

SPACE EXPLORATION SYMPOSIUM (A3)
Solar System Exploration (5)

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ROLE OF ENTRY PROBES IN THE EXPLORATION OF THE SOLAR SYSTEM GIANTS

Abstract

Spacecraft have explored the solar system systematically in the past six decades. The underlying strategy of such exploration has been flyby, orbit, land. In the case of the giant planets, which are gas or fluid rich and whose “land” lies tens of thousands of kilometers beneath their cloud tops, landing is not an option. Fortunately, entry probes deployed to technically feasible depths can still address the fundamental questions about their formation and the origin and evolution of their gaseous or icy envelopes. One such challenge was undertaken by the Galileo probe at Jupiter in 1995. The probe findings fundamentally altered our understanding of Jupiter in particular and the solar system formation in general. In this talk, I will review those findings, why they are so fundamental, and what needs to be done to advance our understanding of the formation and evolution of the other giant planets in our solar system, Saturn, Uranus and Neptune. In each case, I will demonstrate entry probes are absolutely crucial for achieving that goal. Finally, I will discuss how the solar system serves as best analog for extrasolar systems, and how the detailed data from exoplanets can also inform the models of the solar system formation and evolution. Reference for a comprehensive review: Atreya S. K., A. Crida, T. Guillot, J. Lunine, N. Madhusudhan, O. Mousis (2016) The Origin and Evolution of Saturn, with Exoplanet Perspective, in Saturn in the 21st Century (K. H. Baines, F. M. Flasar, N. Krupp, T. S. Stallard, editors), Cambridge University Press, Cambridge, UK.