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Title: Lightly blended exoplanets: the curious confirmation of KOI 1089
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Abstract: We announce the confirmation of multiple-planet Kepler Object of Interest 1089. We obtained spectra with the Nordic Optical Telescope that allowed us to place an upper limit of ~ 4 Jupiter masses on the larger of the two candidate planets. We then performed an MCMC analysis of multi-color photometry from the Gran Telescopio Canarias of the larger planet to eliminate the possibility of high radius ratio false positives: eclipsing binaries, blended to otherwise. These observations not only confirmed the relatively large amount of contamination predicted by the crowding metric, detailed analysis of the two-color photometry revealed an unexpected unresolved contaminant. The presence of this contaminant requires an upward revision to the ratio of radii of the system, leading to a planet that is over 10% larger than would have been measured in single color photometry. This is an important realization: it is often assumed that, once corrected for crowding, the Kepler photometry is uncontaminated and the parameters extracted are accurate. Our studies of KOI 1089 show that this is not necessarily correct, as host stars can have low levels of contamination that nevertheless have a significant impact on planetary parameters, which in turn would have an effect on detailed studies of individual exoplanets or studies of exoplanets as an ensemble.