Scientists present new results from Huygens probe

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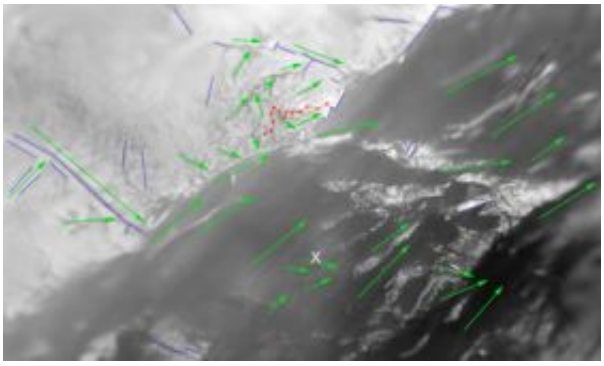
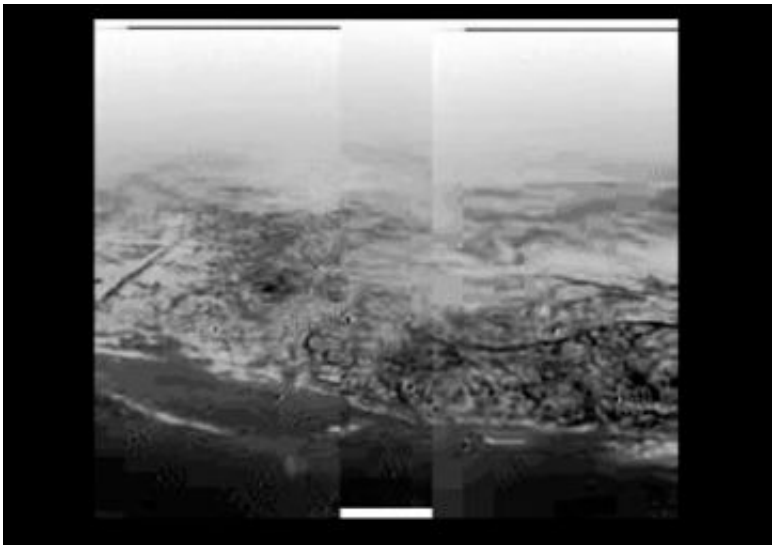


This image of Titan's surface, obtained by Huygens' DISR imager, shows patterns of tectonic and fluid-flow activity. The tectonic patterns are indicated by blue lines; the drainage divide is indicated by the red line; flow directions are indicated by the green arrows. The Huygens landing site is marked by a white cross. Cedits: ESA/NASA/JPL/University of Arizona

Today, two and a half years after the historic landing of ESA's Huygens probe on Titan, a new set of results on Saturn's largest moon is ready to be presented. Titan, as seen through the eyes of Huygens still holds exciting surprises, scientists say.

On 14 January 2005, after a seven-year voyage on board the NASA/ESA/ASI Cassini spacecraft, ESA's Huygens probe spent 2 hours and 28 minutes descending by parachute to land on Titan. It then sent transmissions from the surface for another seventy minutes before

Cassini moved out of range.



This composite was produced from images returned on 14 January 2005, by ESA's Huygens probe during its successful descent to land on Titan. It shows the boundary between the lighter-coloured uplifted terrain, marked with what appear to be drainage channels, and darker lower areas. These images were taken from an altitude of about 8 kilometres with a resolution of about 20 metres per pixel. Credits: ESA/NASA/JPL/University of Arizona

On 8 December that year, a combined force of scientists published their preliminary findings in *Nature*. Now, after another year and a half of patient work, they are ready to add fresh details to their picture of Titan. This time, the papers are published in a special issue of the *Planetary and Space Science* magazine.

“The added value comes from computer modelling,” says Jonathan Lunine, Huygens Interdisciplinary Scientist from the Lunar and Planetary Laboratory, University of Arizona.

By driving their computer models of Titan to match the data returned from the probe, planetary scientists can now visualise Titan as a working world. “Even though we have only four hours of data, it is so rich that after two years of work we have yet to retrieve all the information it contains,” says François Raulin, Huygens Interdisciplinary Scientist, at the Laboratoire de Physique et Chimie de l'Environnement, Paris.

The new details add greatly to the picture of Saturn’s largest moon. “Titan is a world very similar to the Earth in many respects,” says Jean-Pierre Lebreton, ESA Huygens Project Scientist.

Huygens found that the atmosphere was hazier than expected because of the presence of dust particles – called ‘aerosols’. Now, scientists are learning how to interpret their analysis of these aerosols, thanks to a special chamber that simulates Titan’s atmosphere.

When the probe dropped below 40 kilometres in altitude, the haze cleared and the cameras were able to take their first distinct images of the surface. They revealed an extraordinary landscape showing strong evidence that a liquid, possibly methane, has flowed on the surface, causing erosion. Now, images from Cassini are being coupled with the ‘ground truth’ from Huygens to investigate how conditions on Titan carved out this landscape.

As the probe descended, Titan’s winds carried it over the surface. A new model of the atmosphere, based on the winds, reveals that Titan’s atmosphere is a giant conveyor belt, circulating its gas from the south pole to the north pole and back again.

Also, the tentative detection of an extremely low frequency (ELF) radio wave has planetary scientists equally excited. If they confirm that it is a natural phenomenon, it will give them a way to probe into the moon’s subsurface, perhaps revealing an underground ocean.

The journey Huygens took to the surface is the subject of the most intense scrutiny, with many papers on the subject. When an anomaly onboard Cassini robbed scientists of data from the Doppler Wind Experiment (DWE), it was followed by a painstaking analysis of data collected by radio telescopes on Earth that were tracking Huygens. Engineers and scientists succeeded in recovering the movement of the probe, providing an accurate wind profile and helping them place some of the images and data from Huygens into their correct context.

Now corroborating evidence, resulting from a thorough analysis of many instruments and engineering sensors on Huygens, is adding unprecedented detail to the movement of the probe during its descent.

And there is still more science to come. “There are so many papers dealing with the results from Huygens that we could not prepare all of them in time for this issue. So a second special issue is already in preparation,” says Raulin.

This article is an introduction to the series of results to appear in a special issue of the *Planetary and Space Science* magazine dedicated to results from Huygens. It is based on the paper: 'A new image of Titan – preface to the PPS Special Issue: ‘Titan as seen from Huygens”, by F. Raulin, M.C. Gazeau and J.P. Lebreton.

Source: ESA