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STUDY OF VENUS ROVER ENGINEERING CHALLENGES (VREC)

Abstract

The US National Academies of Science Space Studies Board decadal study, *New Frontiers in the Solar System: An Integrated Exploration Strategy* ranked the Venus surface in-situ explorers as one of the five highest priorities for future missions. The exploration of the inner Solar System, mainly the surface missions are driven by the comprehensive concept of symbiotic planetology that helps in understanding the structure, history, processes, and evolution of each terrestrial planets. It has always been difficult to probe the Venus surface via rover carrying scientific experiments as their payload due to the planet's extreme hostile environment.

This paper presents the engineering challenges that will be faced by a Venus rover mission, such as extreme temperatures, severe pressure, power systems, active cooling systems, all crucial challenges for the Venusian exploration. The current technological options for materials, electronics, power systems and instruments are analyzed and an overview is provided including trade-offs and risk analysis of the systems as our current knowledge towards Venus Surface exploration is very limited. Additionally, this paper also scrutinizes the engineering challenges faced by the previous Venus surface missions and suggests different platforms for the exploration, focusing on the development of a rover for the surface exploration which could be beneficial for future science-based missions bringing the operation of robots on the Venusian Surface into the range of feasibility.