Saturn’s moon is source of solar system’s largest planetary ring

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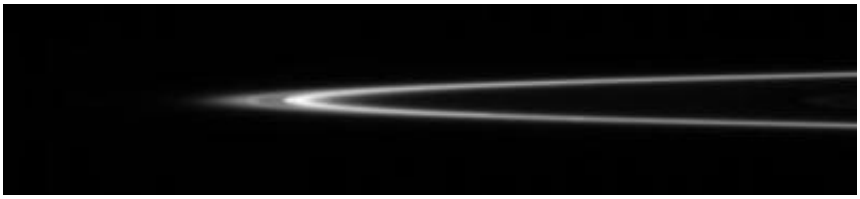

Structure in Saturn's narrow and complex F ring is seen here, including one of the faint strands (at the left) that Cassini has shown to curl around the planet in a tight, rotating spiral. Scientists think the spiral structure might be due to disturbance of micron-sized F-ring particles by a tiny moon (or moons). The image was taken in visible light with the Cassini spacecraft narrow-angle camera on Jan. 19, 2006, at a distance of approximately 1.2 million kilometers (700,000 miles) from Saturn and from just above the ringplane. The image scale is 7 kilometers (4 miles) per pixel.

Saturn's moon Enceladus is the source of Saturn's E-ring, confirms research published today. Writing in the journal *Science*, scientists show how a plume of icy water vapour bursting out of the South Pole of Enceladus replenishes the water particles that make up the E-ring and creates a dynamic water-based atmosphere around the small moon. The E-ring is Saturn's outermost ring and is composed of microscopic particles. It is very diffuse and stretches between the orbit of two of Saturn's moons, Mimas and Titan.

Scientists discovered the dynamic atmosphere during three separate fly-

bys of Enceladus by the Cassini spacecraft in February, March and July 2005. Cassini Huygens is a joint NASA/ESA mission to study the Saturnian system.

The team working on results from the magnetometer instrument were surprised to discover what they believed was an atmosphere on their first fly-by, 1176km from the moon's surface. After a second flyby at 500km confirmed their observations, they persuaded the Cassini Project to take the next flyby much closer to Enceladus in order to investigate further.

On this flyby, at 175km, measurements from all the different instruments on the spacecraft confirmed the presence of an atmosphere. Later remote sensing observations of the moon revealed a plume of water vapour coming from the moon's South Pole.

The atmosphere was also seen to change between the flybys, with a particularly extended atmosphere observed during the first one and a more concentrated atmosphere seen during subsequent flybys. The team believe that changing levels of activity by the plume at the South Pole were causing these changes in the atmosphere.

Professor Michele Dougherty, from Imperial College London's Department of Space and Atmospheric Physics, Principal Investigator on Cassini's magnetometer instrument and lead author of one of the papers, said: "When we observed signatures of an atmosphere on the first distant flyby we were very surprised because it was so unexpected to observe such signatures so far away from the moon.

"It was extremely exciting to have all the other instruments confirm our initial discovery, particularly when it was found that the atmosphere was changing from flyby to flyby and was closely linked with the subsequent plume observations at the South Pole. In addition this discovery clearly shows the importance of having a multi-instrument spacecraft such as

Cassini since it enables us to combine a whole range of different data sets thereby allowing us to gain a much better overall understanding of complex physical systems.

Measurements of the temperature of Enceladus showed that, surprisingly, there is a concentration of heat around the South Pole, with the hottest point located over one of the fractures in the planet's surface. The scientists believe that this heat signature shows internal processes within Enceladus causing the icy plume, by heating the moon's ice.

The Cassini spacecraft is the first spacecraft to explore the Saturn system of rings and moons from orbit. Launched in October 1997 Cassini entered Saturn's orbit on 1st July 2004 and immediately began sending back intriguing images and data.
The European Space Agency's Huygens Probe successfully separated from Cassini on 25th December 2004 and descended through Titan's atmosphere on 14th January 2005, to land on its surface -sending back some amazing images giving us the first close up look at the features of Titan. The sophisticated instruments on both spacecraft are providing scientists with vital data and the best views ever of this mysterious, vast region of our solar system.

Source: PPARC

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