Comparative high-resolution spectroscopy of M dwarfs - exploring non-LTE effects

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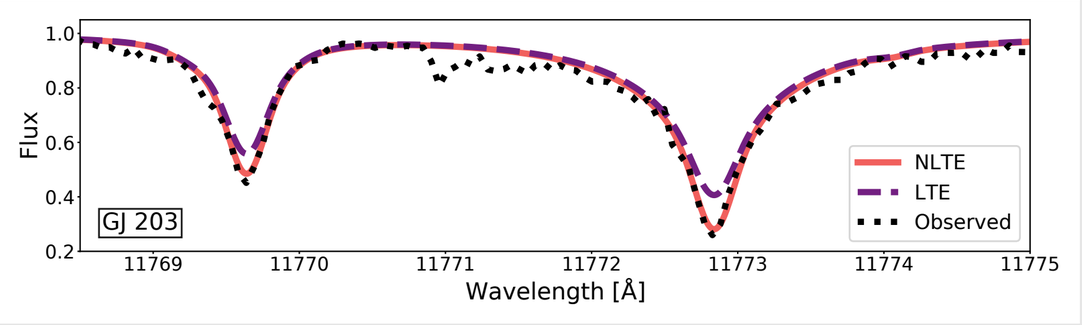
M dwarfs are important in the search for exoplanets but characterizing their atmospheres is difficult due to the plethora of molecular lines. More and more high-resolution spectroscopic analyses are done of M dwarfs in the near-infrared but the parameters in these studies do not always agree. We compare parameters derived by Lindgren et al. 2016 and 2017, Passegger et al. 2018 and 2019, and Rajpurohit et al. 2018. A comparison of T_{eff} and [M/H] is **shown below**. We investigate discrepancies by evaluating non-LTE effects, **shown to the right**.

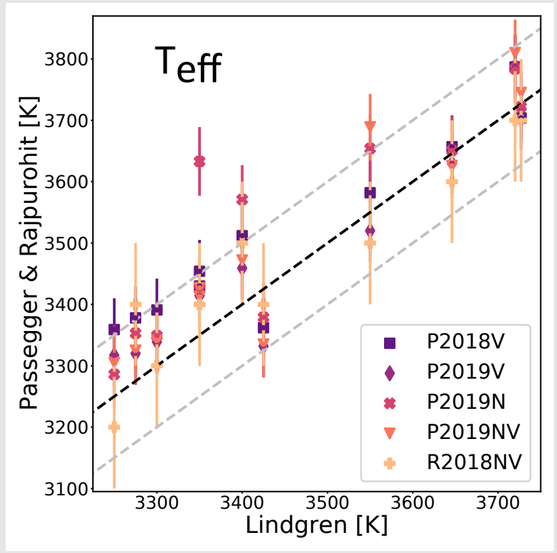
Non-LTE

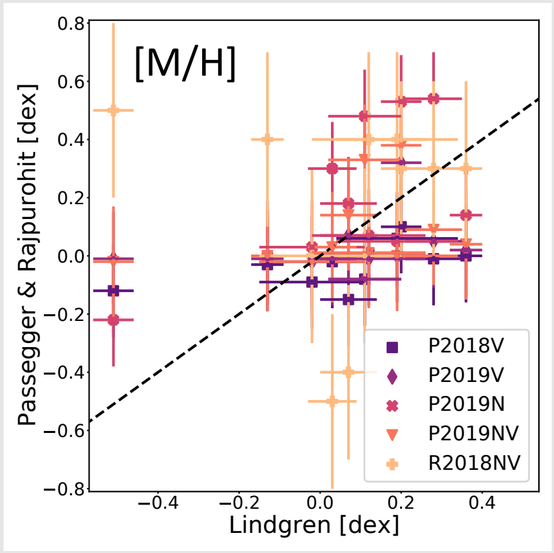


Above: Synthetic spectra generated in SME, LTE and non-LTE overlayed with an observed spectrum.
Right: Difference in T_{eff}, [M/H], and abundance, non-LTE - LTE.

Star	T_{eff} [K]	ΔT_{eff} [K]	[M/H] [dex]	Δ [M/H] [dex]	Abund Corr.
GJ 179	3300	88	+0.36	-0.24	-0.13
GJ 203	3425	50	-0.13	-0.20	-0.13
GJ 514	3727	153	+0.07	-0.16	-0.21
GJ 880	3720	213	+0.20	-0.15	-0.20
GJ 908	3646	133	-0.51	-0.19	-0.14

Parameters





Conclusion

We find that T_{eff} mostly agrees while [M/H] shows a much worse agreement. We find a clear difference for K line profiles between LTE and non-LTE with a difference in abundance and [M/H] up to 0.2 dex and 200 K for T_{eff}. These effects increase with higher temperature and lower metallicity.

References: Olander et al. 2020, Lindgren et al. 2016 and 2017, Passegger et al. 2018 and 2019, Rajpurohit et al. 2018
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