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Assessment of Rhea

This document contains products used to assess the quality of the Rhea global DTM in this bundle. For SPC's purposes, Rhea has an imaging campaign that approaches ideal at many locations near the equator, but would be classified as sufficient at the poles. See Weirich et al. (2022) for definitions of a sufficient and ideal image set. Details of the assessment data found in document/productdescription.pdf should be read before proceeding. Taken as a whole, the assessment data indicates the uncertainties given in the product description are good. Furthermore, the imaging campaign for Rhea indicates that higher resolution regional models can be generated everywhere, giving much potential for future work. Note that the assessment products should be used as a guide to understand the quality of the DTM.

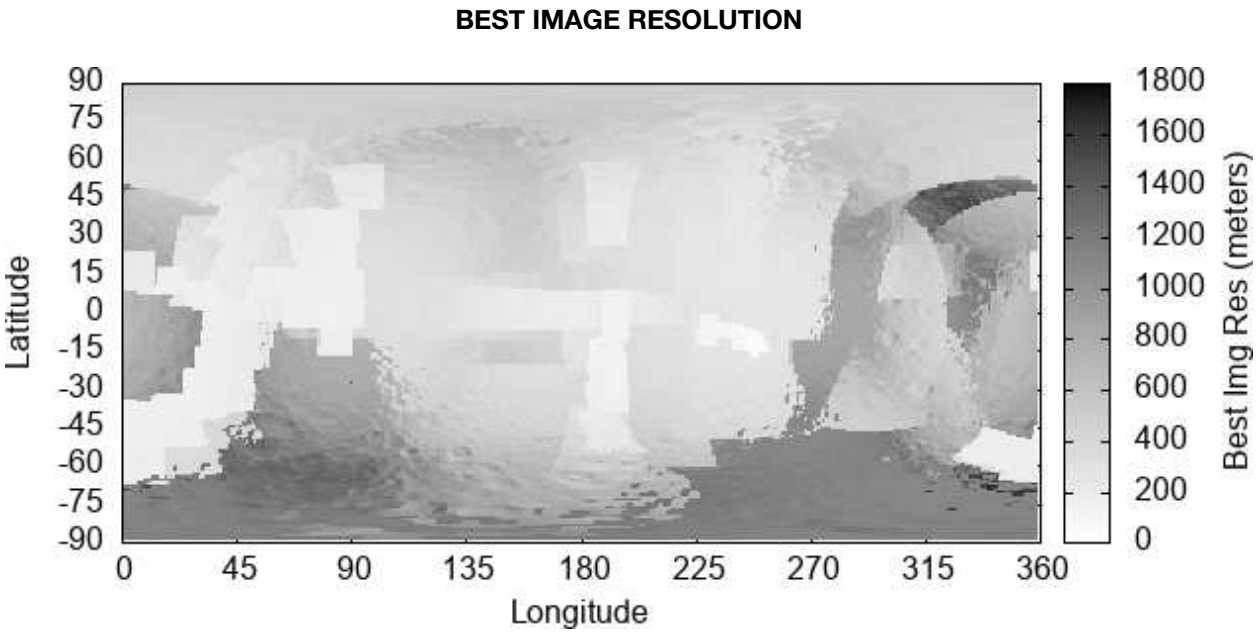
The accuracy of topography generated by SPC has been well-tested, but the relative albedo has not. If the quality of the albedo data is in doubt, a comparison with spacecraft images would be required before considering it as valid. When there is a limited imaging campaign such as Rhea's, there will be aliasing of topography into the albedo channel. Additionally, unmasked shadows can contribute to the darkening of the albedo. This darkening can be expressed as directional asymmetry in craters, especially near the poles. Where there is significant aliasing there is error in both the albedo and topography. The albedo artifacts, and thus the topography, could be improved with additional viewing geometries, but this data is not available.

Below are figures of the assessment data, along with a short exposition on the quality of each. Figures of radius and albedo are included. All figures shown here are available in the bundle as digital files that can be used for quantitative purposes. For assessment figures, the grayscale progression has been adjusted so brighter regions always represent better quality data.

Figures of the assessment data with more detailed explanation are below.

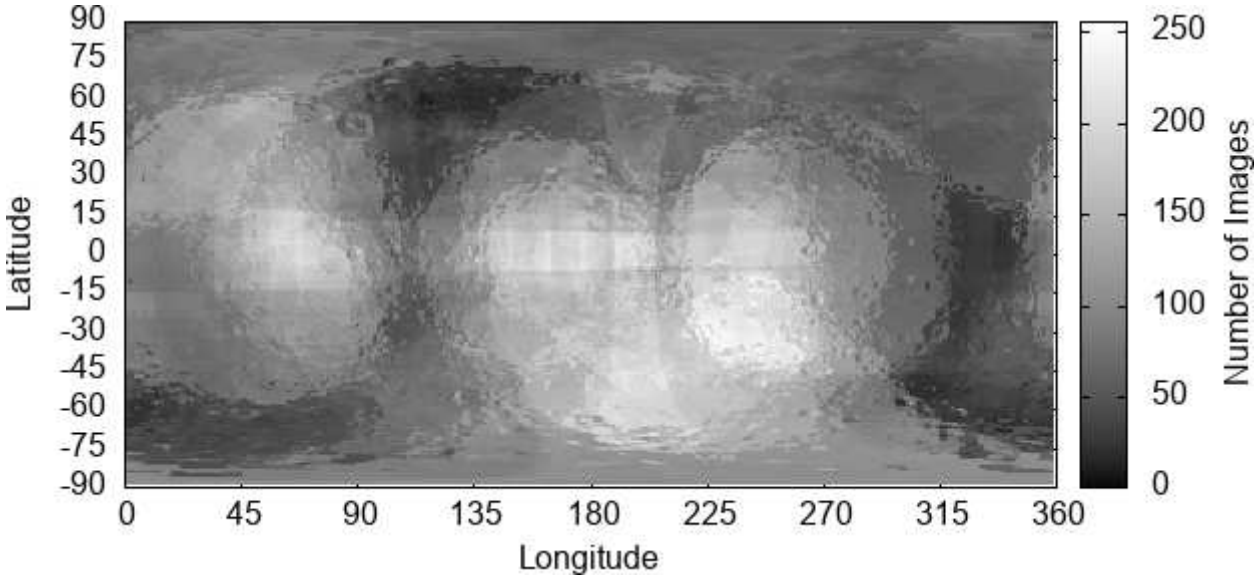
Rhea

Spacecraft Imaging Campaign



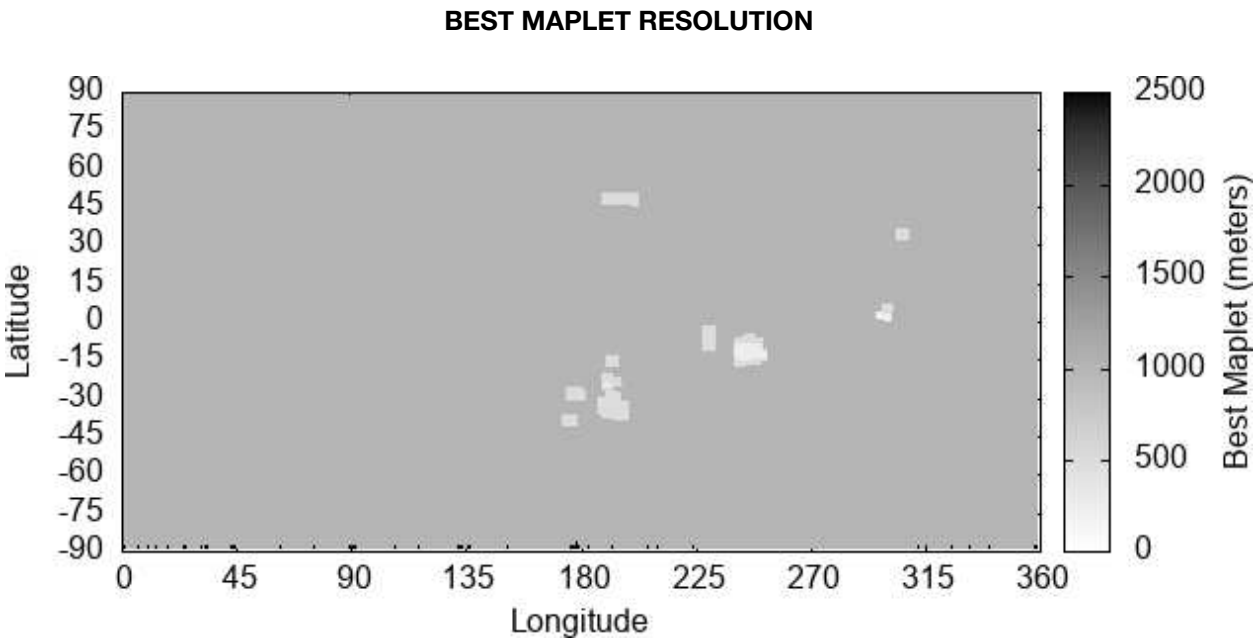
This figure presents the same information as rhea_bestimg_c.cub. The worst image resolution is ~1680 m/px and occurs near -70º latitude and 340º east longitude. The best image resolution is ~37 m/px and occurs near -15º latitude and 245º east longitude. All of Rhea has been imaged at ~2150 m/px or better matching the GSD of the Q=512 global DTM. This means the topography for both the Q=512 (high-resolution) and Q=128 (low-resolution) models are not limited by the available image resolution.

NUMBER OF IMAGES



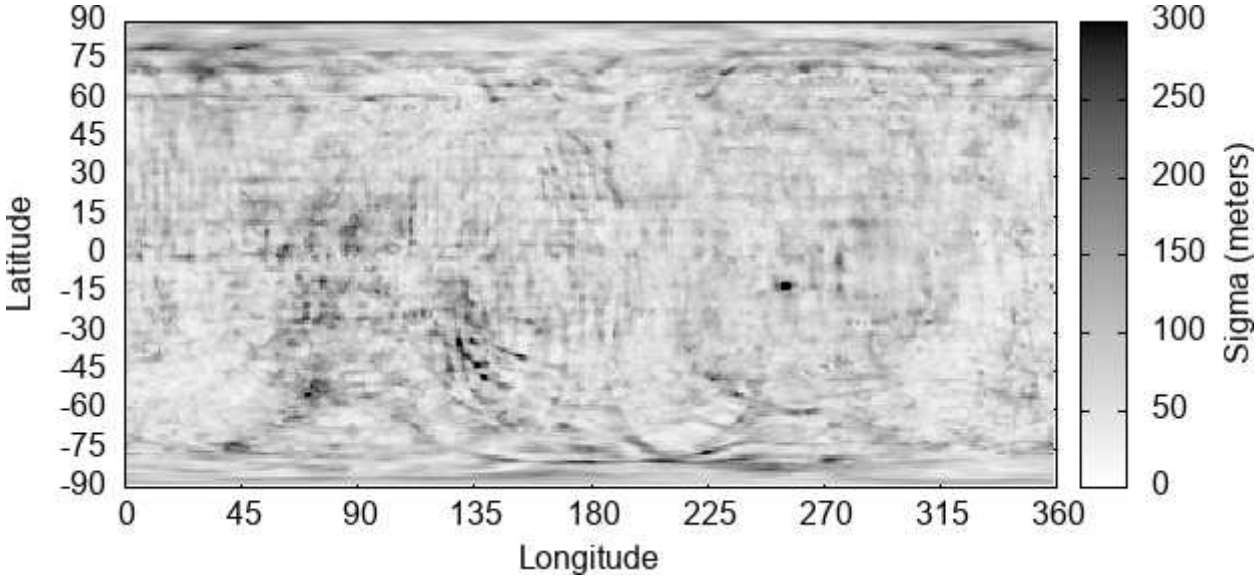
This figure presents the same information as rhea_numimg_c.cub. Number of images is everywhere greater than 12, and usually (i.e. ~98% of the surface) greater than 25. The number of images give confidence to the estimated radius uncertainties. Note that this data product only counts images that are better than 2850 m/px, and reports pixels with more than 255 images as 255 (i.e. off scale).

Global DTM Assessment



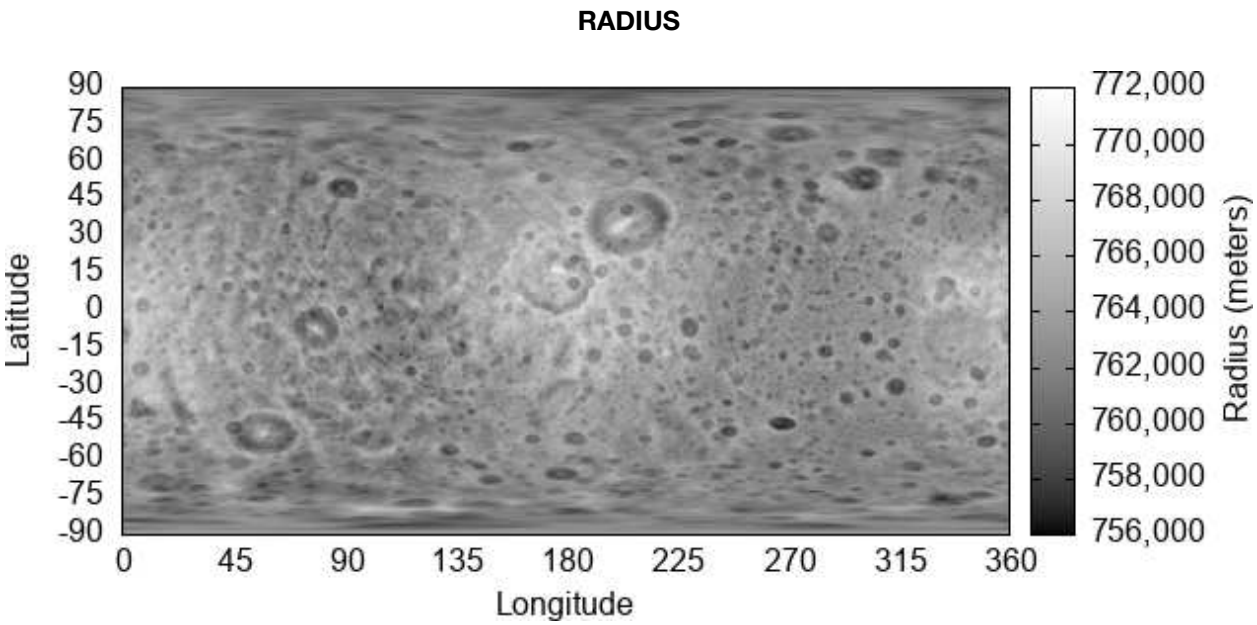
This figure presents the data in rhea_bestmap_c.cub. Rhea is covered by maplets with a GSD of 1000 m over ~99% of the surface, with the remaining ~1% covered by maplets with a better GSD. The graphic above has black pixels at the poles which indicate a higher (i.e. worse) GSD, though this is only a sampling gap. The best maplet resolution is a little over two times better than the Q=512 global model, indicating that the maplet resolution is not the limiting factor for uncertainty .

SIGMAS



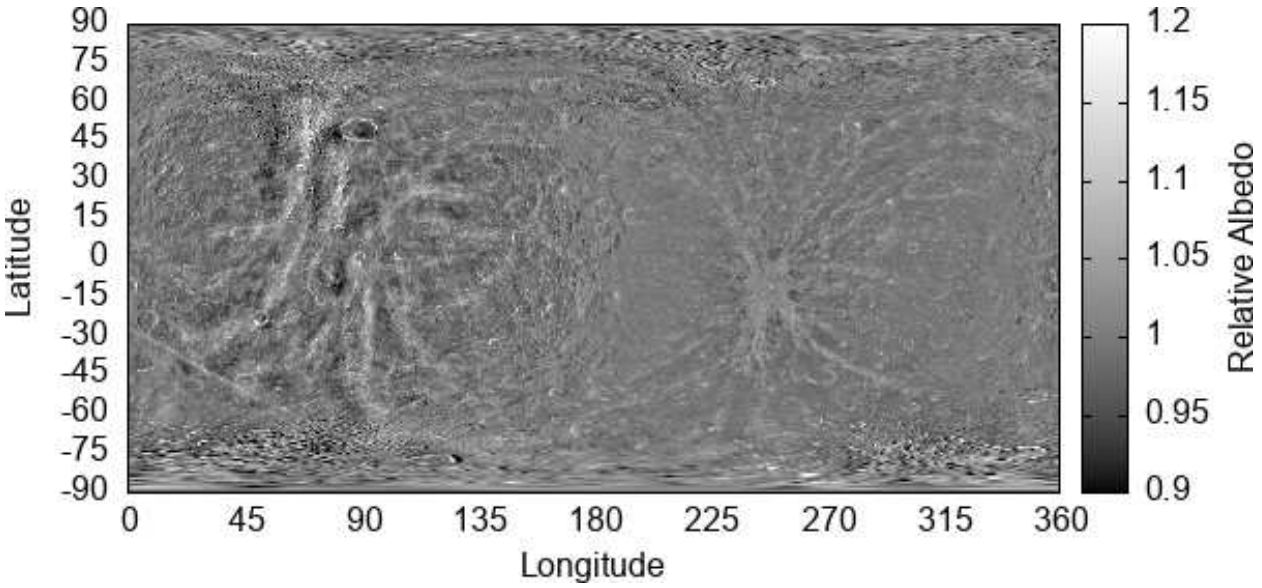
This figure presents the data in rhea_sigmas_c.cub. The worst sigma is ~515 m (note the color bar stops at 300 m), which is less than the GSD of the Q=512 model, and the vast majority (~99%) of the model has a sigma better than 205 m, which is ~10% the GSD of the Q=512 model. These values indicate the maplets agree to a high confidence level. **Sigmas everywhere are good for the global model, hence the reasons for higher sigmas in various regions are outside the scope of this project.**

Global DTM Values



This figure presents the data in rhea_radius_c.cub and rhea_radius_g.tif.

RELATIVE ALBEDO



This figure represents the data in rhea_albedo_c.cub and rhea_albedo_g.tif. Due to the limited imaging campaign there may be aliasing of topography into the albedo channel.