THE APPLICABILITY OF THE ASTROMETRIC METHOD FOR DETERMINING THE PHYSICAL PARAMETERS OF GRAVITATIONAL MICROLENSES

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In this paper, we investigate the applicability of the astrometric method to the determination of the lens parameters for gravitational microlensing events toward both the LMC and the Galactic bulge. For this analysis, we investigate the dependency of the astrometrically determined angular Einstein ring radius, $\Delta(\theta_E/\theta_{E,0})$, in the lens parameters by testing various types of events. In addition, by computing $\Delta(\theta_E/\theta_{E,0})$ for events with lensing parameters which are the most probable for a given lens mass under the standard models of Galactic matter density and velocity distributions, we determine the expected distribution of the uncertainties as a function of lens mass.

From this study, we find that the values of the angular Einstein ring radius are expected to be measured with uncertainties $\Delta(\theta_E/\theta_{E,0}) \lesssim 10\%$ up to a lens mass of $M\sim 0.1\ M_\odot$ for both Galactic disk-bulge and halo-LMC events with a moderate observational strategy. The uncertainties are relatively large for Galactic bulge-bulge self-lensing events, $\Delta(\theta_E/\theta_{E,0}) \sim 25\%$ for $M\sim 0.1\ M_\odot$, but they can be substantially reduced by adopting more aggressive observational strategies. We also find that although astrometric observations can be performed for most photometrically detected Galactic bulge events, a significant fraction ($\sim$ 45%) of LMC events cannot be astrometrically observed due to the faintness of their source stars.