "sheet-like." However, it was clear that some characteristics of the field lines due to this type of "current" produced fields distinctly different from that of the sheet, i.e., a localized oval shaped enhancement in the field (weaker both

nearer and further from the planet). A second order version of the model gave a smaller residual than obtained with the sheet and we have been tempted to interpret the field enhancement near the magnetopause, that is due to the polynomial expression, in terms of additional currents that need to be included. Although providing a cusp that is higher in latitude than that reported previously (although similar to that obtained with return current sheets above and below the equatorial sheet), it is still significantly lower in latitude than expected based upon terrestrial type models. Our future studies of the problem of the low latitude cusp will continue to utilize a polynomial type field, but we will have started a joint study with Ray Walker of UCLA in which "D" shaped currents to represent both the magnetopause and dawn-dusk currents will be utilized. Such an effort was undertaken some time ago for the earth by Pfitzer and Olson, and in fact it is precisely their computer algorithm that we will adapt to Jupiter in a function minimization mode.