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Cassini-Huygens Mission Highlights: Discoveries in the Saturn System

SPILKER, Linda[1*] ; EDGINGTON, Scott[1] ; ALTOBELLI, Nicolas[2]

[1]Jet Propulsion Laboratory/California Institute of Technology, Pasadena, CA, USA, [2]ESA/ESAC, Villafranca del Castillo, Madrid, Spain

Cassini-Huygens exploration of the Saturn system has yielded 11 years of unprecedented discoveries, and answers to many scientific mysteries. Cassini's findings have revolutionized our understanding of Saturn, its complex rings, its amazing assortment of moons and the planet's dynamic magnetic environment. The robotic spacecraft arrived in 2004 after a 7-year flight from Earth, dropped a parachuted probe named Huygens to study the atmosphere and surface of Saturn's big moon Titan, and commenced making astonishing discoveries that continue today.

Among its many firsts, Cassini discovered cryovolcanic jets shooting from the south pole of the tiny moon Enceladus; found hydrocarbon lakes and seas on Titan that are dominated by liquid ethane and methane as well as complex pre-biotic chemicals form in the atmosphere and rain to the surface; provided multi-wavelength coverage of a giant northern storm, the first of its kind on Saturn since 1990; demonstrated that the Saturn Kilometric Radiation period does not reflect the planet's internal rotation; proved that Enceladus is the source of Saturn's E Ring and that its water dominates the magnetosphere; and constrained and complicated our understanding of the 3-dimensional structure and dynamics of multi-particle ring systems. Cassini's findings at Saturn have also fundamentally altered many of our concepts of how planets form around stars.

In just the last two years, Cassini discovered that: the majority of Titan's lakes and seas are located near the north pole and measured the depths of some of the seas; Enceladus harbors a subsurface ocean; a huge hurricane rages at Saturn's north pole; tidal stresses control Enceladus' particulate jets; plume activity is greatest near apoapse; the depth of Titan's Ligeia Mare is 150-200 meters; meteorite impacts, embedded propellers migrating inwards and outwards, and the effects of Saturn internal oscillations can be witnessed in the rings; Titan has a subsurface water ocean; interactions between a strong solar wind and Saturn's magnetosphere can help us understand supernovae shockwaves; and Titan's south polar haze is a seasonal phenomenon.

The Solstice Mission continues to provide fundamental new science as Cassini observes seasonal and temporal changes, and addresses new questions that have arisen during the mission thus far. The mission's grand finale occurs in 2017, with 22 inclined orbits between the innermost D ring and the upper portions of Saturn's atmosphere, enabling unique gravity and magnetic field measurements of the planet, unprecedented determination of the ring mass, some of the highest resolution measurements of the rings and Saturn, and in situ observations in a completely new region around the planet. Highlights from 11 years of Cassini's ambitious inquiry at Saturn will be presented along with the remarkable science that will be collected in the next three years.

Cassini-Huygens is a cooperative undertaking by NASA, the European Space Agency (ESA), and the Italian space agency (Agenzia Spaziale Italiana, ASI).

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