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Studying the Atmospheres of the Most Intriguing WASP Hot Jupiters

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Abstract

Among the over 300 transiting planets confirmed to date, approximately 130 have been found by ground-based wide angle transit surveys such as WASP. While these surveys are not sensitive enough to detect low-mass planets, they excel at picking out rare hot-Jupiters orbiting reasonably bright stars (V mag = 9 - 11) across the sky. These planets occupy a favorable region in parameter space, as they show frequent and deep transits. Due to the proximity to their host stars these gas giants possess hot extended atmospheres making them ideal targets for the study of their atmospheres via transmission and occultation spectrophotometry.

During occultation, the flux emerging from the planetary dayside is eliminated. By comparing the flux in- and out-of occultation, the planet-to-star brightness ratio can be measured. Observations in different passbands yield a measure of the planetary spectral energy distribution and thereby allow to determine the atmospheric temperature structure, heat redistribution efficiency, albedo, and to place constraints on the atmospheric composition. From the spectro-photometric observation of transits, we can measure wavelength dependencies in the effective planetary radius that are sensitive to signatures of chemical elements in the planetary atmosphere.

We present results of ongoing observing campaigns employing these methods to study the atmospheres of hot Jupiters discovered by the WASP survey. In particular we show results for the very short-period planet WASP-19b based on data from the 1m-class Euler-Swiss and TRAPPIST telescopes, as well as a transmission spectrum of the low-density hot Saturn WASP-49b obtained from FORS2 at the VLT/UT1.