Titan still offers all possibilities for the Huygens probe landing

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The prospect of the Huygens probe landing on a hard, soft or liquid surface when it lands on Titan on Friday still remain following further analysis of data taken during the Cassini mother ship's closest encounter with Saturn's largest moon.

Not only is Titan the largest of Saturn's satellites, it is also larger than the planets Mercury and Pluto, and is the second largest satellite in the solar system (Jupiter's Ganymede being larger). It is the only satellite in the solar system with appreciable atmosphere, composed mostly of Nitrogen, but also contains aerosols and hydrocarbons, including

methane and ethane. Titan's atmosphere was first confirmed in 1944 when Gerard Kuiper confirmed the presence of gaseous methane with spectroscopy.

Titan's peak surface temperature is about 95 K (-178 degrees C) and surface pressure is 1.6 Earth atmospheres. At this temperature and pressure, many simple chemicals that are present in abundance (methane, ethane, water, ammonia) provide materials in solid, liquid and gaseous form which may interact to create exotic features on the surface. Precipitation, flowing liquids, lakes and eruptions are all possible.

Titan orbits Saturn at a distance of just over 20 Saturn radii (1,222,000 km/759,000 miles) which is far enough to carry the moon in and out of Saturn's magnetosphere. Very little is known about Titan's interior structure, including whether it has its own magnetic field.

Titan's surface has been difficult to study, as it is veiled by a dense hydrocarbon haze that forms in the dense stratosphere as methane is destroyed by sunlight. From the data collected so far, dark features can be seen crossing the equatorial region of Titan, with a large bright region near longitude 90 degrees now named Xanadu, and possibly a large crater in the northern hemisphere.

Commenting on the data results and implications for the Huygens probe Mark Leese of the Open University, Programme Manager for Science Surface Package [SSP] instruments that will unravel the mysteries of Titan said: "It's interesting that all of the possible landing scenarios that we envisaged - a hard crunch onto ice, a softer squelch into solid organics or a splash-down on a liquid hydrocarbon lake - still seem to exist on Titan."

Leese added, "A first look at the measurements of Titan's atmosphere during the fly-by suggest that the "Atmosphere Model" we developed

and used to design the Huygens probe is valid and all looks good for the probe descent to the surface on 14th January 2005."

Further analysis of Titan's upper atmosphere, the thermosphere, has revealed a strange brew as Dr Ingo Mueller-Wodarg of Imperial College London explained," Our instrument, the Ion Neutral Mass Spectrometer (INMS), made in-situ measurements of atmospheric gases in Titan's upper atmosphere and found a potent cocktail of nitrogen and methane, stirred up with signatures of hydrogen and other hydrocarbons. We are now working on a 'Weather Report' for the Huygens landing in January".

Commenting on the surface characteristics of Titan Professor John Zarnecki of the Open University, lead scientist for the Huygens SSP said: "The recent results from the fly-by have started to show us a very diverse and complicated surface. Titan is geologically active but hasn't yet given up all of its secrets. Combining the visible images with infrared and RADAR data from this and future fly-bys should help to clarify the picture - but the arrival of the Huygens probe in January will perhaps be the key to unlock these mysteries."

Professor Carl Murray, of the Imaging Science System [ISS] team from Queen Mary, University of London also commented on the surface features: "The images of the Huygens' landing site returned by the cameras show a diverse range of features. We see bright and dark areas roughly aligned in an east-west direction. These are similar to wind streaks seen on Mars and may indicate that material on Titan has been deposited by the effects of wind blowing across the landscape. All indications suggest that we are in for a real treat in January when the Huygens probe reaches Titan's surface and returns the first in situ data from this alien world."

Dr Andrew Coates from University College London's Mullard Space Science Laboratory, a Co-Investigator on the Cassini Electron

Spectrometer team, said: "We received some remarkable new information about Titan's plasma environment within the context of Saturn's fascinating magnetosphere. Unexpectedly, it looks like we can directly use features of the electron results to understand what Titan's upper atmosphere is made of, supplementing the ion measurements from companion sensors on other instruments. Our electron results contain tell-tale fingerprints of photoelectrons and Auger electrons which we will use for this. Also, the total picture shows how important electrons, raining down on Titan's upper atmosphere, are in helping the feeble sunlight drive the complex chemistry in Titan's upper atmosphere."

The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. The Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, manages the Cassini-Huygens mission for NASA's Science Mission Directorate, Washington, D.C. The Cassini orbiter and its two onboard cameras were designed, developed and assembled at JPL.

Source: PPARC