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Microlensing survey combining Roman and Euclid Space Telescopes

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As the Kepler mission has done for hot exoplanets, the ESA Euclid and NASA Roman missions have the potential to create a breakthrough in our understanding of the demographics of cool exoplanets, including planets on very wide orbits, unbound, or "free-floating", planets (FFPs). Current ground-based microlensing observations have provided preliminary evidence for a potentially significant population of Super-Earth FFPs. Roman will dedicate part of its core survey program to the detection of cool exoplanets via microlensing, while Euclid may undertake a microlensing program as an ancillary science goal. We argue that simultaneous observations of short-duration microlensing events by Roman and Euclid will enable not just the verification of FFPs, but also a direct measurement of their masses, distances and transverse motions, via the detection of microlens parallax between Euclid and Roman. We use simulations of the joint-mission detection capabilities to show that parallax detections will be possible down to Earth-mass FFPs. The mass and phase-space measurements from a joint survey could thus provide strong clues to the primary mode of FFP formation.

We also demonstrate that an early brief Euclid survey (□5 h) of the Roman fields shortly after the Euclid launch would be also very valuable. It would allow the measurement of at least 10% of the events' relative proper motions and 35% of the lens magnitudes very early on the life of the Roman Survey. We further discuss additional valuable science that will be facilitated by a joint Roman-Euclid microlensing campaign.