Geophysical Research Abstracts Vol. 21, EGU2019-3701, 2019 EGU General Assembly 2019 © Author(s) 2019. CC Attribution 4.0 license.



Icy Giants, The Missing Pieces of the Outer Solar System Puzzle

Sushil K. Atreya (1) and Olivier Mousis (2)

(1) University of Michigan, Climate and Space Sciences and Engineering Dept., Ann Arbor, United States (atreya@umich.edu), (2) Laboratoire d'Astrophysique de Marseille, France

While the gas giant planets have been explored extensively since the early 1970's, icy giants have received little attention so far. Voyager 2 flyby of Uranus in 1986 and Neptune in 1989 provided a fleeting glimpse of the nature of these planets, whereas observations from 1 AU are limited in scope. Dedicated spacecraft missions are essential for understanding the atmosphere, charged particle environment, satellites, rings, and the formation of the icy giant planets. This requires an orbiter and probe combination, similar to the Galileo orbiter-probe mission at Jupiter. The focus of this talk is on the science only in situ measurements can deliver. Those measurements are crucial for understanding the origin and evolution of the icy giant planets. Core accretion model is generally favored for the formation of the giant planets. Volatiles released from the core during accretionary heating phase are expected to be mixed in the troposphere. They can be accessed only by entry probes, not remote sensing. The abundances and isotopic ratios of the "heavy elements", He/H and D/H derived from those volatiles are essential constraints to the models of the origin and evolution. Complementary data from the orbiter would further strengthen the formation and evolution scenarios and are thus most desirable. This presentation will elaborate on both types of relevant measurements, their importance and implications.