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Detecting Extrasolar Asteroid Belts Through Their Microlensing Signatures ETHAN LAKE, ZHENG ZHENG, Department of Physics and Astronomy, University of Utah, SUBO DONG, Kavli Institute for Astronomy and Astrophysics, Peking University — We propose that extrasolar asteroid belts can be detected through their gravitational microlensing signatures and present a simple theoretical understanding of how asteroid belts behave as gravitational lenses. Asteroid belt + star lens systems create so-called pseudo-caustics, which are regions in the source plane where the magnification of the source exhibits a discontinuous jump. Such a magnification change can be associated with either a change in image multiplicity or with a sudden change in the size of an image. The existence of pseudo-caustics and the complex interplay between them and the formal caustics (which possess formally infinite magnification) lead to several interesting consequences, such as the presence of open caustics and the violation of Burkes theorem. These features allow such systems to generate very distinctive microlensing light curves across a wide region of asteroid belt parameter space and possess remarkably large lensing cross-sections. By constructing simulated light curves for a range of asteroid belt parameters, we demonstrate that upcoming space-based microlensing surveys like WFIRST are well-poised to discover extrasolar asteroid belts with masses on the order of $0.1M_{\oplus}$.

Ethan Lake
Univ of Utah

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