



EnVision mission to Venus

Context:

Following NASA's footsteps, the European Space Agency (ESA) announced that it has selected EnVision as its next orbiter that will visit Venus sometime in the 2030s.

Relevance:

Prelims, GS-III: Science and Technology (Space Technology)

Dimensions of the Article:

1. About Venus
2. Difference between Earth and Venus
3. What is EnVision?
4. Why are scientists interested in studying Venus?
5. Which missions did NASA announce?

About Venus

- Venus is the second planet from the sun and the hottest planet in the solar system with a surface temperature of 500C – high enough to melt lead.
- The planet's thick atmosphere has cranked the surface pressure up to 90 bars.
- A single Venusian rotation takes 243.0226 Earth days. That means a day lasts longer than a year on Venus, which makes a complete orbit around the sun in 225 Earth days.
- The Venusian planetary core has a diameter of about 4,360 miles (7,000 km), comparable to Earth's core.



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- Venus is one of just two planets that rotate from east to west. Only Venus and Uranus have this “backwards” rotation.
 - For those on Earth, Venus is the second-brightest object in the sky after the moon. It appears bright because of its thick cloud cover that reflects and scatters light.

Difference between Earth and Venus

- But while Venus, which is the second closest planet to the Sun, is called the Earth’s twin because of their similar sizes, the two planets have significant differences between them.
- For one, the planet’s thick atmosphere traps heat and is the reason that it is the hottest planet in the solar system, despite coming after Mercury, the closest planet to the Sun. Surface temperatures on Venus can go up to 471 degrees Celsius, which is hot enough to melt lead, NASA notes.
- Further, Venus moves forward on its orbit around the Sun but spins backwards around its axis slowly. This means on Venus the Sun rises in the west and sets in the East. One day on Venus is equivalent to 243 Earth days because of its backward spinning, opposite to that of the Earth’s and most other planets. Venus also does not have a moon and no rings.

What is EnVision?

- EnVision is an ESA led mission with contributions from NASA. It is likely to be launched sometime in the 2030s. The earliest launch opportunity for EnVision is 2031, followed by 2032 and 2033. Once launched on an Ariane 6 rocket, the spacecraft will take about 15 months to reach Venus and will take 16 more months to achieve orbit circularisation.
- The spacecraft will carry a range of instruments to study the planet’s atmosphere and surface, monitor trace gases in the atmosphere and analyse its surface composition. A radar provided by NASA will help to image and map the surface.
- EnVision will follow another ESA-led mission to Venus called ‘Venus Express’ (2005-2014) that focussed on atmospheric research and pointed to volcanic hotspots on the planet’s surface. Other than this, Japan’s Akatsuki spacecraft has also been studying the planet’s atmosphere since 2015.

Why are scientists interested in studying Venus?



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- At the core of the ESA's mission is the question of how Earth and Venus evolved so differently from each other considering that they are roughly of the same size and composition.
 - Venus is the hottest planet in the solar system because of the heat that is trapped by its thick cloud cover.
 - Further, scientists speculate about the existence of life on Venus in its distant past and the possibility that life may exist in the top layers of its clouds where temperatures are less extreme.
 - In 2020, a team of scientists reported that they had found phosphine gas (a chemical produced only through biological processes) in the atmosphere of Venus that triggered excitement in the scientific community that some life forms might be supported by the planet.

Which missions did NASA announce?

Both missions called DAVINCI+ and VERITAS are part of the space agency's Discovery Program, which began in 1992 to give scientists the chance to launch some missions that use fewer resources and have shorter developmental times. The two selections are a part of the ninth Discovery Program and were made from proposals submitted in 2019.

DAVINCI+

- DAVINCI+ is short for 'Deep Atmosphere Venus Investigation of Noble gases, Chemistry, and Imaging' and is the first US-led mission to the planet's atmosphere since 1978. It will try to understand Venus' composition to see how the planet formed and evolved. This mission also consists of a descent sphere that will pass through the planet's thick atmosphere and make observations and take measurements of noble gases and other elements.
- Significantly, this mission will also try to return the first high resolution photographs of a geological feature that is unique to Venus. This feature, which is called "tesserae" may be comparable to Earth's continents, NASA says. The presence of tesseraes may suggest that Venus has tectonic plates like Earth.

VERITAS

- The second mission called VERITAS is short for 'Venus Emissivity, Radio Science,



InSAR, Topography, and Spectroscopy' and will map the planet's surface to determine its geologic history and understand the reasons why it developed so differently from Earth.

- VERITAS will orbit Venus with a radar that will help to create a three dimensional reconstruction of its topography which might be able to tell scientists if processes such as plate tectonics and volcanism are still active there. This mission will also map the emissions from Venus's surface that may help in determining the type of rocks that exist on Venus—a piece of information that is not exactly known yet. It will also determine if active volcanoes are releasing water vapour into the atmosphere.

-Source: Indian Express

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