National Aeronautics and Space Administration
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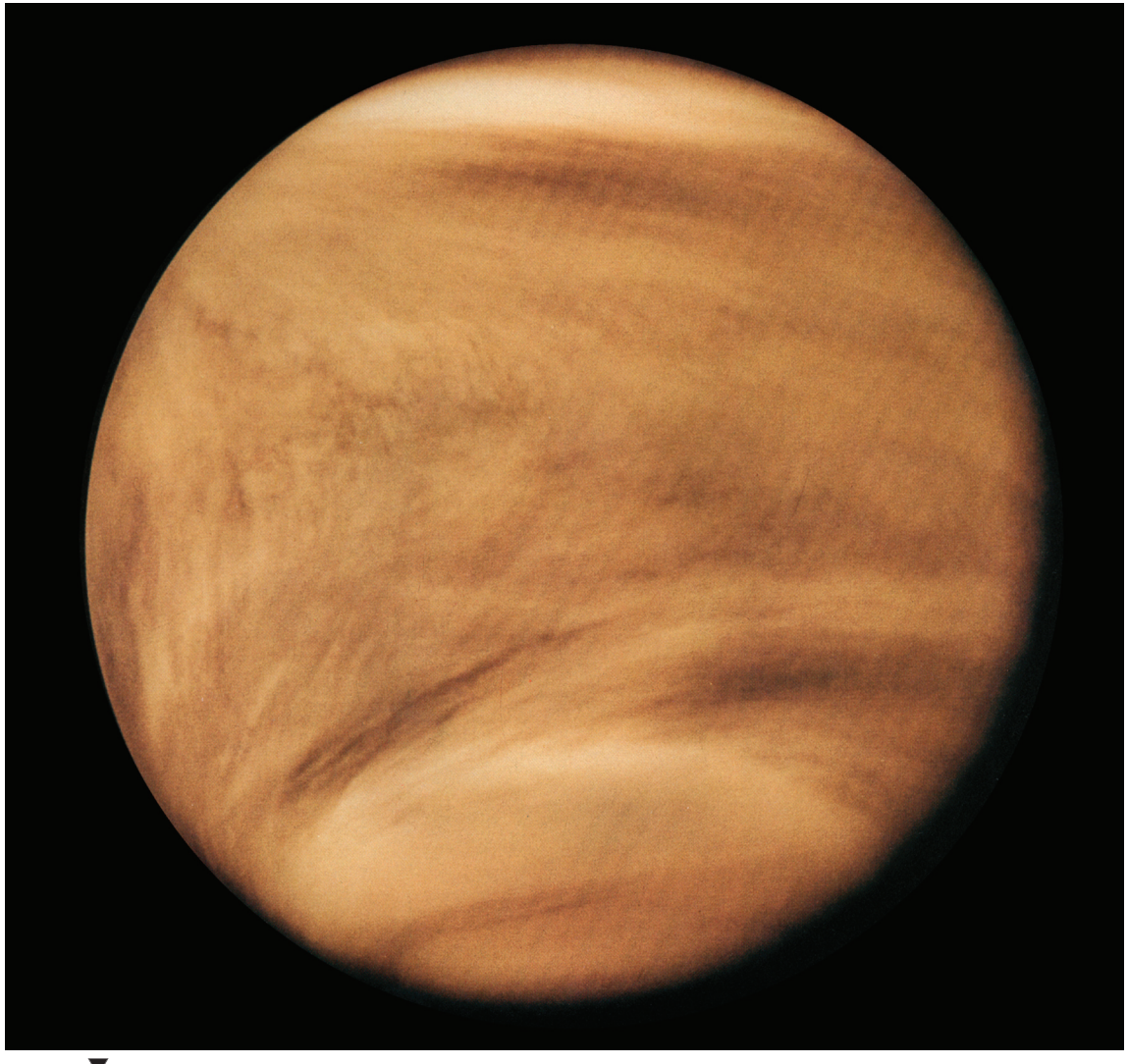
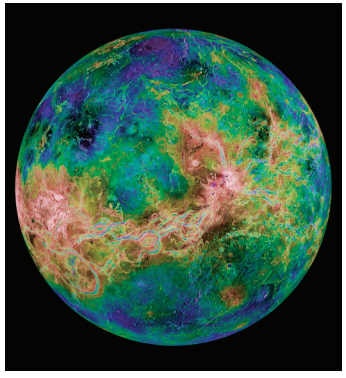
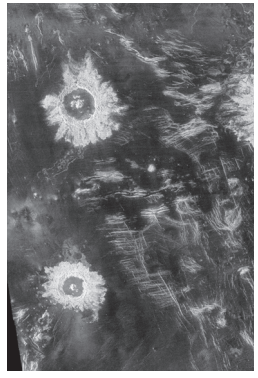
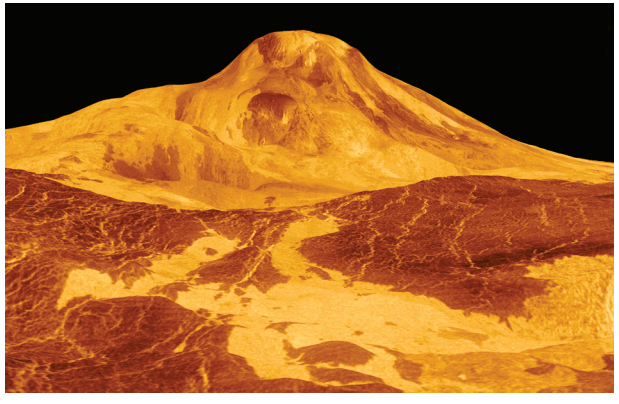
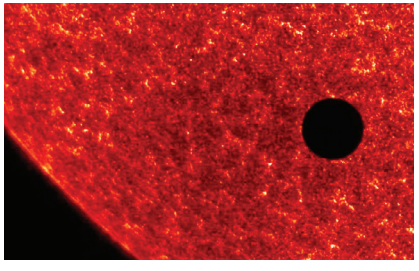
# Venus

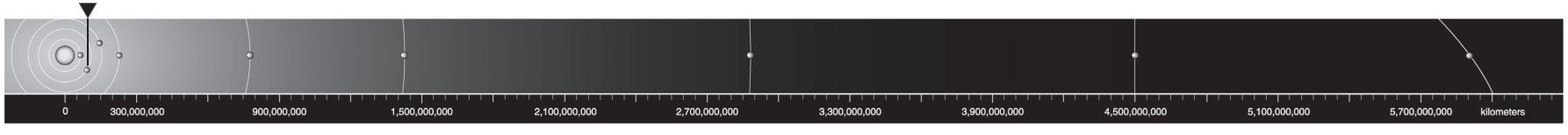












# Venus

Venus and Earth are similar in size, mass, density, composition, and distance from the Sun. There, however, the similarities end. Venus is covered by a thick, rapidly spinning atmosphere, creating a scorched world with temperatures hot enough to melt lead and surface pressure 90 times that of Earth. Because of its proximity to Earth and the way its clouds reflect sunlight, Venus appears to be the brightest planet in the sky. Although we cannot normally see through Venus' thick atmosphere, NASA's Magellan mission to Venus used radar to image the surface, and Galileo used infrared mapping to view mid-level cloud structure.

Like Mercury, Venus can be seen periodically passing across the face of the Sun. These "transits" of Venus occur in pairs with more than a century separating each pair. Since the telescope was invented, transits were observed in 1631, 1639; 1761, 1769; and 1874, 1882. On June 8, 2004, astronomers worldwide saw the tiny dot of Venus crawl across the Sun; the second in this pair of early 21st-century transits occurs June 6, 2012.

The atmosphere consists mainly of carbon dioxide, with clouds of sulfuric acid droplets. Only trace amounts of water have been detected in the atmosphere. The thick atmosphere traps the Sun's heat, resulting in surface temperatures over 470 degrees Celsius (880 degrees Fahrenheit). Probes that have landed on Venus have not survived more than a few hours before being destroyed by the incredible temperatures.

The Venusian year (orbital period) is about 225 Earth days long, while the planet's rotation period is 243 Earth days, making a Venus day about 117 Earth days long. Venus rotates retrograde (east to west) compared with Earth's prograde (west to east) rotation. Seen from Venus, the Sun would rise in the west and set in the east. As Venus moves forward in its solar orbit while slowly rotating "backwards" on its axis, the cloud-level atmosphere zips around the planet in the opposite direction from the rotation every four Earth days, driven by constant hurricane-force winds. How this atmospheric "superrotation" forms and is maintained continues to be a topic of scientific investigation.

About 90 percent of the surface of Venus appears to be recently solidified basalt lava; it is thought that the planet was completely resurfaced by volcanic activity 300 to 500 million years ago.

Sulfur compounds, possibly attributable to volcanic activity, are abundant in Venus' clouds. The corrosive chemistry and dense, moving atmosphere cause significant surface weathering and erosion. Radar images of the surface show wind streaks and sand dunes. Craters smaller than 1.5 to 2 kilometers (0.9 to 1.2 miles) across do not exist on Venus, because small meteors burn up in the dense atmosphere before they can reach the surface.

More than 1,000 volcanoes or volcanic centers larger than 20 kilometers (12 miles) in diameter dot the surface of Venus. Volcanic flows have produced long, sinuous channels extending for hundreds of kilometers. Venus has two large highland areas — Ishtar Terra, about the size of Australia, in the north polar region; and Aphrodite Terra, about the size of South America, straddling the equator and extending for almost 10,000 kilometers (6,000 miles). Maxwell Montes, the highest mountain on Venus and comparable to Mount Everest on Earth, is at the eastern edge of Ishtar Terra.

Venus has an iron core about 3,000 kilometers (1,200 miles) in radius. Venus has no global magnetic field — though its core iron content is similar to that of Earth, Venus rotates too slowly to generate the type of magnetic field that Earth has.

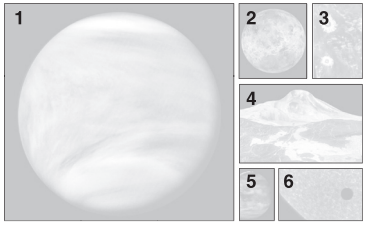
## FAST FACTS

| | |
|---|---|
| Namesake | Roman goddess of love and beauty |
| Mean Distance from the Sun | 108.21 million km (67.24 million mi) |
| Orbit Period | 224.70 Earth days |
| Orbit Eccentricity (Circular Orbit = 0) | 0.0068 |
| Orbit Inclination to Ecliptic | 3.39 deg |
| Inclination of Equator to Orbit | 177.3 deg |
| Rotation Period | 243.02 Earth days (retrograde) |
| Successive Sunrises | 116.75 days |
| Equatorial Radius | 6,052 km (3,760 mi) |
| Mass | 0.815 of Earth's |
| Density | 5.204 g/cm$^3$ (0.95 of Earth's) |
| Gravity | 0.91 of Earth's |
| Atmosphere Primary Component | carbon dioxide |
| Temperature at Surface | 470 deg C (880 deg F) |
| Known Moons | 0 |
| Rings | 0 |

## SIGNIFICANT DATES

650 AD — Mayan astronomers make detailed observations of Venus, leading to a highly accurate calendar.
1761–1769 — Two European expeditions to watch Venus cross in front of the Sun lead to the first good estimate of the Sun's distance from Earth.
1962 — Mariner 2 reaches Venus and reveals the planet's extreme surface temperatures. It is the first spacecraft to send back information from another planet.
1970 — Venera 7 sends back 23 minutes of data from the surface of Venus. It is the first spacecraft to successfully land on another planet.
1990–1994 — The Magellan spacecraft, in orbit around Venus, uses radar to map 98 percent of the planet's surface.

## ABOUT THE IMAGES




1 A 1979 Pioneer Venus image of Venus' clouds seen in ultraviolet.

2 This Magellan radar image is color-coded to represent varying elevations.

3 Impact craters are revealed in this Magellan radar image.

4 Scientists used Magellan radar images to create this three-dimensional view of Venus' Maat Mons volcano.

5 This false-color image taken by Galileo's infrared mapping instrument shows details of Venus' mid-level cloud structure.

6 This view of the transit of Venus of 2004 was taken in ultraviolet light by NASA's Transition Region and Coronal Explorer spacecraft.

## FOR MORE INFORMATION

solarsystem.nasa.gov/planets/profile.cfm?Object=Venus

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