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Spatially-resolved high-resolution retrievals of Ultra-hot Jupiters

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Atmospheres are inherently three-dimensional systems, and thus winds, vertical mixing and thermal/chemical variation can strongly influence atmospheric observations of exoplanets by altering the emergent and transit spectra. In recent years, a new class of exoplanet has emerged, that of ultra-hot Jupiters, with temperatures in excess of 2000K. These planets provide excellent laboratories to study a range of atmospheric physics, owing to their strong spectral signatures. Recently, the ultra-hot Jupiter WASP-76~b has shown evidence for condensation and asymmetric Fe absorption. However, precise constraints on variation in abundance and thermal structure have remained elusive due to the challenge of modelling such dynamics in a Bayesian framework and procurement of informative high-precision observations. To address this we develop a new model, allowing us to explore this variation in the abundance and incorporating a day-night wind. I will discuss the results from this model and the necessity for spatially-resolved models for accurate and robust constraints with current and future ground based high-resolution facilities as well as JWST.