Exoplanet atmospheres detected from Earth for the first time

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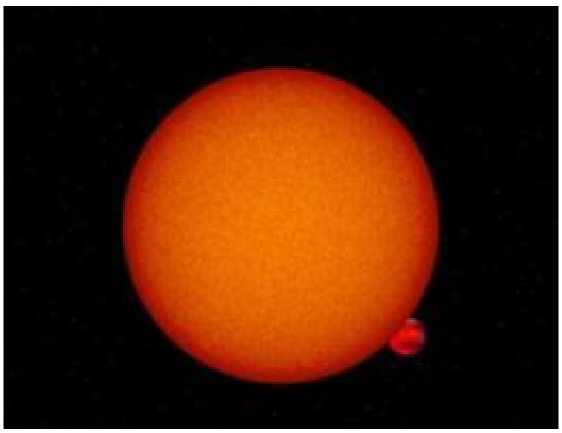

This is an artist's impression of the star OGLE-TR-56 and its planet, as the planet is passing behind the star. Credit: D. Sing (IAP) / A&A

(PhysOrg.com) -- Transiting exoplanets are routinely detected when they pass in front of their parent star as viewed from the Earth, which only happens by chance. The transit event causes a small drop in the observed starlight, which can then be detected. Fifty-five exoplanets have been detected this way since the observation of the first transiting planet HD 209458 b in 1999.

When the planet revolves around its star or when it goes behind, the light coming from the system also varies, though the resulting smaller modulation is much harder to detect. This is mostly due to the small amount of light emitted by these exoplanets which are believed to be as dark as coal and reflect little of the incoming starlight. Fortunately, some of these planets are very hot, thus emitting light, mostly at infrared wavelengths. Up to now, detections of this kind have only been made using the Spitzer infrared space telescope.

This week, *Astronomy & Astrophysics* is publishing the two first ground-based detections of thermal emission from transiting, hot-Jupiter exoplanets, from two independent teams of astronomers that used different approaches.

One team includes Ernst De Mooij and Ignas Snellen (University of Leiden, Netherlands) who used the William Hershel 4.2 meter telescope in La Palma (Canary Islands, Spain) to observe the star TrES-3 and its planet TrES-3b. To be able to detect the light coming from the planet, they observed the planet exactly at the time when it passes behind the star.

They observed the event at infrared wavelengths, where the planet is at its brightest compared to the star (even if the planet is still much fainter than the star!) As they detected the light coming from the planet, they estimated the temperature of its atmosphere to about 2000 Kelvins. This indicates that the day side of the planet is extremely hot.

The other team, involving David Sing (IAP, France) and Mercedes Lopez-Morales (Carnegie Institution of Washington, USA), had a different approach. They looked at a much fainter star and its planet, OGLE-TR-56b. This planet is one of the most irradiated planets known so far, both because the planet is very close to the star and because the star is very hot. To detect the slight modulation in light that occurs when the planet passes behind its star, they used the 8 meter Very Large Telescope (ESO, Chile) and the 6.5 meter Magellan Telescopes (Las Campanas, Chile) and were able to observe this event at visible wavelengths.

Indeed, the planet OGLE-TR-56b is heated so much by its star that it emits detectable amounts of light in the visible wavelengths, and not only in the infrared as TrES-3b does. Hence, Sing and Lopez-Morales measured the record-high temperature of a planetary atmosphere: 2700 Kelvins. As in the case of TrES-3b, such a high day-side temperature indicates that winds cannot redistribute the heat efficiently from the day side to the night side.

These two independent results are very interesting for astronomers and planetary scientists because they allow a direct probe of the temperature of these planetary atmospheres, and because they show that such measurements can be made from ground-based observatories, and not only when using space telescopes.

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