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Ground-based spectroscopy of the primary eclipse of HD 189733b

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Abstract

Among the 550-plus exoplanets discovered to date, an ever-growing sample of the transiting variety present themselves as good targets for further characterisation. Using transmission (when the planet eclipses its host star) and emission (the day-side thermal emission of the exoplanet) spectroscopy it is possible to study the atmospheric compositions of these so-called "hot Jupiters" in more and more detail. The feasibility of such measurements has been demonstrated with great success using Spitzer and HST in the recent years [1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 15, 16]. Most notable are the detections of molecular species such as water, methane, carbon monoxide and dioxide in the near infra-red for a variety of planets. These detections allow us to build up an intricate picture of the atmospheric compositions and dynamics present. At the end of the Spitzer cold-phase, a gap in space-based observatories in the near- to mid-infra-red has emerged, calling for increased efforts in ground-based techniques. Several groups have pioneered the ground using different techniques [7, 8, 9, 14]. Swain et al. (2010, [14]) pioneered the mid-resolution time-resolved spectroscopy for ground based observatories and reported a strong non-LTE emission of methane for the day-side of HD 189733b using the NASA Infra-Red Telescope Facility (IRTF). Waldmann et al. (submitted, [17]) later on confirmed this detection using several nights of data, demonstrating that such measurements using medium-sized telescopes on the ground are feasible. However, the detection of day-side methane fluorescence in the L-band of HD 189733b remains puzzling and controversial.

Using the same SpeX instrument on the IRTF as has previously been used for the secondary eclipse measurements by Swain et al. (2010), we obtained six nights of observations for the K and L-band of the primary eclipse of HD 189733b. At this conference, I will present preliminary results of the data analysis and be able to address the question of mid-infrared methane emissions at the terminator of HD 189733b.

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