



MEETING NOTICE **Buenaventura MTT-S Chapter**

Date and Time: Wednesday, May 15th, 2019 (6:30PM)

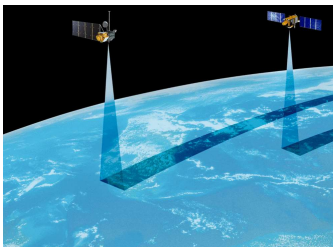
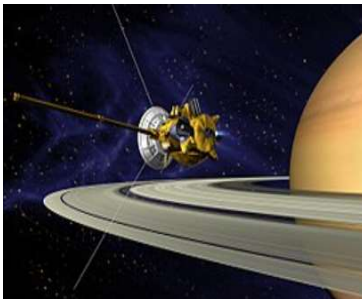
Location : Skyworks (Conference Room), 649 Lawrence Drive,
Newbury Park, CA 91320

Agenda: 6:30PM Reception & Networking;
7PM Presentation

A Concept for a Future NASA/ESA Entry Probe Mission to the Ice Giants

Presenter : **Dr. David H. Atkins**

NASA/Caltech/JPL Sr. System Engineer



■ **Abstract:** The outer solar system comprises many unexplored bodies within which evidence of the origin, formation, and fundamental processes central to the evolution of the solar system can be found. Filling the gap in size between the larger gas giants and the smaller terrestrial planets including Earth, the planets Uranus and Neptune represent the entire population of a largely unexplored class of planets known as the Ice Giants.

■ Due to the physical limitations of remote sensing and the lack of *in situ* measurements, many of the most important physical and atmospheric properties of the ice giants are poorly constrained and the ultimate role of the ice giants in the evolution of the Solar System is currently impossible to ascertain. Only *in situ* exploration by a single or multiple descent probes can reveal the secrets of the deep, well-mixed atmosphere that contains pristine materials from the epoch and location of ice giant formation. Of particular importance are the chemically inert noble gases. With no detectable radio signature and therefore requiring direct sampling, the noble gases reflect the processes of ice giant origin, formation, and evolution. The primary goal of a ice giant atmospheric probe would therefore be to measure the well-mixed abundances of the noble gases He, Ne, Ar, Kr, Xe and their isotopes, the altitude profile of the heavier elements C, N, S, and P, key isotope ratios $^{15}\text{N}/^{14}\text{N}$, $^{13}\text{C}/^{12}\text{C}$, $^{17}\text{O}/^{16}\text{O}$ and $^{18}\text{O}/^{16}\text{O}$, and D/H, as well as key disequilibrium species such as CO and PH_3 . The atmospheric probe would sample well into the cloud-forming regions of the troposphere where many cosmogenically important and abundant species are expected to be well-mixed, far below regions directly accessible to cloud top remote sensing. In this talk I will present a mission concept for a possible future flagship mission to one of the ice giants that includes a NASA-provided spacecraft to carry and deliver a European probe to enter and descend into the ice giant atmosphere.

■ **Bio:** Dr. David H. Atkinson is a Senior Systems Engineer at the Caltech/NASA Jet Propulsion Laboratory in Pasadena. From 1989 to 2017, Dr. Atkinson was a professor of Electrical Engineering at the University of Idaho. He was a Co-Investigator on the NASA/ESA (European Space Agency) Cassini/Huygens Doppler Wind Experiment that successfully measured the winds in the atmosphere of Titan in 2006., Dr. Atkinson used the Galileo probe to make the only measurements of giant planet deep atmospheric winds in 1995, for which he received the NASA Exceptional Scientific Achievement Award in 1997.



■ Dr. Atkinson has undergraduate degrees from Whitman College (Astronomy/Physics) in 1977 and from Washington State University (Electrical Engineering) in 1980, a Master's degree in Applied Physics from Stanford University in 1981, and a Ph.D. in Electrical Engineering from Washington State University in 1989. From 1981 through 1986 Dr. Atkinson worked as a Systems Engineer on both the Galileo Jupiter probe at NASA Ames Research Center and the Space Infrared Telescope Facility (SIRTF, now Spitzer Space Telescope).