Abstract template

Biosignature Exploration in Martian Volcanic Terrains: Insights from India's Deccan Volcanics

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The study outlines a multidisciplinary investigation into Martian geology with a specialized focus on biosignatures and deciphering potential markers of past life on the Red Planet. By observing the geological and chemical properties of the Deccan Volcanics in India as an analogue, critical parallels between terrestrial and Martian environments are illuminated. Beginning with a foundational understanding of Martian geology, nuanced evaluation of biosignatures, encompassing both geological and chemical indicators are explored. Compelling evidence of microbial life and its resilience within volcanic rocks underscores the importance of reexamination of the habitability of Martian terrains. The presence of jarosite and Subsurface Filamentous Fabrics(SSF) in the Deccan Volcanics and on Mars not only underscores their shared geological lineage but also unveils a promising avenue for biosignature exploration. Substantive biosignatures within the Deccan volcanics suggest the potential for ancient microbial activity on Mars. These discoveries hold far-reaching implications, substantially bolstering the case for the existence of life in Mars' distant past. The incorporation of a novel sulfur isotope in probing approach augments biosignature discernment and fortifies our ability to differentiate genuine markers from potential false positives. In conclusion, this study reviews the potential of finding biosignatures in Martian volcanic terrains, from analog study of India's Deccan Volcanics on Earth. By refining landing site selection methodologies and optimizing payload configurations, a robust foundation for future missions is proposed to unlock further secrets of Martian life.

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