**PDC2023**
**Vienna, Austria**

*Please submit your abstract at https://atpi.eventsair.com/23a01---8th-planetary-defense-conference/abstractsubmission*

*You may visit https://iaaspace.org/pdc for more information*

*(please select the topic that best fits your abstract from the list below)*
*(you may also add a general comment - see end of this document)*

**NEO Characterization**

# ON-BOARD LIMB-BASED SHAPE MODELING FOR SMALL BODY NAVIGATION

**Joshua Lyzhoft[(1)], Andrew Liounis[(2)], Dahlia Baker[(2)], Meghan Fickett[(2)], and Jason Swenson**
[(1)]*Goddard Space Flight Center, 8800 Greenbelt Rd, Greenbelt, MD 20771, joshua.r.lyzhoft@nasa.gov*
[(2)] *Goddard Space Flight Center, 8800 Greenbelt Rd, Greenbelt, MD 20771*

***Keywords:*** *limb-based shape modeling, asteroid characterization*

## ABSTRACT

Missions to small bodies within our solar system are becoming more frequent. Generally, shape models of the target body are required to perform proximity operations as demonstrated by the OSIRIS-REx, Hayabusa2, and Rosetta missions. However, these missions required image downlinking to create high-resolution models on the ground. In some missions, especially small-sats, there may be data downlink data constraints, resulting in the inability to provide the large number of images needed for high-resolution shape models. A solution to this is the ability to generate shape models on-board during the approach to the target or initial proximity surveying. Current work implements a limb-based shape model routine that is able to be executed on a Raspberry Pi 1, which is similar to the processing capability to the flight computer on OSIRIS-REx, and that does not require low phase angle geometries. With this method, however, there is a requirement to have a Target's rotation pole, rotation period, and range between the spacecraft and the object. Initial shape model results generated from Bennu approach (Nov 2-3, 2018) show that the limb-based shape model agrees well with a 75-cm SPC shape model generated after Preliminary Survey; Results are: min difference -7.047m, max difference 17.347m, mean 1.122m, and RMS 3.219m. These results were obtained by using PolyCam approach images that had camera pointing inaccuracies, requiring centroid estimation to compensate for the center of the object error on the image.. Further scenarios are presented herein. Future work will investigate the possibility to better estimate the center of the target, range uncertainty, pole estimation as well as rotation period.