Geophysical Research Abstracts
Vol. 19, EGU2017-13527, 2017
EGU General Assembly 2017

Explorer of Enceladus and Titan (E2T): Investigating Ocean Worlds' Evolution and Habitability in the Saturn System

Giuseppe Mitri and the Explorer of Enceladus and Titan (E2T) Team
LPG, Université de Nantes, Nantes, France (giuseppe.mitri@univ-nantes.fr)

The NASA-ESA Cassini-Huygens mission has revealed Titan and Enceladus to be two of the most interesting worlds in the Solar System. Titan, with its organically rich and dynamic atmosphere and geology, and Enceladus, with its active plumes, both harboring subsurface oceans, are prime environments in which to investigate the conditions for the emergence of life and the habitability of ocean worlds. Explorer of Enceladus and Titan (E2T) is dedicated to investigating the evolution and habitability of these Saturnian satellites and is proposed in response to ESA's M5 Call as a medium-class mission led by ESA in collaboration with NASA. E2T has a focused payload that will provide in-situ composition investigations and high-resolution imaging during multiple flybys of Enceladus and Titan using a solar-electric powered spacecraft in orbit around Saturn. The E2T mission will provide high-resolution mass spectroscopy of the plumes currently emanating from Enceladus's south polar terrain (SPT) and of Titan's changing upper atmosphere. In addition, high-resolution IR imaging will detail Titan's geomorphology at 50-100 m resolution and the source fractures on Enceladus's SPT at meter resolution. These combined measurements of both Titan and Enceladus will permit to achieve the two major scientific goals of the E2T mission: 1) Study the origin and evolution of volatile-rich ocean worlds; and 2) Explore the habitability and potential for life in ocean worlds. More in detail, these goals will be achieved by measuring the nature, abundance and isotopic properties of solid- and vapor-phase species in Enceladus's plume and Titan's upper atmosphere, and determining the processes that are transporting and transforming organic materials on the surface of Titan and the mechanisms controlling, and the energy dissipated by, Enceladus's plumes. E2T's two high-resolution time-of-flight mass spectrometers will enable us to resolve the ambiguities left by Cassini regarding the identification of low-mass organic species, to identify high-mass organic species for the first time, to further constrain trace species such as the noble gases, and to clarify the evolution of solid and volatile species. E2T's high-resolution IR camera will reveal Titan's global surface only partly covered today and Enceladus's fractured SPT and plume in detail unattainable by the Cassini mission. The nominal science operation phase is 3.5 years after a 6 years transfer from Earth to Saturn with an expected launch in April 2030. The proposed mission will address key scientific questions regarding extraterrestrial habitability, abiotic/prebiotic chemistry and emergence of life in the outer solar system, which are among the highest priorities of ESA's Cosmic Vision program.