

Cassini Finds an Atmosphere on Saturn's Moon Enceladus

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The Cassini spacecraft's two close flybys of Saturn's icy moon Enceladus have revealed that the moon has a significant atmosphere. Scientists, using Cassini's magnetometer instrument for their studies, say the source may be volcanism, geysers, or gases escaping from the surface or the interior.

When Cassini had its first encounter with Enceladus on Feb. 17 at an altitude of 1,167 kilometers (725 miles), the magnetometer instrument saw a striking signature in the magnetic field. On March 9, Cassini



approached to within 500 kilometers (310 miles) of Enceladus' surface and obtained additional evidence.

Image: This false-color, close-up look at Saturn's moon Enceladus yields new insight into the different processes that have shaped the moon's icy surface.

The observations showed a bending of the magnetic field, with the magnetospheric plasma being slowed and deflected by the moon. In addition, magnetic field oscillations were observed. These are caused when electrically charged (or ionized) molecules interact with the magnetic field by spiraling around the field line. This interaction creates characteristic oscillations in the magnetic field at frequencies that can be used to identify the molecule. The observations from the Enceladus flybys are believed to be due to ionized water vapor.

"These new results from Cassini may be the first evidence of gases originating either from the surface or possibly from the interior of Enceladus," said Dr. Michele Dougherty, principal investigator for the Cassini magnetometer and professor at Imperial College in London. In 1981, NASA's Voyager spacecraft flew by Enceladus at a distance of 90,000 kilometers (56,000 miles) without detecting an atmosphere. It's possible detection was beyond Voyager's capabilities, or something may have changed since that flyby.

This is the first time since Cassini arrived in orbit around Saturn last summer that an atmosphere has been detected around a moon of Saturn, other than its largest moon, Titan. Enceladus is a relatively small moon. The amount of gravity it exerts is not enough to hold an atmosphere very long. Therefore, at Enceladus, a strong continuous source is required to maintain the atmosphere.

The need for such a strong source leads scientists to consider eruptions,



such as volcanoes and geysers. If such eruptions are present, Enceladus would join two other such active moons, Io at Jupiter and Triton at Neptune. "Enceladus could be Saturn's more benign counterpart to Jupiter's dramatic Io," said Dr. Fritz Neubauer, co-investigator for the Cassini magnetometer, and a professor at the University of Cologne in Germany.

Since the Voyager flyby, scientists have suspected that this moon is geologically active and is the source of Saturn's icy E ring. Enceladus is the most reflective object in the solar system, reflecting about 90 percent of the sunlight that hits it. If Enceladus does have ice volcanoes, the high reflectivity of the moon's surface might result from continuous deposition of icy particles originating from the volcanoes.

Enceladus' diameter is about 500 kilometers (310 miles), which would fit in the state of Arizona. Yet despite its small size, Enceladus exhibits one of the most interesting surfaces of all the icy satellites.

Source: NASA

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