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Pluto's Interaction with the Solar Wind: A Colossal Comet?

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Pluto's interaction with the solar wind is determined by photoionization of escaping neutrals, the spatial extent of which depends on the magnitude of the atmospheric escape, and is characterized as Venus-like to comet-like for small to large escape rates. The weak magnetic field at >30 AU means that ion kinetic effects play a crucial role at Pluto given both large ion gyroradii and upstream ion inertial lengths that are comparable to the size of the obstacle (2-4 R_{Pluto}). The nature of this highly kinetic interaction has been studied using a three-dimensional hybrid code (particle ions, fluid electrons). For small, but plausible, neutral escape rates we find that a bow shock structure forms with considerable upstream asymmetry and the velocity distribution of heated protons in the shock region is characterized as a partial ring beam. The downstream wake is highly structured with a density enhanced "arm" of deflected solar wind protons. We anticipate that models of the strength and geometry of the solar wind interaction with Pluto's atmosphere will be useful for analyzing the particle data returned by the New Horizons spacecraft (potential launch in January 2006).

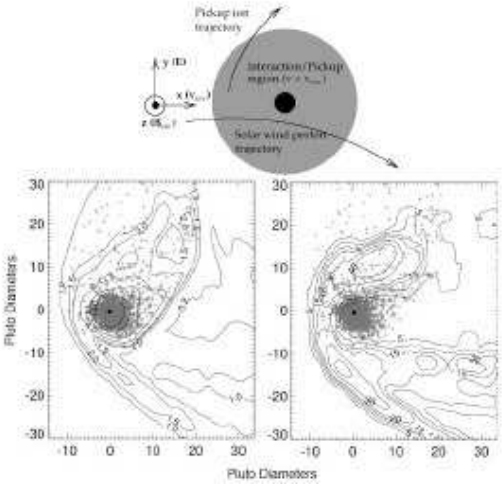

Figure 1: (Top) Interaction geometry. (Bottom left) Density and (Bottom right) temperature from hybrid simulation of Pluto's interaction with the solar wind.

References

[1] P.A. Delamere and F. Bagenal, *Geophys. Res. Lett.* **31**, L04807, (2004).