Formation of the Giant Planets and their Atmospheres: The Role of Entry probes

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Models of the formation of the giant planets can be constrained by the abundance of heavy elements (mass>helium). With the exception of carbon (derived from measuring methane), heavy elements are inaccessible to remote sensing [1,2]. The bulk composition, particularly for determining the elemental abundances of N, S, and O, heavy noble gases (Ne, Ar, Kr and Xe), He (for interior processes), heavy noble gas isotopes, 3He/4/He, 14N/15N and the D/H ratios, requires entry probes [2]. The focus of this talk will be the hypotheses for the giant planet formation and the origin of their atmospheres, together with recommendations of the minimum set of relevant measurements for each giant planet to constrain their formation models. Shallow probes to ten bars can deliver the desired data at Saturn, Uranus and Neptune [2-5] . However, deep probes may be needed for Jupiter but the depth, number and location of such probes should be guided by the results on the water vapor distribution from the Juno mission in 2016 [2]. It is important to remind ourselves that comparative planetology of the outer planets is key to the origin and evolution of the Solar System, and, by extension, Extrasolar Systems. <http://www.umich.edu/~atreya>

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