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Characterisation of the hydrodynamic atmospheric escape of HD 209458 b, HD 189733 b, and GJ 3470 b

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Hydrodynamic escape is the most efficient atmospheric mechanism of planetary mass loss and has a large impact on planetary evolution. However, the lack of observations remained this mechanism poorly understood. Therefore, new observations of the He I triplet at 10830 Å provide key information to advance hydrodynamic escape knowledge. In this work, we analyse the hydrodynamic escape of three exoplanets, HD209458 b, HD189733 b, and GJ 3470 b via an analysis of He triplet absorptions recently observed by the CARMENES high-resolution spectrograph, and their available Ly-alpha measurements, involving a 1D hydrodynamic model. We characterise the main upper atmospheric parameters, e.g., the temperature, the composition (H/He ratio), and the radial outflow velocity. We also study their hydrodynamic regime and show that HD209458 b is in the energy-limited regime, HD189733 b is in the recombination-limited regime, and GJ 3470 b is in the photon-limited regime. Details of this work can be found in [1], [2], [3].

References

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