

ASTEROID CHARACTERIZATION PRIORITIES FOR PLANETARY DEFENSE

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We propose a prioritized list of asteroid characterization needs for planetary defense. In particular, we consider the properties of asteroids that are of greatest interest for assessment of planetary defense options, including gravity tractors, kinetic impactors, and nuclear explosives. In addition, much of our discussion is relevant for impact assessments and subsequent emergency-response planning. Rather than intending this as a definitive answer, however, our purpose is to stimulate and focus discussion regarding characterization needs for planetary defense, with a specific list as a starting point. A key theme is understanding the sensitivity of the outcome of an asteroid deflection or disruption effort to the asteroid's physical properties.

There is a range of previous work relevant to our topic, including some explicit discussions as well as many more that are implicitly relevant. We incorporate elements from such reports while extending them using our own experience and perspectives. After introducing our prioritized list, we provide further discussion on each element, with details on the relevance of each characteristic for modeling purposes, our rationale for the assigned priority, and examples of analyses that require improved characterization information.

Our goal is to establish a framework that can be modified and adapted by the community for a variety of purposes, such as mission design and optimization, development of new measurement techniques, or prioritization of research efforts. The objective is to increase understanding and reduce uncertainties in the specific aspects of characterization that most benefit accurate assessments of practical techniques for planetary defense.