New Horizons Arrokoth Encounter Geology and Geophysical Maps

Data

(1) Is the presentation of the data adequate, are the data in an adequate format, are the data useful to the science community?
Yes. The dataset.cat file in particular was helpful to understand the data. (And though it wasn't technically part of my review, I used one of the shape models to a interrogate the thermal maps. THANK YOU for supplying obj files!)

(2) Are supporting data needed (e.g. calibration data)?
No.

(3) Can the data be read programmatically using only the information contained in the PDS labels?
Yes. I could understand their contents based on the labels and dataset.cat

The temperature files were plain text and I could read them with a text editor. I also was able cut out a column of data and read it into the Small Body Mapping Tool (SBMT) and overlay it as a plate coloring onto the also-provided, low-resolution shape model.

The albedo and reflectance maps are in .img format, which gave me some trouble. Normally I'd have turned to ISIS3 to read these in – I do not have this installed on my current laptop, and wanted to do this review in a timely manner, so I did not go that route (maybe my USGS co-reviewer did?). The SBN website suggests that .img files "can be displayed using the PDS NASAView tool" and that the "SBN utility ReadPDS will read the data into IDL." I downloaded the NASAView tool, but it does not work with my current mac OS. I used ReadPDS to bring the data into IDL, the command seemed to work, but the array consisted of mostly -1.0000 values (so clearly not right). Not having the time to troubleshoot this issue (it could very well be user error, I'm not sure) but having access to a python script that converts an .img into a .fit file using the GDAL library, I converted both .img files to .fit files. I was able to view these files with ImageJ.

(4) Do the data look physically reasonable when it is displayed?

I looked at both files in ImageJ, stretched the data, and produced histograms (that intentionally did not include outlier datapoints). The images looked reasonable when displayed. ImageJ displays the fits files flipped from reality – I did not flip them here.
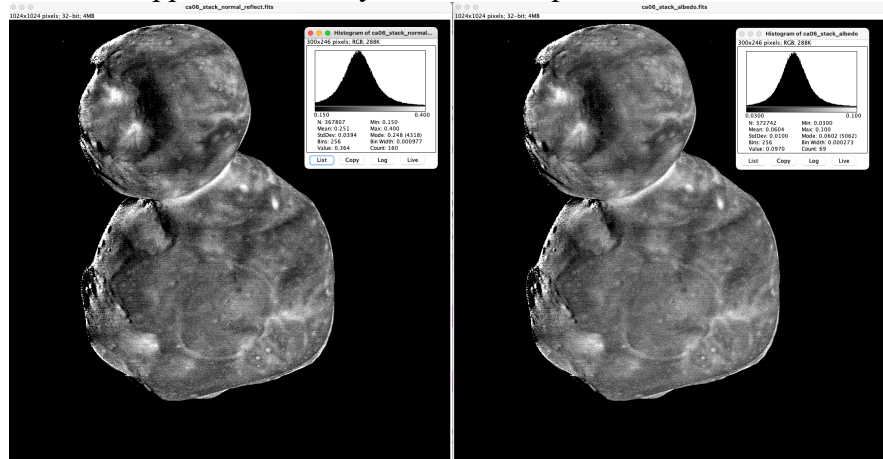
(5) Are there any unexpected deviations observed in the data?

None noted.

Additionally, the values for minimum, maximum, mean, and standard deviation for the albedo and reflectance files that were reported in dataset.cat match those I found when converting the file to .fits format.

| CA06_STACK_NORMAL_REFLECT	Minimum	Maximum	Mean	StdDev
Reported in dataset.cat	-285.906	241.708	0.094	0.750
Found in this review	-285.90622	241.70758	0.09388472	0.7497727
CA06_STACK_ALBEDO	Minimum	Maximum	Mean	StdDev
Reported in dataset.cat	-69.036	58.364	0.023	0.181
Found in this review	-69.03609	58.363705	0.022669796	0.18104315

(6) Formulate a scientific inquiry and attempt to use the data to answer it.

As these data are associated with peer-reviewed publications, and in particular with figures within those publications, I set out to and was able to recreate the figures.
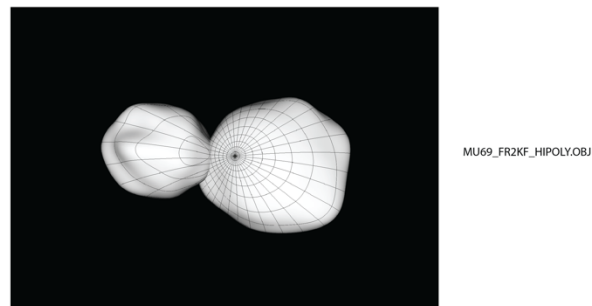
Temperature Simulations:
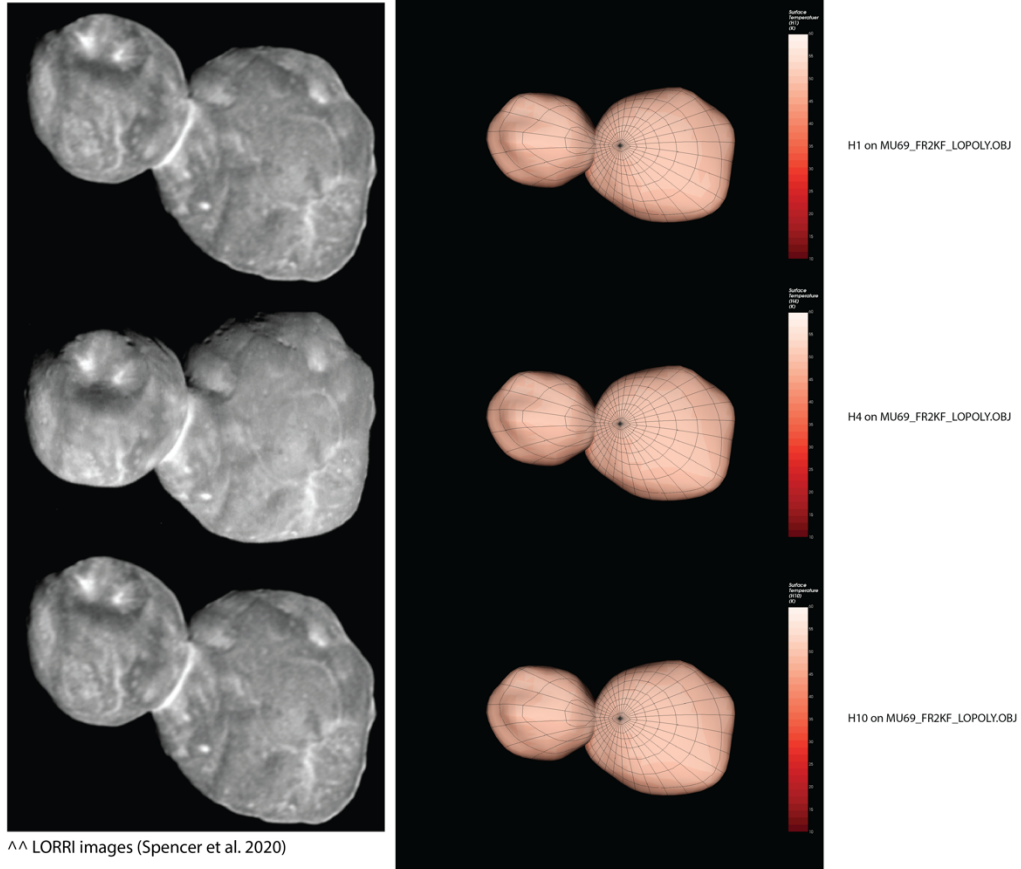
^^ LORRI images (Spencer et al. 2020)
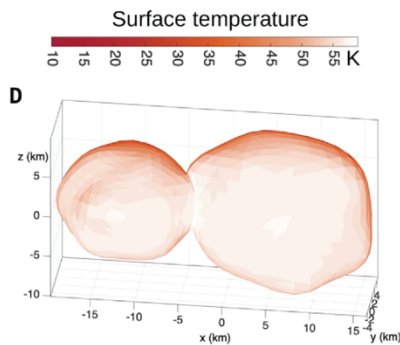
^^ Figure 7D from Grundy et al. 2020

I read the h1, h4, and h10 surface temperature column into the SBMT and used it as a plate coloring on the low-resolution model. The colorbar available to me in the SBMT is not identical to the one used in the figure, but it's close. From figure caption: "Typical temperatures are in the range of 50 to 57 K near the poles of each lobe, falling to ~40 K near the equator." I find this to be consistent with what I found. *One curious thing to note*: if you look at the shape in the Grundy et al paper, you'll notice the slightly flattened edge of the shape model towards the bottom right

of the image. In the SBMT, that feature is to the upper right. Similar can be said about the depression on the left lobe. The orientation matches what is shown in the LORRI images taken from Spencer et al. 2020. Could the image from the Grundy et al. paper be flipped across the long axis?

Albedo and Reflectance Maps:
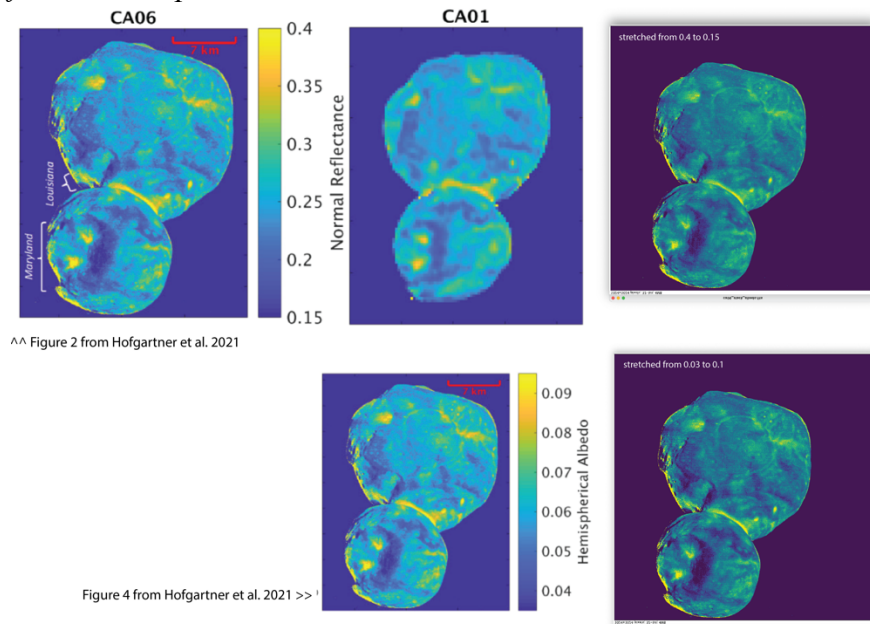
Top left and top middle panels are from Hofgartner et al. 2021 figure 2 showing the normal reflectance. Top right is a view from my review from ImageJ with a reasonably close stretch and color table applied. Bottom middle is from Hofgartner et al. 2021 figure 4 showing the albedo. Bottom right is a view from my review from ImageJ with a reasonably close stretch and color table applied. There is a good match between the publication and the data being reviewed. (Note, the fits file created here zeroed out the values below zero in the .img file – this mostly affects the background levels). In both cases, the image was rotated and flipped to match the publication.

Documentation

(1) Does the data set contain all documentation needed to use and understand the data?
Yes.

(2) Is the documentation well organized, clear, and self-consistent?
Yes. The dataset.cat file was particularly useful.

Typos:

docinfo.txt: +->JD_SUBSOLARLATITUDES.LBL   SubSolar <u>Latutide</u> table, PDS label

mvic.cat: The other six CCDs all use Time Delay and <u>Intgration</u>…