Geophysical Research Abstracts, Vol. 7, 09627, 2005
SRef-ID: 1607-7962/gra/EGU05-A-09627

A Neptune/Triton Vision Mission Using Nuclear Electric Propulsion

B. Bienstock (1), D. Atkinson (2), K. Baines (3), P. Mahaffy (4), S. Atreya (5), A. Stern (6), P. Steffes (7), M. Wright (8)

(1) Boeing, California, USA, (2) University of Idaho, Idaho, USA, (3) JPL, California, USA, (4) NASA-GSFC, Maryland, USA, (5) University of Michigan, Michigan, USA, (6) Southwest Research Institute, Colorado, USA, (7) Georgia Institute of Technology, Georgia, USA, (8) NASA-Ames, California, USA (bernard.bienstock@boeing,com, / (310) 416-4963 / (310) 416-2503)

The giant planets of the outer solar system divide into two distinct classes: the 'gas giants' Jupiter and Saturn, primarily comprising hydrogen and helium; and the 'ice giants' Uranus and Neptune that are believed to contain significant amounts of the heavier elements including oxygen, nitrogen, carbon, and sulfur. Detailed comparisons of the internal structures and compositions of the gas giants with those of the ice giants will yield valuable insights into the processes that formed the solar system and, perhaps, extrasolar systems. By 2012, Pioneer, Voyager, Galileo, Cassini, and possibly a New Frontiers Jupiter mission will have yielded significant information on the chemical and physical properties of Jupiter and Saturn. A Neptune mission would deliver the corresponding key data for an ice giant planet.

A Neptune Orbiter with Probes mission utilizing nuclear electric propulsion (NEP) to study Triton, Nereid, the other icy satellites of Neptune, Neptune's system of rings, and the deep Neptune atmosphere to pressures ranging from several hundred bars to possibly several kilobars is being examined. Power and propulsion would be provided using nuclear electric technologies. Such an ambitious mission requires a number of technical issues be investigated and resolved, including: (1) developing a realizable mission design that allows proper targeting and timing of the entry probe(s) while offering adequate opportunities for detailed measurements of Triton, the other icy satellites and ring science, (2) giant-planet atmospheric Probe thermal protection system (TPS) design, (3) descent Probe design including seals, windows, penetrations and inlets,

and pressure vessel, (4) Probe telecommunications through the dense and absorbing Neptunian atmosphere, 5) designing Triton Landers to conduct an extended surface science mission and (6) within NEP mass and power constraints, defining an appropriate suite of science instruments for the Orbiter, Probes and Landers to explore the depths of the Neptune atmosphere, magnetic field, Triton, and the icy satellites. Another driving factor in the design of the Orbiter, Probes and Landers is the necessity to maintain a fully operational flight system during the lengthy transit time from launch through Neptune encounter, and beyond.

Following our response to the recent NASA Research Announcement (NRA) for Space Science Vision Missions for mission studies by NASA for implementation in the 2013 or later time frame, our team has been selected to explore the feasibility of such a Neptune mission.