SP-1312

Extract of COROT section

ESA's Report to the 37th COSPAR Meeting

Montreal, Canada
July 2008

European Space Agency
Agence spatiale européenne

2.12.4 COROT

COROT (Convection, Rotation and planetary Transits) is the first space mission dedicated to exoplanetary research and designed for this purpose. It is a CNES mission, with partners ESA, Austria, Belgium, Brazil, Germany and Spain.

COROT was launched from Baikonur in Kazakhstan on the 27 December 2006. Ascent into a near perfect orbit was on a new version of the well-proven Soyuz launcher. The in-orbit verification was intended to last until April 2007, but already on 2 February 2007 it was decided to start the science phase, since all elements of spacecraft and payload were working to specification or better. Consequently, COROT literally swung into action and has been obtaining data ever since. On 2 April 2007 the spacecraft was officially handed over to the scientists.

Although the origin (and the other main purpose) of the mission is asteroseismology (the detection of micro-variability caused, for example, by acoustical p-modes in stars), the detection of planetary transits has become more important as the mission has progressed through its development. The development of COROT is described in the so-called COROT book (*The COROT Mission*, ESA SP-1306, 2006). The COROT collaboration today consists of about 60 Co-Investigators (Co-I's) and a further 60-odd associated scientists from Europe and Brazil.

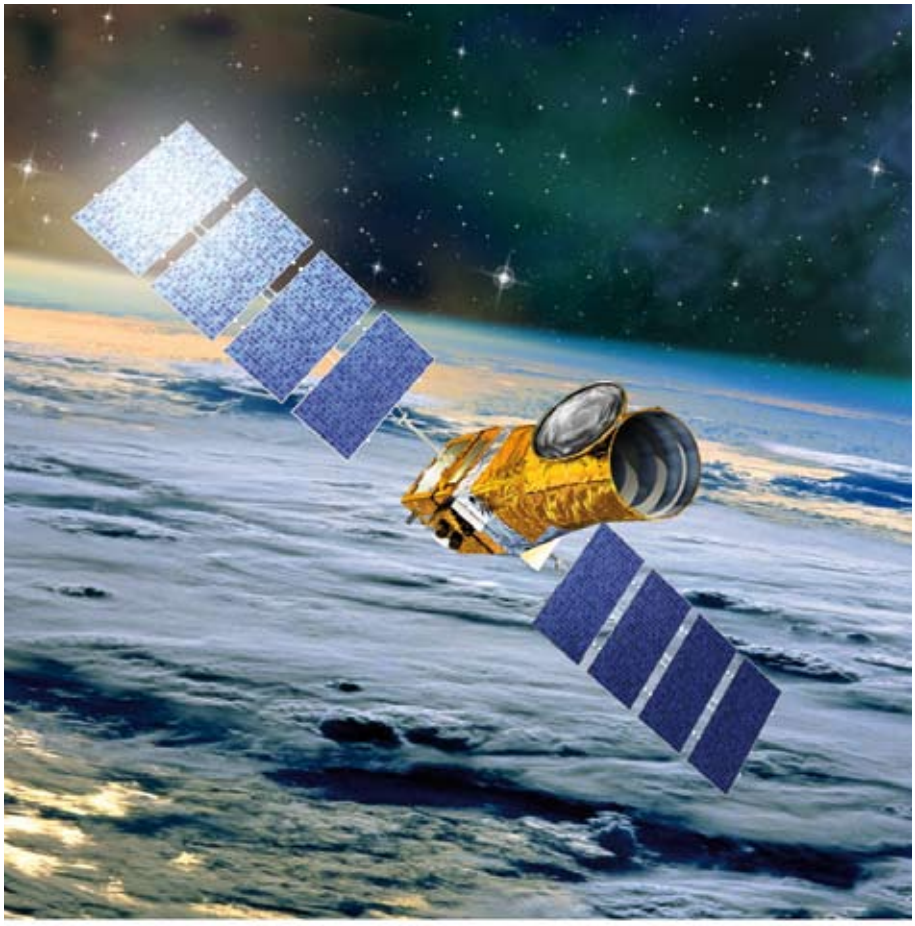

Figure 2.12.4.1. Artist's impression of COROT in orbit around the Earth.

COROT thus has two main scientific objectives:

— To detect planets of a size analogous to our own Earth through observing transits

— To study stellar interiors through the detection of acoustical p-modes and activity

The spacecraft is built around the PROTEUS spacecraft bus, which also implied a launch into a Low-Earth Orbit (LEO) of 900 km (polar). The requirement to look at a large enough sample of stars for the longest possible uninterrupted time set the constraint that COROT can only observe two oppositely-located regions (with about 10° diameter) of the sky. Observing for such a time allows detection of planetary orbital periods of up to 50 and 60 days with three eclipses detected, although in some cases two or even one eclipse will be enough (for large planets that can be confirmed from the ground). This places potential planets in the so-called habitable zone of both K- and M-type main sequence stars. The nominal mission is 2.5 years and extensions of up to 3–4 years can be envisaged. The detectors are four frame transfer CCDs (2048 by 4096) with two each dedicated to the exo- and seismo-programmes respectively. A prism is mounted in front of the two CCDs involved in the exo-planetary search providing very short spectra. This is used for separating certain types of variability and activity from 'true' eclipses, the signal of which is achromatic. All CCDs have defocussed PSFs in order to exclude or minimise the impact of in-pixel sensitivity variations. A massive groundbased programme is supporting the mission.

The telescope is operating at the photon noise limit in most of the magnitude range (5.5–9 for asteroseismology and 11.5–17 for exoplanetology). COROT thus has the capability of detecting Earth-like planets in short period orbits. In the asteroseismology channel, with significantly brighter objects, the 1 s noise for a $m_v = 5.5$ star has been measured to be 0.6 ppm for a 1-hour integration.

The first exoplanet found by COROT was – not surprisingly – of the 'Hot Jupiter' variety. It was presented in a press release by CNES and ESA at the beginning of April 2007. Since then, several new planets have been confirmed and literally hundreds of candidates are being followed up. Because of the complex and long supporting and confirming observations that have to be carried out, the first refereed papers are just now appearing at time of writing (early 2008).