Detection of Barium in the atmospheres of the ultra-hot gas giants WASP-76b and WASP-121b

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High-resolution spectroscopy studies of ultra-hot Jupiters have been key in our understanding of exoplanet atmospheres. Observing into the atmospheres of these giant planets allows for direct constraints on their atmospheric compositions and dynamics while laying the groundwork for new research regarding their formation and evolution environments. Two of the most well-studied ultra-hot Jupiters are WASP-76b and WASP-121b, with multiple detected chemical species and strong signatures of their atmospheric dynamics. We take a new look at these two exceptional ultra-hot Jupiters by reanalyzing the transit observations taken with ESPRESSO at the Very Large Telescope. By exploiting new synthetic templates that were specifically designed for ultra-hot Jupiters, in combination with the cross-correlation technique, we unveil species that remained undetected by previous analyses. We add a novel detection of Ba+ to the known atmospheric compositions of WASP-76b and WASP-121b, the heaviest species detected to date in any exoplanetary atmosphere, with additional new detections of Co and Sr+ and a tentative detection of Ti+ for WASP-121b. We also confirm the presence of Ca+, Cr, Fe, H, Li, Mg, Mn, Na, and V on both WASP-76b and WASP-121b, with the addition of Ca, Fe+, and Ni for the latter. Finally, we also confirm the clear asymmetric absorption feature of Ca+ on WASP-121b, with an excess absorption at the bluer wavelengths and an effective planet radius beyond the Roche lobe. This indicates that the signal may arise from the escape of planetary atmosphere.