Simulation of a Planetary Microlensing Survey by Euclid

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Abstract: The Euclid mission is a selected ESA M-class mission to study dark energy by performing a wide-field optical and near-infrared survey for weak lensing and baryon acoustic oscillations. The Euclid spacecraft is also an ideal instrument to perform a planetary microlensing survey, and may have up to two months per year available for additional science programmes. We simulate a 300-day microlensing survey making use of this available time to determine the number of exoplanet detections that can be expected. The simulations are performed using a newly built simulator, MaBuLS, incorporating the Besancon Galactic model and image simulations using numerical PSFs. We find that, under very conservative assumptions about the planetary mass function, a Euclid microlensing survey can detect ~7 bound Earth-mass planets and ~3 free-floating Earth-mass planets. Alternatively, using extrapolations based upon empirically estimated mass functions, a Euclid microlensing survey can expect to detect ~40 bound Earth-mass planets, ~5 Mars-mass planets and even ~1 planet with a mass lower than Mercury. A Euclid microlensing survey will measure the cold exoplanet mass function down to below Earth mass, with orbital separations ranging from ~1 AU to infinity. In addition we investigate the effect of different spacecraft designs, different filter choices and the effect of systematic photometry errors.