Zooming in on Starspots: Scanning a stellar surface with an exoplanet

The surface of a star located 300 lightyears away from Earth in the constellation Aquila (Eagle) is blemished by dark spots apparently similar to spots found on our Sun. Using the french-german space telescope CoRoT, one such spot was studied in detail by a team of german astronomers from Hamburg and Tautenburg. The high resolution of their observations could only be achieved because the star, named CoRoT-2a, is orbited by a planet. The team reports their results in the journal Astronomy and Astrophysics.

“Our observation method is new”, explains lead author Uwe Wolter of the Hamburger Sternwarte, an institute of the University of Hamburg. “To study the stellar surface, we make use of the fact that the star is regularly occulted by its own planet.” As seen from earth, the planet passes in front of its host star about every other day. While the planet is in front of the star, it blocks out some of the light which makes the star appear slightly fainter. The resulting brightness difference amounts to a few percent.

Using the space telescope CoRoT enabled Wolter and his colleagues to study the light which is missing due to the occultations with a much higher precision than offered by terrestrial observations. Since the orbital parameters of the planet CoRoT-2b are known precisely, the portion of the stellar surface occulted by the planet at a given time is also well known. This allows to study the surface structure of the star with a precision that is currently out of reach for even the largest ground-based telescopes when using direct imaging. In this way, the planet serves as a kind of magnifying glass that repeatedly scans sections of the stellar surface.

Concerning its size and spots, the star CoRoT-2a to some degree resembles our Sun. However with its estimated age of a few hundred million years it is - for stellar standards - relatively young. At this age presumably not even primitive organisms could evolve on a planet. Additionally, the planet CoRoT-2b is very close to its host star, less than ten times the distance between Earth and Sun. The resulting very high temperatures make any presently conceivable lifeforms impossible on the planetary surface.

Illustration: Photomontage using a solar image (U. Wolter, SOHO/MDI, ESA/NASA)

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