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Press release

Mission accomplished for CoRoT

After a mission that lasted twice as long as planned, CNES's CoRoT spacecraft—capable of listening to the music of the heavens and hunting for exoplanets—is to be retired from service. Its remarkable haul of results has enabled scientists to progress from detecting exoplanets to studying them in close detail, while opening a new window into the interior of stars.

Launched on 26 December 2006, the CoRoT space telescope—a French initiative led under CNES oversight by the Paris Observatory with contributions from numerous French and foreign research laboratories—has set new standards in science.

A pioneering satellite designed to study stars and look for extrasolar planets, CoRoT quickly demonstrated its ability to acquire ultra-precise measurements—to a factor of one ten-thousandth—of the brightness of stars, operating almost continuously over periods of several months. And the resulting harvest of unprecedented results is still far from over, since science teams are still analyzing its data.

In light of the successes achieved, CNES and its partners decided to extend the CoRoT mission—initially planned to last 3 years—twice, first in 2009 and then again in 2012. But after enduring 6 years of intense bombardment by high-energy particles in space, its instrument stopped sending data on 2 November 2012 and engineering teams at CNES and the French scientific research centre CNRS have been unable to recover the instrument. A series of operations will now be performed to lower CoRoT's orbit and conduct some technology experiments before passivating the satellite. Its journey will end as it burns up on re-entry in Earth's atmosphere.

In its search for exoplanets, CoRoT pioneered exploration of small planets with the discovery of the first confirmed Earth-like exoplanet orbiting a star similar to our own Sun, thereby proving the value of space-based observation. In all, it has since revealed 32 planets and 100 more are awaiting confirmation.

Supported by a vast network of complementary observing telescopes on the ground, scientists have obtained precious information about the planets discovered by CoRoT, such as their radius, mass and density—information which reveals their inner structure and composition—and the inclination and eccentricity of their orbit. Numbers aside, what is striking about these planets is their extraordinary diversity, especially in the domain of gas giants.

Some of the planets discovered, like CoRoT-7b, circle their star in less than 24 hours. CoRoT-9b, on the other hand, with an orbital period of 95 days, is one of very few known “warm” transiting exoplanets. Planet densities also vary to a surprising degree: CoRoT-20b, for example, is nearly twice as dense as Earth, suggesting that its interior is very rich in heavy elements whose origin is difficult to explain with current models of planet formation; others, like CoRoT-26b, are even less dense than Saturn and appear abnormally large. CoRoT was also the first to obtain measurements of the radius of brown dwarves, intermediate objects between a planet and a star.

Theories about the formation and evolution of planetary systems, based until the 1990s only on the knowledge of our own system, were thrown wide open with the discovery by ground telescopes of the first exoplanets with very different orbits and masses. But without more precise information, any further assumptions about their nature remained difficult. The CoRoT space mission, complemented by observations from the ground, thus took exoplanet science from the age of detection to actual characterization and detailed study.

CoRoT and ground telescopes also broke new ground through the combined study of stars and their planets, looking at their interactions, tidal effects in stars and the impact of a star's brightness on a planet's structure.

CoRoT has revolutionized stellar physics to an equal extent. By measuring the frequencies and amplitudes of stellar vibrations with unprecedented precision, it has literally opened up a whole new field of study: temporal analysis of the micro-variability of stars.

Like musical instruments, the vibration frequencies of stars are a unique signature that tells us about their structure, functioning and age. Among CoRoT's rich results, the discovery of vibrations comparable to those of the Sun in very different stars, notably older or massive ones, is a fundamental finding that will help scientists to better understand the inner workings of stars, where all the ingredients of planets and life are manufactured.

Our galaxy is full of red giants, stars nearing the end of their life. CoRoT has shown that oscillation properties are an indicator of their mass, radius and exact age, and has succeeded in measuring them in the farthest reaches of the galaxy. When combined with positional and velocity measurements from GAIA, this key result will give us new insights into the past and future of these outer regions of the Milky Way.

While CoRoT leaves a significant legacy, many successors are already waiting in the wings. At ESA, the CHEOPS mission, selected in 2012 and set to launch in 2017, and the EChO and Plato missions competing to launch in 2024 all draw on CoRoT's heritage. On the ground, numerous exoplanet detection campaigns are also underway. Across the Atlantic, NASA's Kepler satellite—which has also now stopped transmitting—followed in CoRoT's footsteps in 2009 and the future TESS mission was recently selected. In 2012, despite the successes achieved by Kepler, the majority of downloads from the CoRoT data archive were requested from the United States.

From 29 June to 29 December, an exhibition at the Musée de l'Air et de l'Espace at Le Bourget reveals all about the CoRoT project and its results.

<http://www.museeairespace.fr/agenda/exposition-corot/>

The CoRoT satellite was developed and operated by CNES and the LESIA space and astrophysics instrumentation research laboratory (CNRS, Paris Observatory, Pierre and Marie Curie University, Denis Diderot University), the LAM astrophysics laboratory in Marseille (CNRS, Aix-Marseille 1 University, Marseille Provence Astronomy Observatory), the IAS space astrophysics institute in Orsay (CNRS, Paris-Sud 11 University) and the Midi-Pyrenees Observatory in Toulouse (Universe Science Observatory operated by CNRS-INSU and Paul Sabatier University). The project also received significant contributions in Europe from Austria, Belgium, ESA, Germany and Spain, and from Brazil.

CoRoT mission website: <http://smc.cnes.fr/COROT/Fr/>

Learn more in a video about the mission:

http://www.dailymotion.com/video/x110jua_au-secours-de-corot_tech#.UcFut-926M0

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