PDC2017
Tokyo, Japan

IAA-PDC-17-04-P10

Please send your abstract to iaapdc (at) iaamail.org

☐ **Key International and Political Developments**
☐ **Advancements and Progress in NEO Discovery**
☐ **NEO Characterization Results**
X Deflection and Disruption Models & Testing
☐ **Mission & Campaign Designs**
☐ **Impact Consequences**
☐ **Disaster Response**
☐ **Decision to Act**
☐ **Public Education & Communication**

MODELING POTENTIAL OUTCOMES OF THE DART IMPACT USING CTH

E. S. G. Rainey[(1),*], A. M. Stickle[(1)], A. S. Rivkin[(1)], O. S. Barnouin[(1)], C. M. Ernst[(1)], and A. F. Cheng[(1)]
[(1)]*The Johns Hopkins University Applied Physics Laboratory, 11100 Johns Hopkins Rd, Laurel, MD 20723, USA*
**Emma.Rainey@jhuapl.edu*

Keywords: *Asteroid Deflection, Impact Modeling, Kinetic Impactor, AIDA, DART*

ABSTRACT

The Double Asteroid Redirection Test (DART) is a mission concept that will include the first demonstration of an asteroid deflection, by kinetic impactor. In October 2022 the DART spacecraft will impact the secondary member of the binary asteroid system 65803 Didymos at a speed of 6 km/s, and the resulting period change in the orbit of Didymos-B will be determined using Earth-based measurements.

The predicted momentum transfer is highly dependent on the properties of the asteroid, which have large uncertainties. Numerical simulations will be used both pre- and post-impact to predict the range of possible deflections and to determine the relationship between the measured deflection and the asteroid physical properties. Post-impact these simulations will be used to infer physical properties of Didymos-B.

We used CTH simulations of the DART impact to calculate the sensitivity of the momentum transfer to asteroid material properties and interior structure. We present results from simulations spanning end-member estimates for asteroid material properties such as strength and porosity. We also include comparisons of cohesive vs. rubble pile targets. Our results show that the momentum enhancement factor β

can be as low as ~1 or as high as ~5 in the end-member cases. We also discuss methods of calculating momentum transfer in CTH's Eulerian framework, and the effect of CTH grid size and resolution. If the impact of the DART spacecraft with the Didymos-B surface is oblique, the impact simulation must be done in 3-D, which is computationally challenging at planetary scale and may result in additional uncertainty if the simulations are underresolved.

****