

The Dimorphos boulder size-frequency distribution derived from DART/DRACO images: Preliminary results

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ABSTRACT

On 26 September 2022, the Double Asteroid Redirection Test (DART) spacecraft impacted the surface of Dimorphos, the ~150 m size satellite of the near-Earth binary asteroid (NEA) (65803) Didymos (~780 m-size). During the last minutes of the DART mission, the DRACO camera imaged the surface of Dimorphos at increasingly fine scales, ranging from few meters to a best resolution of 5.5 cm. In order to identify and manually count all boulders located on the illuminated surface of the asteroid, we used two DRACO images with spatial scales of 0.26-0.20 m directly projected onto the Dimorphos shape model through the Small Body Mapping Tool (SBMT) software. We then counted boulders as ellipses over an area that is 0.0132 km² wide. The value of an ellipse's major axis is then used as the maximum size of the boulder. The total number of boulders identified is 4757, with a maximum size of 16 m. After fitting a power-law, an exponential-law and a Weibull curve, we determined that the latter best represents the boulder size frequency distribution (SFD) on Dimorphos in the full 1.0-16.0 m size range. Since a Weibull distribution is thought to result from sequential fragmentation and is often used to describe the particle distribution resulting from grinding experiments, this suggests that the boulders SFD on Dimorphos might have originated from impacts, but was later modified by other processes that will be discussed at the time of the conference.

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