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DLR helps plan Cassini fly-by of Saturn moon Rhea

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Surface of Saturn's moon Rhea

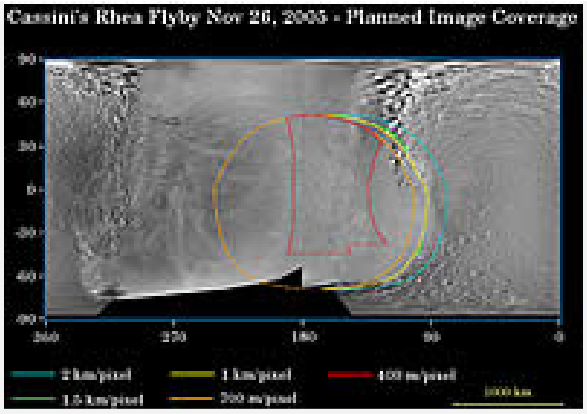
Berlin-Adlershof — On the night of 26/27 November 2005, the US-European space probe Cassini will perform a fly-by of Saturn's second largest moon Rhea at a distance of just 500 kilometres from its surface. During the fly-by, the probe will take the highest-resolution images and spectrometer measurements ever taken of the moon. The Institute for Planetary Research at the German Aerospace Center (DLR) was responsible for planning the precisely-timed sequences for the Cassini camera team for this close fly-by of Rhea.

The Institute's planetary researchers also intend to use the spectrometry data onboard Cassini to find out exactly what the moon is made of. The on-board dust detector, built in Germany with the close involvement of the DLR, will be used to study the moon's immediate cosmic environment.

"Wispy Streaks" on Saturn's moon Rhea

With a diameter of 1528 kilometres, Rhea is Saturn’s second largest moon (after Titan). It orbits the planet at a distance of over 500 000 km and the two bodies are ‘tidally locked,’ which means that the same hemisphere of the moon is always facing Saturn. The moon was first discovered in 1672 by Jean-Dominique Cassini, after whom this mission to Saturn and its moons was named. In Greek mythology, Rhea was the daughter of Uranus and the Earth mother Gaia and the mother of Zeus, the ruler of the gods.

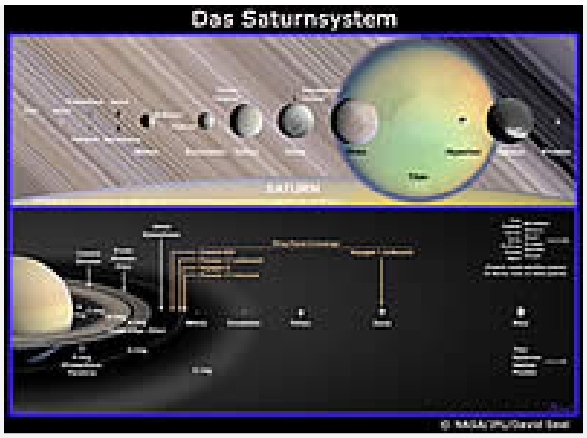
The surface of the moon is peppered with impact craters, suggesting that it is very old. Detailed photographs are to be taken of two larger craters on the side of the moon that faces away from Saturn using the ISS (Imaging Sub-System) camera on Cassini. Scientists from DLR’s Institute for Planetary Research will use these images, which cover approximately one third of Rhea’s surface, to create image mosaics and new maps of the moon for the Cassini camera team (led by Dr Carolyn Porco at the Space Science Institute in Boulder, Colorado).



Overview map of Rhea

Another, obviously very recent, impact crater (picture 1) will be examined by both the camera and the spectrometer. Analysing the crater using the VIMS (Visual and Infrared Mapping Spectrometer) could help scientists to deduce what other materials are present on Rhea besides water ice.

“In these young craters, the ejected material has not been exposed to the cosmic environment for very long and is almost unchanged,” explains Dr Ralf Jaumann from DLR’s Institute for Planetary Research, a member of the VIMS project team. “So this area affords us an opportunity to get a glimpse, if you like, of the moon's interior, rather like a bore hole into the surface, and perhaps some clues as to the geochemical composition beneath the surface of Rhea.” The spectrometer team is led by Prof. Bob Brown at the Lunar and Planetary Institute in Tucson, Arizona.



The 21 largest satellites of Saturn

Scientists are particularly eager to get high-resolution images of some bright, narrow streaks that appear only faintly on older images (picture 2) and which extend over the side of the moon never seen from Saturn. Similar features found on the neighbouring moon Dione — known as 'wispy streaks' — turned out to be tectonic fissures in the brittle ice crust.

The Cassini images are being taken at a somewhat greater distance from Rhea and should show a level of detail of around 400 metres per pixel in large regional areas of coverage. Although at a distance of just 500 km the probe could theoretically take even higher-resolution pictures, the mission planners decided not to use this option on this fly-by. Firstly, observation time needs to be kept free for other instruments, and secondly, the long exposure times needed in the outer Solar System when travelling at a speed of over 26 000 km/h would mean that, at the probe’s maximum proximity to Rhea, the images would actually become blurred. On this fly-by, scientists are focusing on the internal structure of Rhea. Soon after Cassini has completed the ten-hour experimental phase, all the measurement data and images of Rhea recorded by the probe will be transmitted to Earth and disseminated to the team of scientists involved in the mission.

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