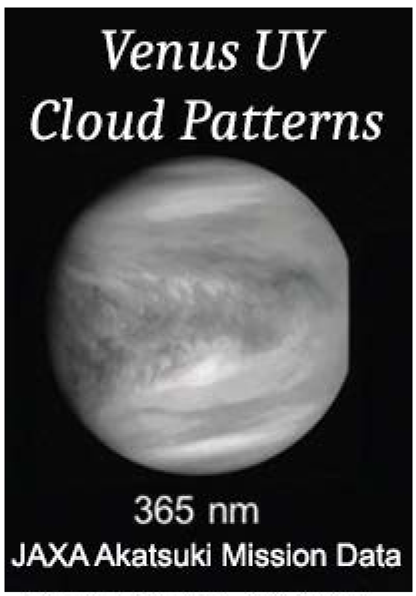
Assessing Venus' Clouds in the Ultraviolet

Venus is an intriguing planet not only for its well-known environmental extremes (high surface temperatures, pressures, and CO_2 atmosphere with clouds of sulfuric acid... that could teach us a thing or two about runaway greenhouse effect), but also for the potential chemical components in its murky clouds. The atmospheric layer where the clouds form, about 48 kilometers up from the surface, boasts more moderate temperatures and pressures. What if some of the unknown components in these clouds were biological? The astonishing idea has been around for decades and is championed now by an international team of planetary scientists and bio-, geo- chemists.

What we've learned so far about the global cloud cover of Venus comes from spectral data obtained from ground-based telescopes and spacecraft instruments in the ultraviolet (***UV***), visible, near-infrared, and mid-infrared wavelengths. One hot research topic is identifying the UV absorbers that contribute to the changing patterns of UV ***albedo*** observed to shift in size, shape, and location over timescales as brief as minutes.

Sanjay Limaye (University of Wisconsin–Madison), and colleagues in California, India, and Poland, hypothesize a biological-microbial contribution to the UV spectra. They compare results from previous studies and spacecraft data of the Venus atmosphere to present ideas for the potential survivability of indigenous micro-organisms in Venus' lower clouds.



(Limaye, *et al.*, 2018, *Astrobiology*, doi: 10.1089/ast.2017.1783.)

Data obtained with 365 nm filter by the Ultraviolet Imager onboard the JAXA Akatsuki orbiter.

Limaye and coauthors discuss for the need for new bio-, geochemical studies under simulated Venus-cloud conditions to test the viability of such things as acid-tolerant or acid-metabolizing micro-organisms. The team also supports efforts to investigate the clouds of Venus *in situ* with new missions, including orbital, lander or aerial instrument-platforms that could use cutting-edge technology such as Raman LIDAR and laser-induced fluorescence to identify minerals and/or organics.

See Reference:
· Limaye, S. S., Mogul, R., Smith, D. J., Ansari, A. H., Słowik, G. P., and Vaishampayan, P. (2018) Venus' Spectral Signatures and the Potential for Life in the Clouds, *Astrobiology,* v. 18(9), doi: 10.1089/ast.2017.1783. [**paper**]

See also:
· Abedin, M. N, Bradley, A. T., Misra, A. K., Bai, Y., Hines, G. D., and Sharma, D. K. (2018) Standoff Ultracompact Micro-Raman Sensor for Planetary Surface Explorations, *Applied Optics,* v. 57, p. 62-68, doi: 10.1364/AO.57.000062. [**abstract**]
· Akatsuki Venus Climate Orbiter **gallery of UVI images**.
· Devitt, T. (2018) Is There Life Adrift in the Clouds of Venus? **News Release** from University of Wisconsin–Madison.
· Peralta, J., et al. (2017) Overview of Useful Spectral Regions for Venus: An Update to Encourage Observations Complementary to the Akatsuki Mission, *Icarus,* v. 288, p. 235-239, doi: 10.1016/j.icarus.2017.01.027. [**abstract**]
· Pérez-Hoyos, S., et al. (2018) Venus Upper Clouds and the UV Absorber from MESSENGER/MASCS Observations, *Journal of Geophysical Research-Planets,* v. 123, p. 145-162, doi: 10.1002/2017JE005406. [**abstract**]
· **Venus missions** list.

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