Understanding exoplanet systems through high-energy observations

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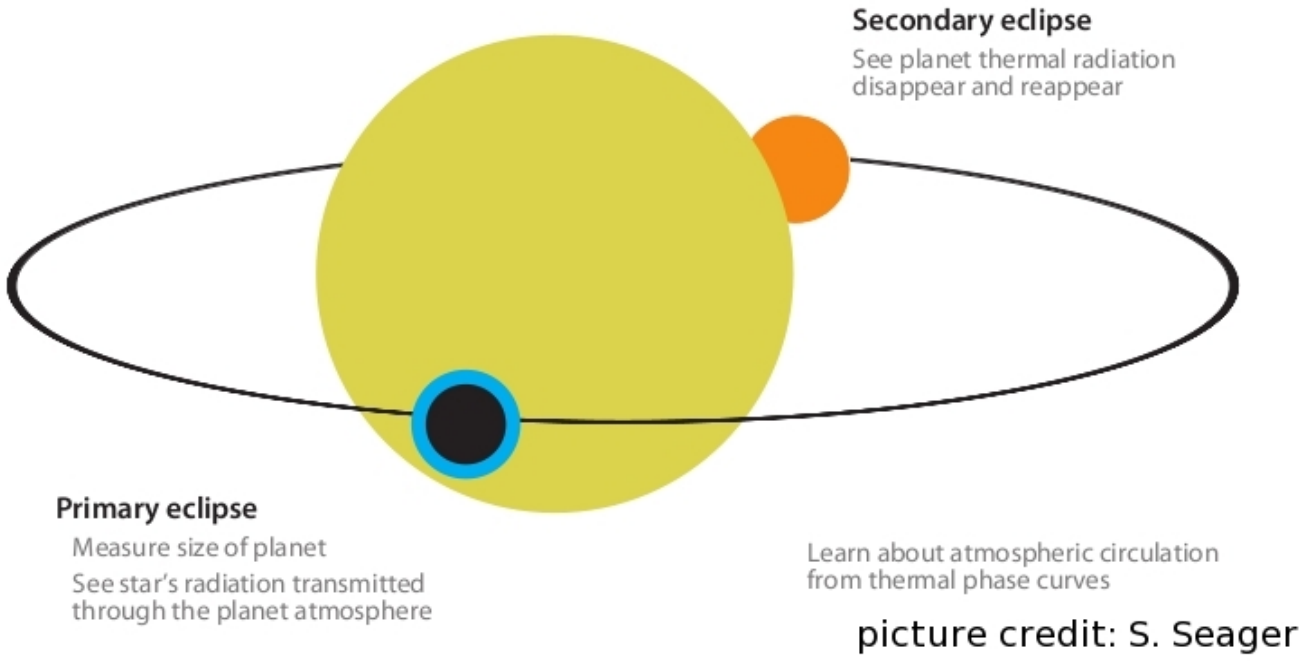
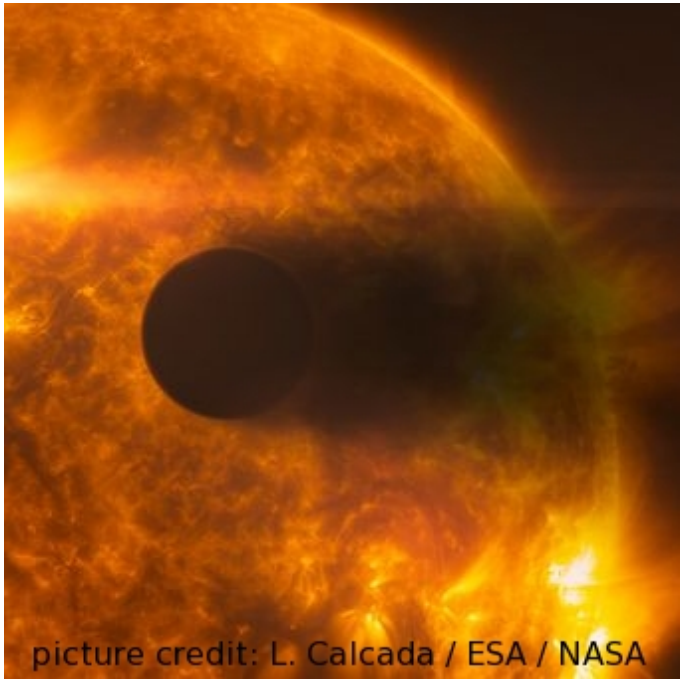
picture credit: L. Calcada / ESA / NASA

Transits: window to an exoplanet's atmosphere



Starlight passing through the atmosphere of an exoplanet during a primary transit carries information about the atmosphere's composition and structure.

High-energy irradiation drives atmospheric evaporation



High-energy photons from extreme UV and X-ray wavelengths can heat the planetary atmosphere strongly.
If the planet is very close to its host star, this irradiation can be intense enough to cause planetary evaporation.
This high-energy irradiation is produced in the host star's chromosphere and corona.

The stellar disk at short wavelengths

Observing high-energy transits in front of the stellar corona is challenging:

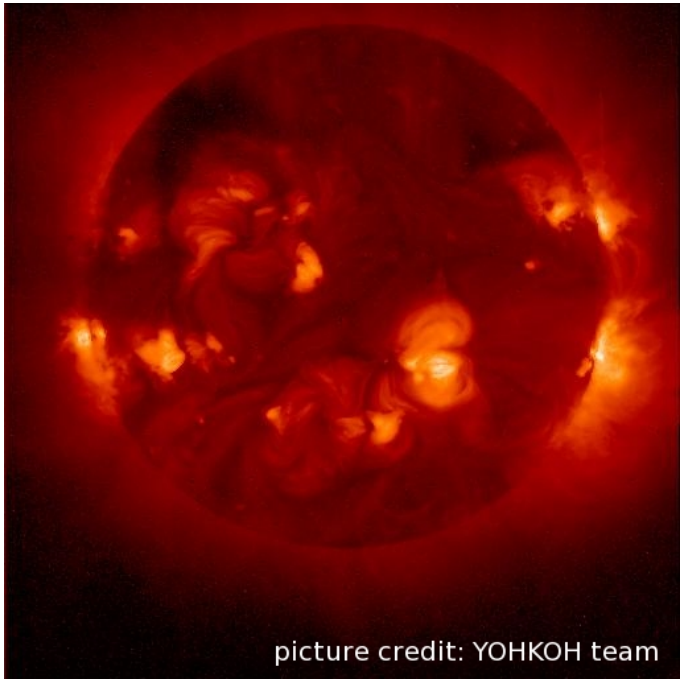
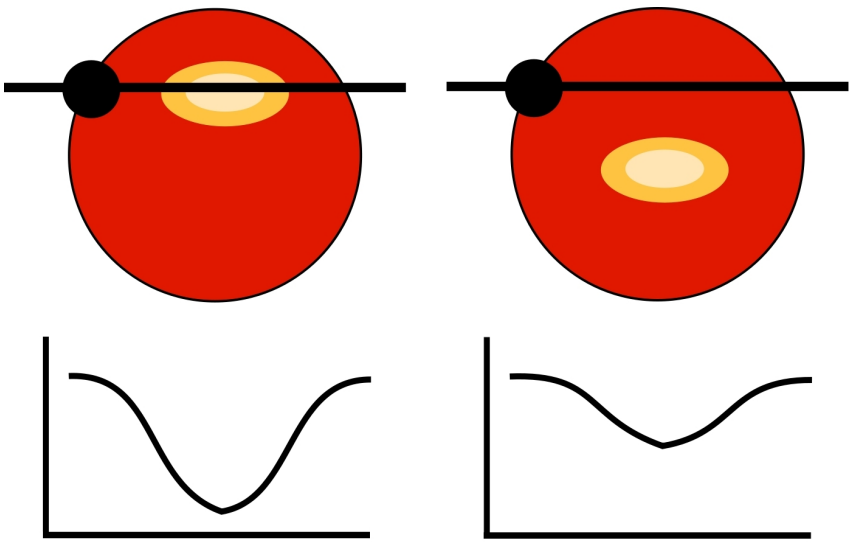


Image of the Sun in soft X-rays, taken with the Soft X-ray Telescope onboard the Yohkoh spacecraft. The Sun's corona is patchy, with active regions being bright.

Transits across a patchy stellar disk



picture credit: K. Poppenhaeger

Transits across a patchy stellar disk can vary in depth due to different locations of active regions, even if the occulting planetary disk does not change.
Multiple observations at high energies are needed to average over the stellar disk; they will reveal the dynamics of the high-altitude atmosphere of strongly irradiated planets.