Impact of planetary mass uncertainties on eclipse spectroscopy for the Ariel space mission

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Ariel is expected to observe a large sample of exoplanet spectra to characterize their atmospheres. However, the masses of some Ariel candidate exoplanets are affected by systematic uncertainties and may not be sufficiently constrained. While the influence of planetary mass is well established in transit spectroscopy (e.g. Changeat et al. 2020), its impact in eclipse spectroscopy has not yet been explored in detail. In this work, we investigate how uncertainties in planetary mass propagate into the atmospheric parameters retrieved from simulated emission spectra. We specifically examine the effect of different mass priors on retrieved atmospheric properties. We select three Tier 3 exoplanets from the Ariel Mission Candidate Sample (MCS) and simulate their emission spectra using TauREx. Instrumental noise is modelled with ArielRad and we perform atmospheric retrievals on these simulated datasets. Our results show how uncertainties in planetary mass affect the uncertainty on inferred atmospheric parameters. This highlights the need for accurate planetary mass measurements and for properly accounting for mass uncertainties within atmospheric retrieval frameworks.