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Winds and Dynamics Revealed by High-Resolution Transmission Spectroscopy

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High resolution transmission and emission spectroscopy has proven a powerful tool for characterizing exoplanet atmospheres. Due to the velocity precision that is available with high-resolution spectroscopy, velocity shifts and line broadening caused by winds and dynamics in exoplanet atmospheres can be resolved. As the planet transits, it rotates, and varying areas of the evening and morning terminator are visible, giving information about dynamics in different parts of the atmosphere. Furthermore, because the opacity of individual absorption lines varies greatly, they probe different layers in the exoplanet's atmosphere, which allows us to measure the atmospheric wind structure as a function of altitude and reveals a 3D picture of dynamics in exoplanet atmospheres. In this talk, I will present the analysis of winds in two different ultra-hot Jupiters, WASP-76 b and WASP-121 b. On both planets we find that absorption lines are blueshifted on average, which indicates a strong day-to-night wind. However, we find different degrees of blueshifting on each planet and different velocity patterns across the surfaces of the planets. We hypothesize that these differences are due to the different temperatures and irradiation of the planets (WASP-76 b: T_{eq} = 2160 K, and WASP-121 b: T_{eq} = 2350 K), which drive different wind patterns.