

Bulletin of the AAS • Vol. 53, Issue 7 (DPS53 Abstracts)

VERITAS (Venus Emissivity, Radio science, InSAR, Topography, And Spectroscopy): Discovering the Secrets of a Lost Habitable World

Sue Smrekar¹, Scott Hensley¹, Daniel Nunes², M. Darby Dyer³, Joern Helbert⁴, Luciano Iess⁵, Erwan Mazarico⁶, Jennifer Whitten⁷, VERITAS Science Team⁸

¹Jet Propulsion Laboratory, California Institute of Technology,

²Jet Propulsion Laboratory, California Institute of Technology,,

³Department of Astronomy, Mount Holyoke College, ⁴Institute for Planetary Research, DLR,

⁵University of Sapienza, ⁶Goddard Space Flight Center, ⁷Tulane University,

⁸Jet Propulsion Laboratory

Published on: Oct 03, 2021

License: [Creative Commons Attribution 4.0 International License \(CC-BY 4.0\)](https://creativecommons.org/licenses/by/4.0/)

VERITAS is a selected Discovery mission launching in 2028. It will investigate Venus' geologic evolution and processes that affect rock planetary habitability. Venus' present condition is a geodynamic analog for early Earth, when the lithosphere was hotter and thinner, plate tectonics and continents began to form, and life emerged. 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, as well as analogs of continents. VERITAS will test whether Venus' tessera plateaus represent the only analogs of continents in the solar system, which formed on Earth when massive quantities of basalt melted in the presence of water. VERITAS will use numerous methods to search for current volcanism and tectonism, including subduction.

VERITAS produces global, foundational datasets using two instruments, the Venus Interferometric Synthetic Aperture Radar (VISAR) and the Venus Emissivity Mapper (VEM), plus a gravity science investigation. The VISAR X-band measurements include: 1) a global digital elevation model (DEM) with 250 m postings, 6 m height accuracy, 2) Synthetic aperture radar (SAR) imaging at 30 m horizontal resolution globally, 3) SAR imaging at 15 m for >25% of the surface, and 4) surface deformation from repeat pass interferometry (RPI) at 2 cm precision for >12 targeted areas. VEM covers >70% of the surface in six NIR bands located within five atmospheric windows sensitive to Fe mineralogy, plus eight atmospheric bands for calibration and water vapor measurements, with SNR \gg VIRTIS. It is a near IR spectral imager with optimized spectral bands for observing the surface of Venus that supports the determination of rock type and the search for active and recent volcanism. VERITAS will use a low circular orbit (< 250 km) and Ka-band uplink and downlink to create a global gravity field with 3 mGal accuracy at 155 km (d&o 123) resolution. VERITAS also constrains core size and state, using radar tie points to help find k_2 , the phase lag, and MOIF.

This research was partially conducted at the Jet Propulsion Laboratory, California Institute of Technology, under contract with the National Aeronautics and Space Administration.