

NEO Characterization

**Constraining the ejecta cone geometry following the DART impact on
Dimorphos using LICIACube data**

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ABSTRACT

The Italian cubesat LICIACube was launched together with the NASA Double Asteroid Redirection Test (DART) spacecraft on November 24th, 2021, towards the Didymos binary asteroid system, composed of Didymos and Dimorphos. Prior to DART’s intended impact on Dimorphos, LICIACube was released from DART spacecraft on September 11th, 2022, and it was independently navigated towards the target Didymos system to observe the DART’s impact. The impact would test the possibility of changing the orbit of the asteroid Dimorphos around the asteroid Didymos. LICIACube successfully witnessed the impact event and acquired images of the impact and the resulting ejecta cone.

By analysing the LICIACube images obtained by the LUKE instrument, we characterized the axis and the aperture angle of the observed ejecta cone. Using a

sequence of LUKE images where the ejecta cone can be observed in a projected side-on profile and using the geometrical relation between a cone and its projection onto a plane, we first derived an upper limit for the aperture angle of the cone. Then, we developed a system of non-linear equations to be numerically solved to recover the axis and the aperture angle of the ejecta cone. After that, we generated synthetic images with the solved ejecta cone at the same original LUKE observing geometries to reject or accept the solutions returned by solving the system of non-linear equations. The method and results will be presented in detail and discussed.

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