

# COROT discovers its first exoplanet

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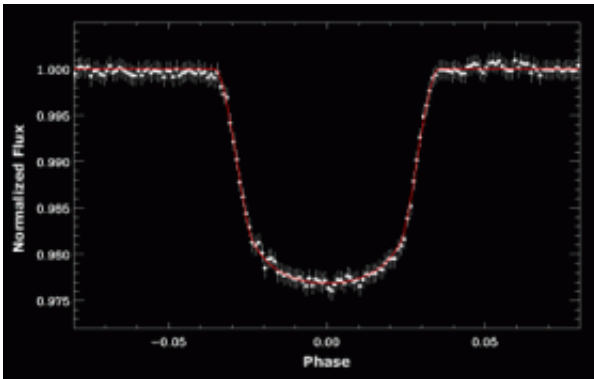
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This is an artist's impression of a Jupiter-sized planet passing in front of its parent star. Such events are called transits. When the planet transits the star, the star's apparent brightness drops by a few percent for a short period. Through this technique, astronomers can search for planets across the galaxy by measuring periodic changes in a star's luminosity. The first class of exoplanets found by this technique are the so-called "hot Jupiters," which are so close to their stars they complete an orbit within days, or even hours. Credits: NASA, ESA and G. Bacon

COROT has provided its first image of a giant planet orbiting another star and the first bit of 'seismic' information on a far away, Sun-like star - with unexpected accuracy.

The unanticipated level of accuracy of this raw data shows that COROT will be able to see rocky planets - perhaps even as small as Earth - and possibly provide an indication of their chemical composition.



This image shows the signature of the presence of a planet orbiting a star. The intensity of light coming from the star is represented on the y-axis whereas the x-axis shows the phase, or the revolution of the planet around the star. The amount of light from the star reaching COROT decreases each time the planet passes in front of the star itself. This is when the drop is registered. This was the first planet detected by COROT since the beginning of its mission. This light curve is part of a data set obtained between February and April 2007. The planet is a very hot gas giant, of radius equal to 1.78 times that of Jupiter. The planet takes 1.5 days to revolve around the star. Coordinated spectroscopic observations from the ground have allowed to determine that the mass of the planet is about 1.3 times that of Jupiter. The parent star is a yellow dwarf star similar to our Sun. It is located in the direction of the constellation Unicorn (Monoceros), roughly 1 500 light years from us. Credits: COROT exo-team

COROT, a CNES project with ESA participation, is a mission with a dual goal. It is the first space mission dedicated entirely to the search of extra-solar planets. It provides a wide-field survey of planets like our own at an unprecedented level of accuracy. It is also making the most comprehensive study ever of the interior of stars other than our Sun. Both objectives are achieved by analysing the behaviour of light emitted by a target star.

An exoplanet is detected by COROT due to a sudden decrease in the

intensity of light or the ‘light curve’ of a parent star when a planet transits in front of it.

The study of stellar interiors – or ‘asteroseismology’ – is carried out by analysing the oscillations in the light curve of the star. The oscillations are created due to mechanical waves propagating in the star itself and they give a clue to the structure of its interior.

COROT’s strength lies in the continued observation of the same targets in a given area of the sky. The observations have been on since the science operations began, 60 days ago. Another strong point is the accuracy with which it measures the variations in the luminosity of the star.

The first planet detected by COROT, now named ‘COROT-Exo-1b’, is a very hot gas giant, with a radius equal to 1.78 times that of Jupiter. It orbits a yellow dwarf star similar to our Sun with a period of about 1.5 days. ‘COROT-Exo-1b’ is situated roughly 1500 light years from us, in the direction of the constellation Unicorn (Monoceros). Coordinated spectroscopic observations from the ground have also allowed the determination of the mass of the planet, equivalent to about 1.3 Jupiter masses.

The scientific evaluation of the results that are streaming in will take some time. “The data we are presenting today is still raw but exceptional,” says Malcolm Fridlund, COROT Project Scientist for ESA. “It shows that the on-board systems are working better than expected in some cases - up to ten times the expectation before launch. This will have an enormous impact on the results of the mission.”

All the sources of noise and disturbance have not yet been taken into account in the data. This first exoplanet was detected with an error of only five parts out of 100 000 during one hour of observation. When all

the corrections are applied to the light curves, the error will be reduced to only one part out of 100 000.

As a consequence, small planets down to the size of our Earth – three times smaller than initially thought possible - will be in the grasp of COROT. The satellite may also be able, in specific circumstances, to detect subtle variations in the stellar light reflected by the planet itself. This would give an indication of its chemical composition.

The quality of the asteroseismological data is equally impressive. Excellent ‘starquake’ data were obtained during the first 60 days of observations, with a margin of error of less than one part per million.

COROT observed a bright Sun-like star continuously for 50 days, showing large, unexpected luminosity variations on time scales of a few days. This may be related to the star’s magnetic activity.

The accuracy of these measurements was truly outstanding: with an error of five parts out of 100 000 in one minute (corresponding to one part per million over four minutes), COROT has already reached the maximum performance for a telescope of its size.

The preliminary analysis of the oscillations in stellar luminosity clearly shows the seismic signature typical of a Sun-like star. This analysis will eventually help scientists understand the star’s internal structure and age.

“COROT, a joint endeavour between France, Europe and Brazil under the leadership of CNES, was certainly born under a lucky star,” concluded Fridlund. “After a perfect launch, and a faster-than-expected start of its science operations, we have been eagerly awaiting its data. Now, having seen its quality, we can expect great discoveries in the future.”

Source: ESA

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