News-Archiv

New details in the clouds of Venus are revealed

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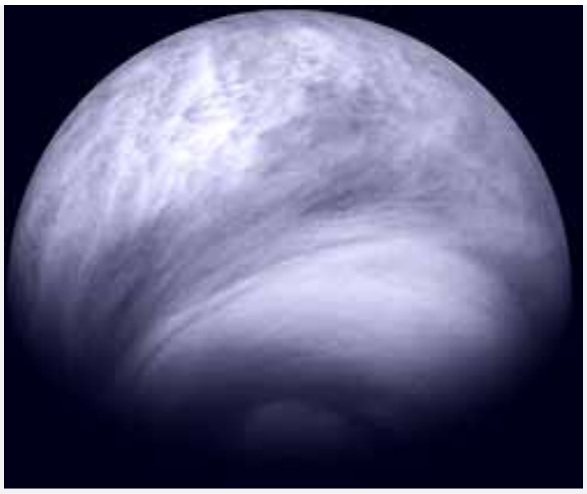
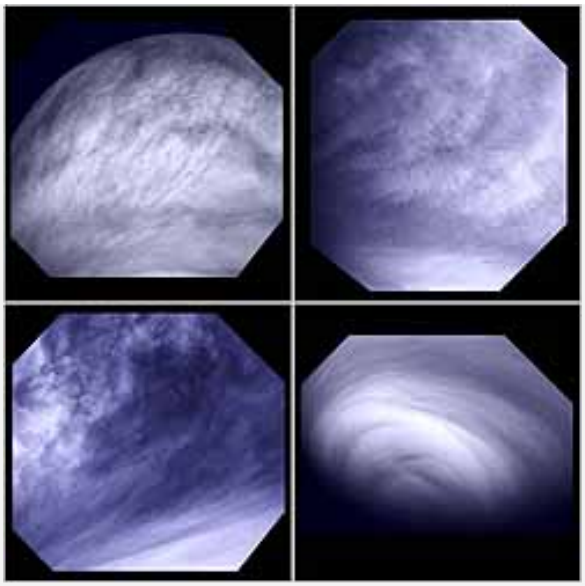


Cloud structure of the Venusian southern hemisphere in UV light

As ESA's Venus Express continues to orbit around our sister planet, new images of the cloud structure of one of the most enigmatic atmospheres of the Solar System reveal brand-new details.

Venus is covered by a thick layer of clouds extending between 45 and 70 km altitude over the surface. These rapidly moving clouds are mainly composed of micron-size droplets of sulphuric acid and other aerosols whose origin is still unknown. An aerosol is a suspension of fine solid or liquid droplets in a gas. Earlier missions showed that Venus clouds resemble Earth's mists, but their great vertical extension eventually creates unpenetratable veil.

The Venus Monitoring Camera (VMC) on board Venus Express has been relentlessly observing the top of the cloud layer, reaching up to 70 km, in visible, near-infrared and ultraviolet light. In particular, ultraviolet observations at 365 nm have shown a wealth of new details on mid- to large-scale cloud structures. These include a variety of markings created by variable concentrations of different aerosols located at the top of the cloud layer. These aerosols absorb ultraviolet light differently from each other, becoming visible to VMC.



Detailed view of the clouds of Venus

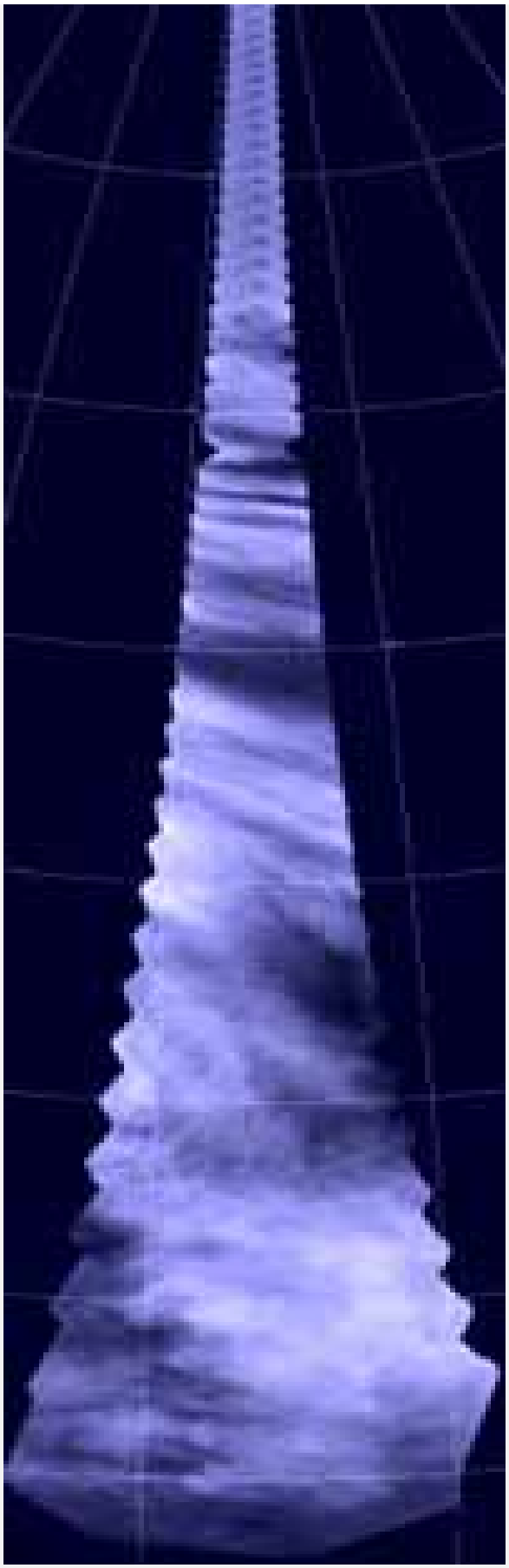
The first image shown at the top of this article provides a global view of the southern hemisphere of Venus, obtained from a distance of 30 000 km. The south pole is in the bottom, while equator is on the top.

The appearance of the cloud veil changes dramatically from the equator to the pole. At low latitudes, the shapes are spotty and fragmented. This is indicative of a vigorous convective movement - like that of boiling water in a pot - powered by the radiation of the Sun heating the clouds and the atmosphere itself. The bright lace visible on top of the darker cloud deck is made of freshly formed droplets of sulphuric acid.

At mid latitudes the scene changes - convective patterns leave place to more streaky clouds indicating that the convection is weaker as the amount of absorbed sunlight decreases.

At high latitudes, the cloud structure changes again. Here it all appears as a dense, almost featureless haze forming some kind of polar 'cap' or 'hood' on Venus. The dark circular feature visible at the lower edge of the image is one of the dark streaks usually present in the polar region, indicating atmospheric parcels spiralling around and towards the pole.

Hitherto unseen details of the Venusian soup



Mosaic picture from the North Pole to the Equator

Additional images provide close-up views of the structures described above and show details never seen before. This is possible thanks to the elongated orbit of Venus Express, that allows the spacecraft to image the same phenomena from decreasing distances as it approaches the planet.

Above, we see a composite of four images. The top two in the composite provide a zoom-in on the equatorial region, showing details of the cloud top and of the bright lace of sulphuric acid, from 20 000 and 15 000 km respectively.

The bottom left in the composite provides a close-up on the region of transition between the equatorial area dominated by convection and the mid-latitude area populated by streaky clouds. This region is located at about 40-50 degrees latitude and was imaged from a distance of about 15 000 km. The way the transition between structures and dynamics so different from each other occurs, is one of the outstanding enigmas in our current comprehension of Venus.

The final image in the composite, obtained from a distance of about 20 000 km, is a zoom-in on the south polar 'hood', located inside a 60-degree-latitude circle. This region is highly variable on time scales of days. In this particular case it shows a very bright and uniform appearance and lacks small-scale markings. However several global dark streaks here and usually cross the polar regions and seem to indicate strong 'jet' winds.

The mosaic shown on the right is composed of more than 40 single UV images taken by VMC during a pericentre pass. Distance to the planet decreased from about 5 000 km above the equator (bottom) to 1 000 km in Northern polar regions (top) resulting in shrinking of the VMC field of view from 1 500 to 300 km. The mosaic traverses the northern hemisphere.

The transition from mottled clouds in low latitudes to streaky patterns at middle latitudes is quite similar to that observed in the Southern hemisphere (the first image in the article). This suggests global North-South symmetry of the cloud morphology on Venus.

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