

Astrobiology News July 2021: Venus & Earth: A Tale of Two Planets

Last month, NASA selected two missions for concept design development to revisit the planet Venus for the first time in over 30 years. Why the renewed interest in Venus? In a few respects, Venus and Earth are similar - they're about the same size and mass, and Venus is the closest planet to the Earth. That's about where the similarity ends. A day on Venus is longer than its year (Venus' period of rotation is longer than its orbital period about the Sun), and Venus' global average temperature is 864 F, hot enough to melt lead, and hotter than the closest planet to the Sun, Mercury. Venus' thick carbon dioxide atmosphere is 90 times as thick as Earth's atmosphere, amounting to a surface air pressure similar to the pressure of water a mile under the ocean!

Venus' exceedingly high temperature and air pressure have to do with the way its thick carbon dioxide atmosphere traps heat. Planetary scientists think that in the distant past, Venus had a climate much more similar to Earth's climate today, one that may have been able to support life. At some point in its history, it experienced a runaway greenhouse effect leading to the "hell-like" conditions that exist on Venus today. The DAVINCI+ and VERITAS missions, both expected to launch in the 2028-2030 timeframe, were selected to help shed light on what happened to this "Lost Habitable" world.¹

DAVINCI+ will consist of a descent sphere that will plunge through Venus' thick atmosphere, while VERITAS will obtain high-resolution maps of the Venusian surface from orbit. Together, these missions will shed light on Venus' geological history and why Venus' atmosphere is so different from Earth's. DAVINCI+ will study the composition of Venus' atmosphere and determine whether Venus ever had an ocean, and, if so, for how long. It will return the first high resolution pictures of the unique geological features known as "tesserae," which may be comparable to Earth's continents, suggesting that Venus has plate tectonics. VERITAS will use radar to create 3D reconstructions of topography over nearly the entire planet, and confirm whether processes such as plate tectonics and volcanism are still active on Venus today. Answering questions about why Venus and Earth evolved so differently may also be key to understanding what might make other rocky planets habitable.

Even as we develop missions to study other planets, satellites continuously monitor conditions on Earth. While preparing a talk on Earth's climate crisis for an intergenerational camp led by Dr. Sharon Grant at Hood Theological Seminary,² I discovered a great NASA site for families called "ClimateKids."³ I highly recommend this site to those of you who may be looking for resources and activities to explore with your children or grandchildren. Another great resource is the free, online journal *Frontiers for Young Minds*⁴ that connects young people (typically ages 8-15 years) to scientists and cutting-edge discoveries. You can find some terrific articles about Earth's environment in the sections on Biodiversity and Earth and Its Resources. There are also some wonderful new climate research projects you can participate in on Zooniverse,⁵ including one called *NASA Globe Cloud Gaze*,⁶ which is particularly timely in light of the terrible wildfires in the west.

¹ <https://www.nasa.gov/press-release/nasa-selects-2-missions-to-study-lost-habitable-world-of-venus>

² <https://www.hoodseminary.edu/Initiatives/international-center-of-faith-science-and-history/events>

³ <https://climatekids.nasa.gov/>

⁴ <https://kids.frontiersin.org/>

⁵ <https://www.zooniverse.org/projects?discipline=climate&page=1&status=live>

⁶ <https://www.zooniverse.org/projects/nasaglobe/nasa-globe-cloud-gaze>

Finally, I want to thank everyone who has responded to Michael's call for help in filling out one of the surveys associated with Engaging Faith-based Communities in Citizen Science with Zooniverse,⁷ and if you haven't responded, there's still time! The pre-participation questionnaire is for people who have never used Zooniverse, and the post-participation questionnaire is for those who have. If you filled out the pre-participation questionnaire previously and have subsequently used Zooniverse, please consider filling out the post-participation questionnaire, too. Your responses are extremely helpful to me as I begin evaluating this project and planning new ways to bring science to everyone - please do email me if you'd like to discuss possible ways of integrating science into programs at your places of worship!

Until next month,

Grace

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⁷ <http://www.theclergyletterproject.org/Resources/Zooniverse.html>