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First observations of an ultra-hot jupiter with ESPRESSO

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Abstract

Ultra-hot gas giants are unique laboratories to study the impact of extreme stellar irradiation on the evolution of planetary atmospheres. Most molecules and aerosols cannot resist these environment high temperatures, hence models predict clear atmospheres mainly composed by atoms and ions. The observational signatures of these species can be best detected at high-spectral resolution in the optical wavelength range. This was demonstrated by the recent detections of metallic vapours in the atmosphere of KELT-9b [1] and neutral sodium in WASP-76b [2] using the HARPS and HARPS-North spectrographs. These observations on 4-metre telescopes served as pathfinder experiments towards ESPRESSO. ESPRESSO is the new-generation high-fidelity and high-resolution spectrograph installed at the ESO Very Large Telescope (4x8m) in Chile. Science observations started in Autumn 2018 for both the Community and the GTO Consortium. About 25% of the GTO programme is dedicated to a survey of exoplanet atmospheres at high spectral resolution. In this frame work, we first observed transits of the ultra-hot gas giant WASP-76b. These observations clearly reveal the Doppler absorption signal from the planet atmosphere. This spectrally resolved signature proves the presence of atomic iron in the planetary atmosphere and provide exquisite constraints on the atmospheric dynamics such as jet wind circulation, bulk planetary rotation, and hint to atmospheric escape. These new results allow us to propose the first model-independent, spectroscopic criterion to identify ultra-hot atmospheres and demonstrate the potential of ESPRESSO as an exoplanet atmosphere characterisation machine.

References

[1] Hoeijmakers, H. J., Ehrenreich, D., Heng, K. et al.: Atomic iron and titanium in the atmosphere of the exoplanet KELT-9b, Nature 560, 453, 2018.

[2] Seidel, J. V., Ehrenreich, D., Wyttenbach, A. et al.: HEARTS II. A broadened sodium feature on the ultra-hot giant WASP-76b, A&A 623, A166, 2019.