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Mapping the Near-Infrared Microlensing Event Rate with UKIRT

Gravitational microlensing as a method of exoplanet detection is best suited to detecting planets of all masses located just beyond the snow line (i.e. the distance from a host star at which liquid water turns to ice) (Gaudi 2012). This region of parameter space is largely unexplored, and it is necessary to detect many more planets via large microlensing surveys in order to understand these understudied planets. Principally, our project is focused on utilizing the ground-based United Kingdom Infrared Telescope (UKIRT) to detect microlensing events, measure the survey detection efficiency, and by combining these calculations, measure the near-infrared (NIR) microlensing event rate. To accomplish this, we inject a multitude of mock stars into real UKIRT observations taken between 2015 and 2017. Each mock star is injected using a PSF appropriate to its associated UKIRT image, and varies its brightness over time according to a single-lens microlensing magnification model (Gaudi 2012). We then utilize a modified UKIRT pipeline to extract the light curves of these mock stars, which in turn allows us to study the detection efficiency towards the Galactic Bulge. Information on event rates in the NIR is crucial for informing mission design specifications, and allows astronomers to prepare for the upcoming Wide Field Infrared Survey Telescope (WFIRST) (Yee et al. 2014).