High-resolution spectroscopy for the confirmation of a temperature inversion in WASP-121b

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In recent years, the atmospheres of so-called "hot Jup- iter" exoplanets have astounded us with their variety. Various detection methods have unearthed a trove of atomic and molecular species in their atmospheres, along with the discovery of cloud decks and hazes. However, one component thought to exist in the atmospheres of hot Jupiters has, until recently, eluded us: the temperature inversion. In the most irradiated of these planets, molecules such as TiO and VO are thoug- ht to exist in gaseous form, and these remarkably efficient optical absorbers cause the temperature to increase in upper layers of the atmosphere. Recent work has only just begun to uncover evidence of these inversions. Using high-resolution spectroscopic data in the optical from UVES on the VLT, and taking advantage of the planet's much greater radial velocity to disentangle planetary spectral lines from those of the parent star, my work hopes to find an unambiguous detection of TiO in the transmission spectrum of the extremely hot and inflated hot Jupiter WASP-121b, building on previous work by Evans at el (2016) and Nugroho et al (2017). This would be the first successful use of this technique using this instrument, and would pave the way for future molecular detections using powerful ground-based facilities, expanding our knowledge of these highly-unusual planets.

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