IAF SYMPOSIUM ON ONGOING AND NEAR FUTURE SPACE ASTRONOMY AND SOLAR-SYSTEM SCIENCE MISSIONS (A7)
Science Goals and Drivers for Future Exoplanet, Space Astronomy and Space Physics (2)

Author: Ms. HUDA MOHAMMAD
Jain University, India, hudamohammad1199@gmail.com

Mr. Rutvik Mehenge
University of Pune, India, rutvikmehenge@gmail.com
Ms. PRATYAKSHA SHETTY
India, pratyaksha.shetty1999@gmail.com
Ms. SHWETA KANSAL
India, shwetakansal680@gmail.com
Ms. SHAMBHAVI A S
Nitte Meenakshi Institute of Technology, India, shambhavias14@gmail.com

A MISSION CONCEPT FOR UNVEILING EVIDENCE OF LIFE ON TRAPPIST-1E

Abstract

The search for life beyond the Solar System has been a topic of great interest for many decades. Despite the recent surge in exoplanet discoveries, finding signs of life on such planets remains a daunting task. One of the most promising approaches in this regard is the search for biosignatures, physical or chemical indicators of life. This study proposes a mission concept that uses advanced telescopic techniques and spectroscopy to detect biosignatures on Trappist-1e, a rocky exoplanet in the habitable zone of the TRAPPIST-1 system. The proposed approach involves the utilization of a satellite equipped with cutting-edge telescope and spectroscopy instruments, which facilitates in detecting and analyzing atmospheric compositions with unparalleled accuracy and precision. This exoplanet has a number of compelling potential biosignatures, including oxygen, methane, organic molecules, specific isotopic ratios, and atmospheric features that may indicate the presence of life. However, detection of biosignatures in TRAPPIST-1e is a complex process, requiring the use of different detection methods such as Transmission spectroscopy, direct imaging, polarimetry, and observations in the time domain. By observing a planet passing in front of its host star, its atmospheric composition and biosignature can be determined by analyzing changes in the star's light. Direct imaging can offer useful information about the planet's spectrum, while polarimetry can identify atmospheric haze or clouds that might signify the presence of life. Time-domain observations can monitor changes in the planet's brightness and identify patterns that may indicate the presence of life. Therefore, tracking biosignatures in TRAPPIST-1e is an important and essential endeavor that requires careful analysis and multiple detection techniques. The results of this study provides a compelling argument for possible biosignatures that can be found in TRAPPIST-1e, and the techniques used to identify them. Future research in this topic will provide essential insights on the ongoing search for life beyond Earth and the habitability potential of exoplanets.