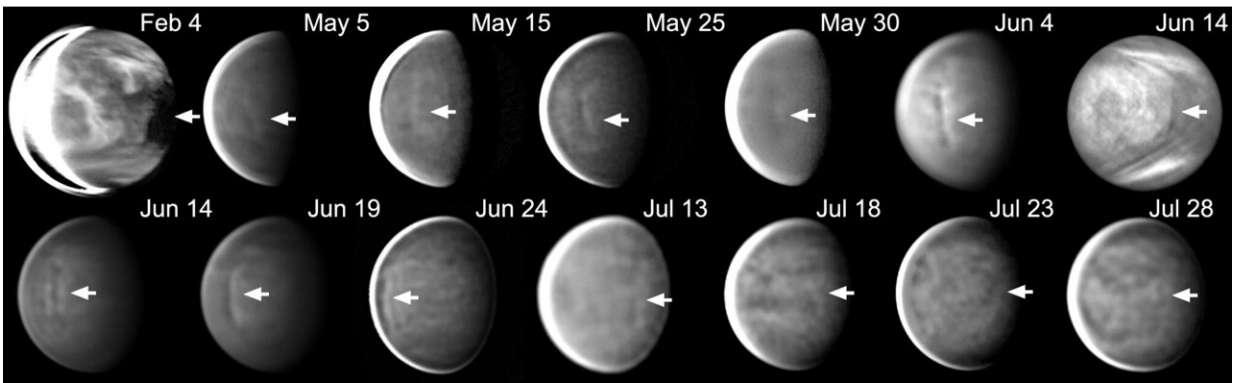


New study explores the 'tsunami' in Venus's clouds

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Examples of discontinuity events during 2022. The discontinuity was apparent on the nightside lower clouds with 2.26 μ m images from IRTF/SpeX taken on February 4, and at the dayside middle clouds as observed in images by amateur observers taken with filters covering wavelengths 700–900 nm from May to July 2022. During June 14, Akatsuki/UVI images at 365 nm suggest that the discontinuity was propagating simultaneously at the upper and middle clouds (last image in upper row). All the images were high-pass filtered to enhance cloud details. Credit: *Astronomy & Astrophysics* (2023). DOI: 10.1051/0004-6361/202244822

A group of scientists from the University of Seville, in collaboration with experts from the University of the Basque Country, has led the first detailed study of the evolution of the discontinuity of Venus's clouds, a gigantic atmosphere wave with the appearance of a "tsunami" that is

propagated in the planet's deepest clouds and which, it is believed, may be playing a very significant role in the acceleration of Venus's fast-moving atmosphere.

The observations were carried out non-stop for more than 100 days. "This observational feat was possible thanks to the collaboration of amateur astronomers from various countries, who have been the leading lights in the worldwide campaign of observations coordinated with the Japanese mission Akatsuki in 2022," explains the University of Seville researcher and member of this mission, Javier Peralta.

This paper published in *Astronomy & Astrophysics* has also revealed a truly unexpected event, since the ultraviolet images taken in June by the UVI camera on board the Akatsuki mission (which allows us to see the highest clouds in Venus) seem to reflect the fact that the discontinuity was capable of propagating for a few hours to around 70 km above the surface of Venus. "This is surprising, because until now the discontinuity appeared 'trapped' in the deepest clouds and we had never observed it at such a [high altitude](#)," explains Peralta.

The astrophysicist Javier Peralta was responsible for designing in 2022 the strategy for WISPR's Venus observations during the spacecraft's approach/departure maneuvers during Parker's flybys. He also contributed to physical interpretation of the observations, comparing thermal emission images of the surface of Venus taken by WISPR (NASA-Parker) and the IR1 camera (JAXA-Akatsuki).

In this vein, the Akatsuki images not only point to the fact that the discontinuity may have propagated to Venus' upper clouds, but also help us to understand the reasons for this displacement. In general, regions where winds have the same speed as a wave act as a physical "barrier" for the propagation of that wave.

Because winds gradually increase with height on Venus and have higher speeds than the discontinuity at the peak of the clouds, the discontinuity attempts to propagate upwards from the deep clouds, but meets this obstacle on its way and eventually dissipates.

Thus, [experts](#) were surprised when they measured the winds in the high clouds with Akatsuki: they found that they were unusually slow in the first half of 2022, several times slower than the discontinuity itself. And if the winds grow much more slowly with height, the discontinuity takes longer to find atmospheric regions as fast as itself, allowing it to propagate to higher altitudes.

"Measuring the winds on Venus is essential to try to explain why Venus's atmosphere spins 60 times faster than the surface. This atmospheric phenomenon is known as superrotation. It also happens on the Saturn moon Titan and on many exoplanets, but after more than half a century of research we still cannot satisfactorily explain it," explains this researcher.

More information: J. Peralta et al, Venus cloud discontinuity in 2022. The first long-term study with uninterrupted observations, *Astronomy & Astrophysics* (2023). [DOI: 10.1051/0004-6361/202244822](https://doi.org/10.1051/0004-6361/202244822)

Provided by University of Seville

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