Paper ID: 61104
oral
student

IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Astrobiology and Exploration (6)

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TITAN-LIKE EXOPLANETS: A STUDY OF THE EVOLUTION OF OCEAN WORLDS

Abstract

Considered as the most Earth-like place in the Solar System, Titan has liquid hydrocarbons flowing on its surface and a dense atmosphere, mainly composed of nitrogen. The presence of the liquid hydrocarbons as opposed to water raises the question of whether life could exist on its surface. The spacecraft Cassini has provided scientists with great insights into Titan's world and its observations suggest the existence of a subsurface ocean; another possible habitat for life. These unique characteristics have sparked the interest for further exploration of Titan. The motivation also comes from findings of research focused on extrasolar planets, as it is considered very probable that ocean worlds similar to Titan orbit red dwarf stars, the most abundant stars of the Universe. Therefore, this work presents a study of Titan's evolution orbiting stars similar to the Sun as well as red dwarfs through simulations. The main aim is to explore whether oceans can still be formed. Furthermore, the role Saturn plays in protecting Titan's environment is investigated as the planet's presence shelters its moon from catastrophic events such as meteorites and its extended magnetosphere offers protection from cosmic radiation. The results of this paper can be used to determine the driving factors in Titan's evolution as well as support the quest for Earth-like worlds capable of harboring life.