

VERITAS: Discovering the Secrets of a Lost Habitable World

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Magellan almost 30 years ago along with the Venus Express and Akatsuki missions to Venus have done much to elucidate to geologic and atmospheric processes operating at Venus. Yet, basic questions remain informed by these prior investigations about the most Earth-like planet in terms of size, bulk composition, and stellar energy. Answers to these questions for Venus have profound implications beyond Venus to understanding how rocky planets evolve and what makes them habitable.

Geologic processes on Venus are a missing link for rocky planet evolution. Its present condition is a geodynamic analog for early Earth, when the lithosphere was hotter and thinner, plate tectonics began, and life emerged. In turn, plate tectonics led to continent formation. Earth no longer retains a clear record of how these processes began, but Venus may have active subduction—the necessary first step to initiate plate tectonics. Venus is the control case to Earth for determining what conditions give rise to these fundamental processes, thus enabling their prediction for exoplanets.

The proposed VERITAS (Venus Emissivity, Radio science, InSAR, Topography, And Spectroscopy) mission to the NASA Discovery 2019 is structured around 18 science questions designed to understand the processes that led to Venus' current geologic state and determine what processes are geologically active. VERITAS is equipped with an interferometric synthetic aperture radar to acquire high resolution imagery and topography as well as make repeat pass interferometric deformation measurements. It is also equipped with a near IR spectral imager with optimized spectral bands for observing the surface of Venus that supports the determination of igneous rock type and the search for active and recent volcanism. The low Venus orbit of the VERITAS spacecraft supports major improvements in the determination of the Venus gravity field as well as determination of the tidal Love number and phase lag leading to a refined understanding of the Venus interior and assessment of core size and state. This talk provides an overview of its science objectives, measurements and mission profile.

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