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# THE EFFECTS OF BINARY ASTEROIDS ON HAZARD ASSESSMENT AND MITIGATION

**S. Sonnett**[(1)]**, A. Mainzer**[(2)]**, T. Grav**[(1)]**, and J. Masiero**[(2)]
[(1)] *Planetary Science Institute, 1700 East Fort Lowell, Suite 106, Tucson, AZ 85719, ssonnett@psi.edu*
[(2)] *NASA Jet Propulsion Laboratory/Caltech, 4800 Oak Grove Dr, Pasadena, CA 91109*

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## ABSTRACT

A relatively large fraction (~15%) of near-Earth asteroids (NEAs) are in binary systems. Sometimes, these systems consist of two components tidally stretched toward one another, producing an elongated silhouette. Such a silhouette then produces a rotational light curve that has a broad maximum and sharp minimum, when observed edge-on. Typical for NEA discovery campaigns, an asteroid's rotational light curve is sampled to glean the average brightness, which is then converted to size and used to assess impact hazard. Overestimating an asteroid's brightness by sampling predominately the light curve maximum (as could be done more easily for binary systems with these broad maxima) therefore causes overestimation of the size and impact damage. Conversely, there is a smaller chance (to be better quantified in our work) that eclipse events in a binary system introduce a chance to undersample the system's flux, thus underestimating size and corresponding impact damage. Given the potentially complex light-scattering profile of binary systems, the sensitivity of size/hazard calculations to adequate rotational light curve sampling, and the unique properties of some binary asteroid rotational light curves, we explore the effects size calculations of binary asteroids have on accurately determining the system's mass and thus assessing its impact hazard. Our techniques mimic those of major NEA discovery efforts like the NEOWISE and proposed NEOCam missions. We also comment on techniques that can be used in these large discovery surveys for distinguishing binaries from singular bodies and on

how mitigation strategies may require different treatment in the event a hazardous asteroid is a binary instead of a singular asteroid.

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