

Assessment of Dione regional DTMs

This document contains products used to assess the quality of the Dione regional DTMs in this bundle. All 4 regional DTMs have a sufficient imaging campaign in a broad sense, though some vertices are at the limit of what SPC can use. Details of the assessment data found in document/productdescription.pdf should be read before proceeding. The images can support higher resolution topography in most of the DTMs, but only for a portion of the area. 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 Dione'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 topography 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.

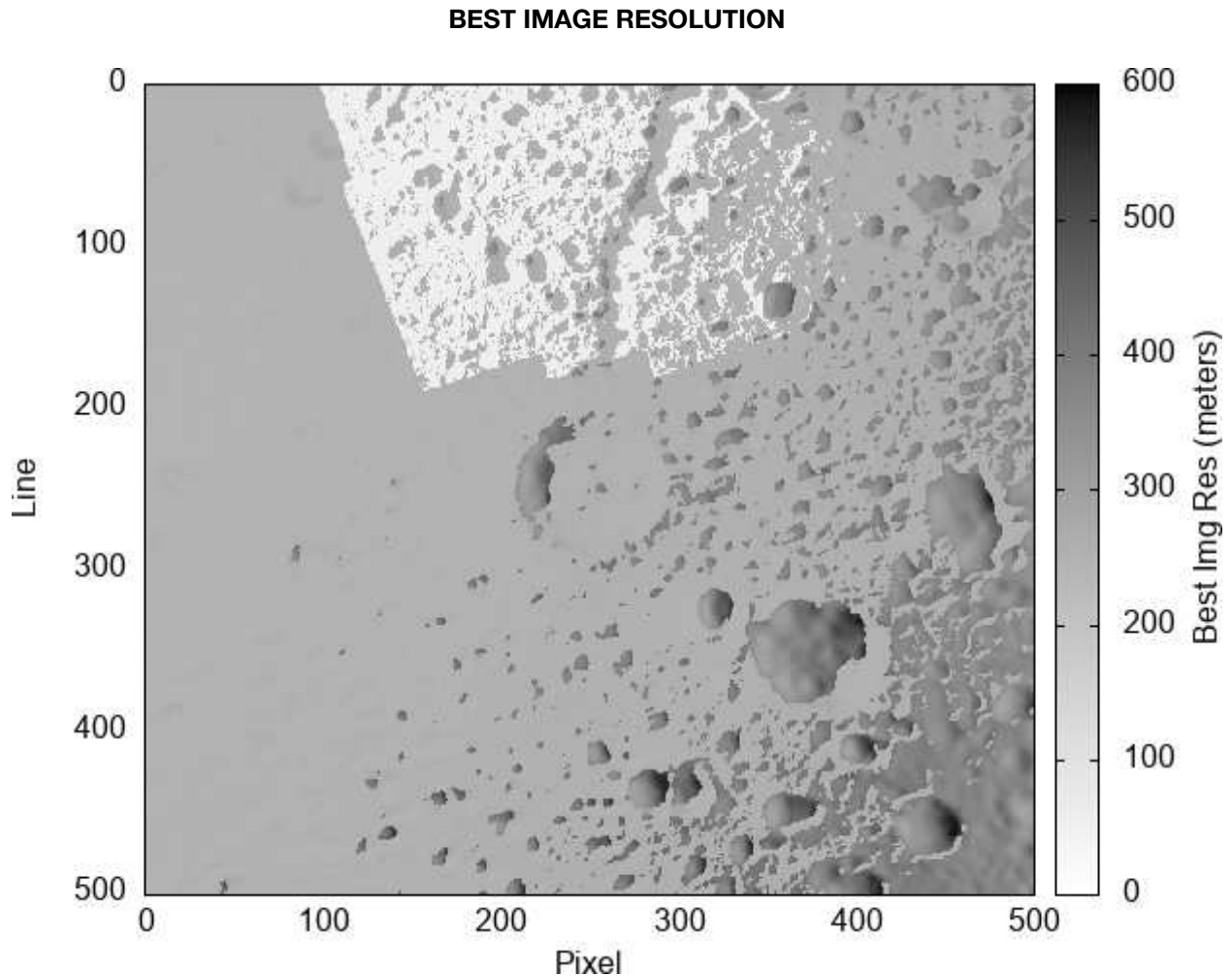
Note: Although we provide a “best maplet resolution” for the global model, we only provide one here for thln48083 because the other regional DTMs all have a uniform maplet GSD of 300 m.

These four regions are broadly similar in their assessment. Region leqs00294 has the number of images always acceptable. The other three regions all have vertices with a small number of images, though >99% of the vertices have 5 or images indicating reliable data. All four regions can have higher resolution topography generated over ~30% or more of the area. All four regions have the worst sigma (see document/productdescription.pdf) smaller than the DTM GSD, so the uncertainty is reliably 1 to 2 times the GSD/best image resolution (whichever is worse).

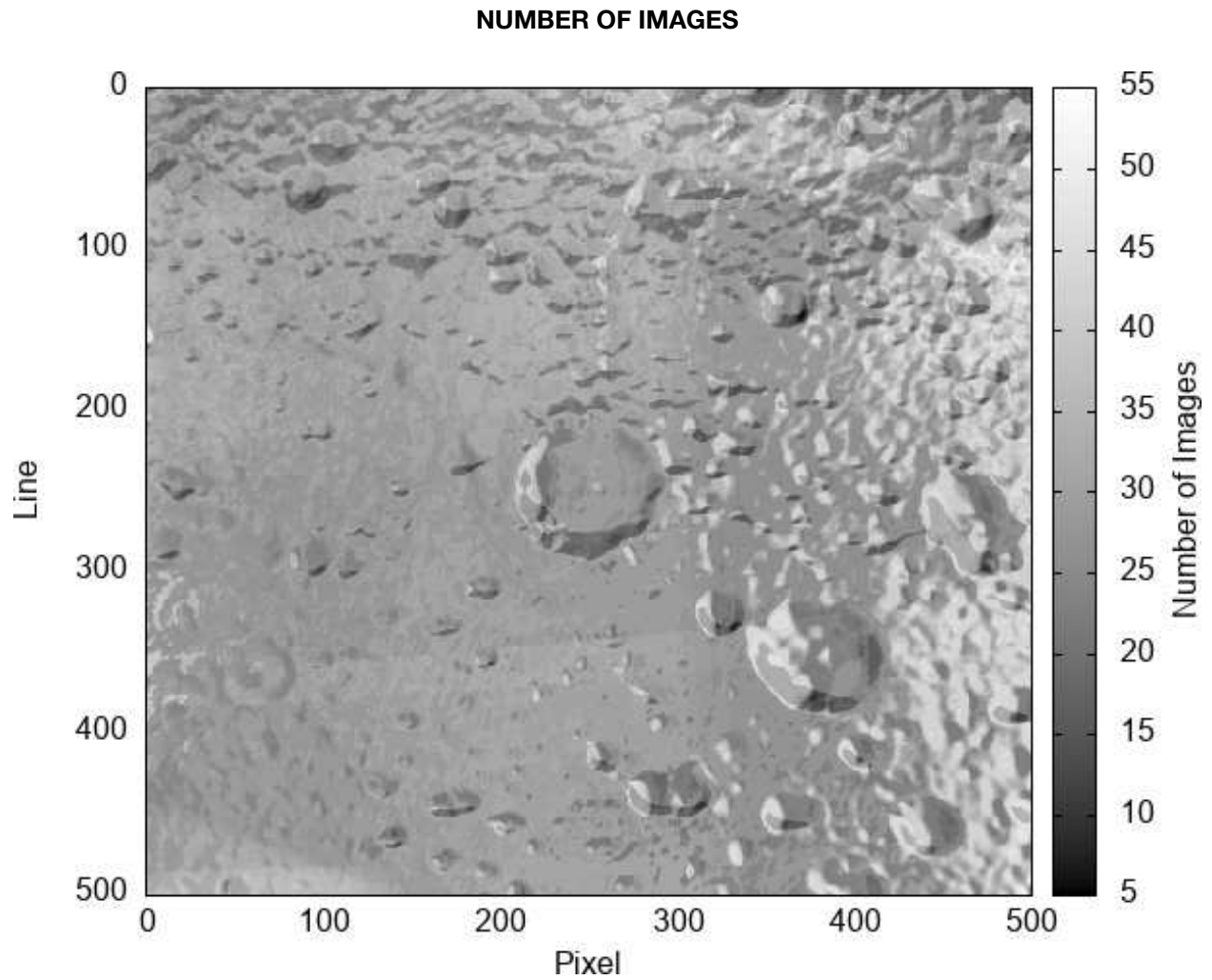
Figures of the assessment data with more detailed explanation are below.

Dione leqs00294

Spacecraft Imaging Campaign

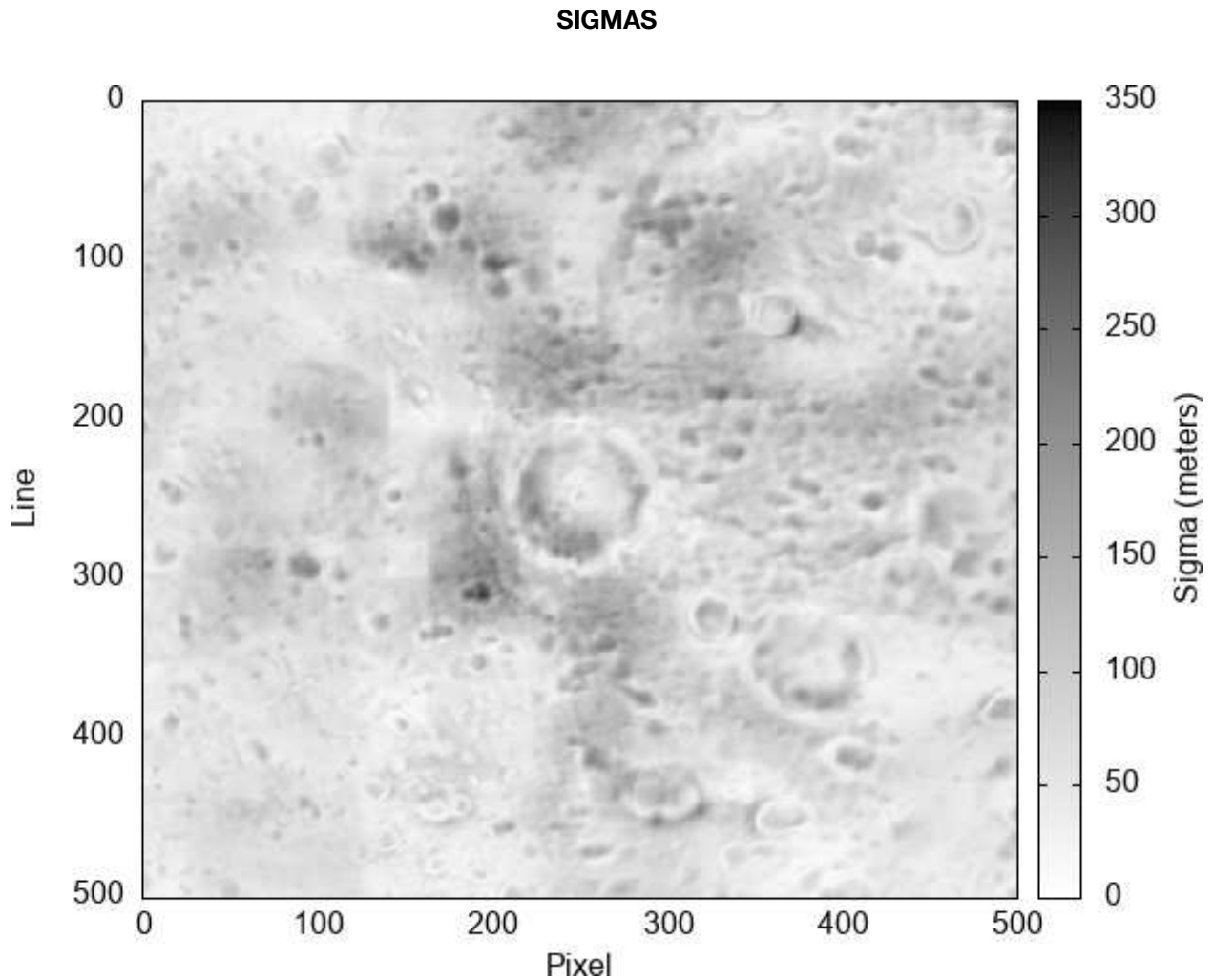


This figure presents the same information as leqs00294_bestimg_c.cub. The worst image resolution is ~594 m/px and the best is ~50 m/px. About 96% of the regional DTM (with a GSD of 405 m/vertex) under samples the best image resolution, and in these areas the effective resolution is that of the regional DTM GSD. The rest of the regional DTM over samples the best image resolution, and in those areas the effective resolution is limited by that of the best image resolution.



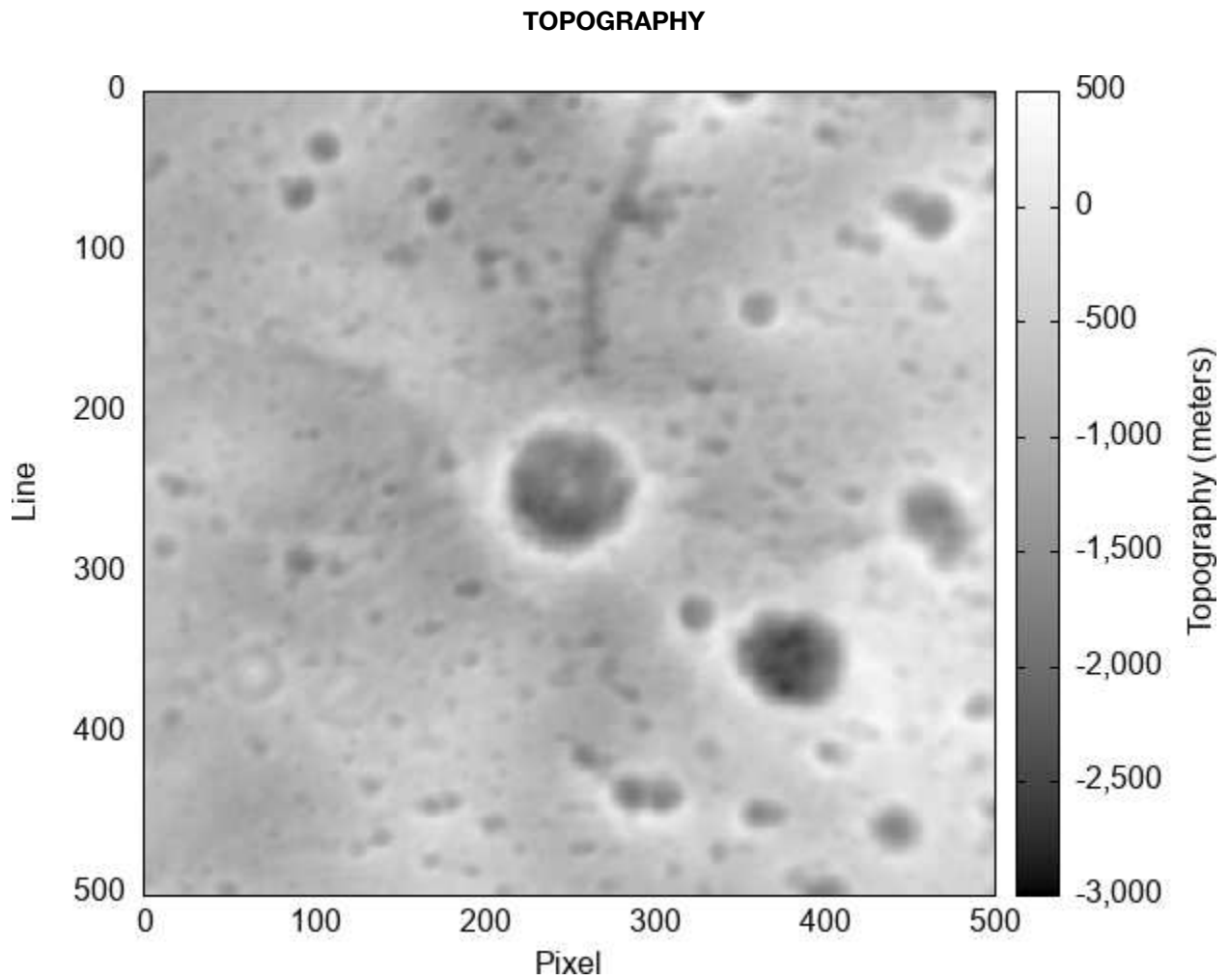
This figure presents the same information as `leqs00294_numimg_c.cub`. It only samples images up to 1,000 m/px. The number of images is everywhere at least 5 and up to a maximum of 54. The number of images give confidence to the estimated topographic uncertainties.

Regional DTM Assessment

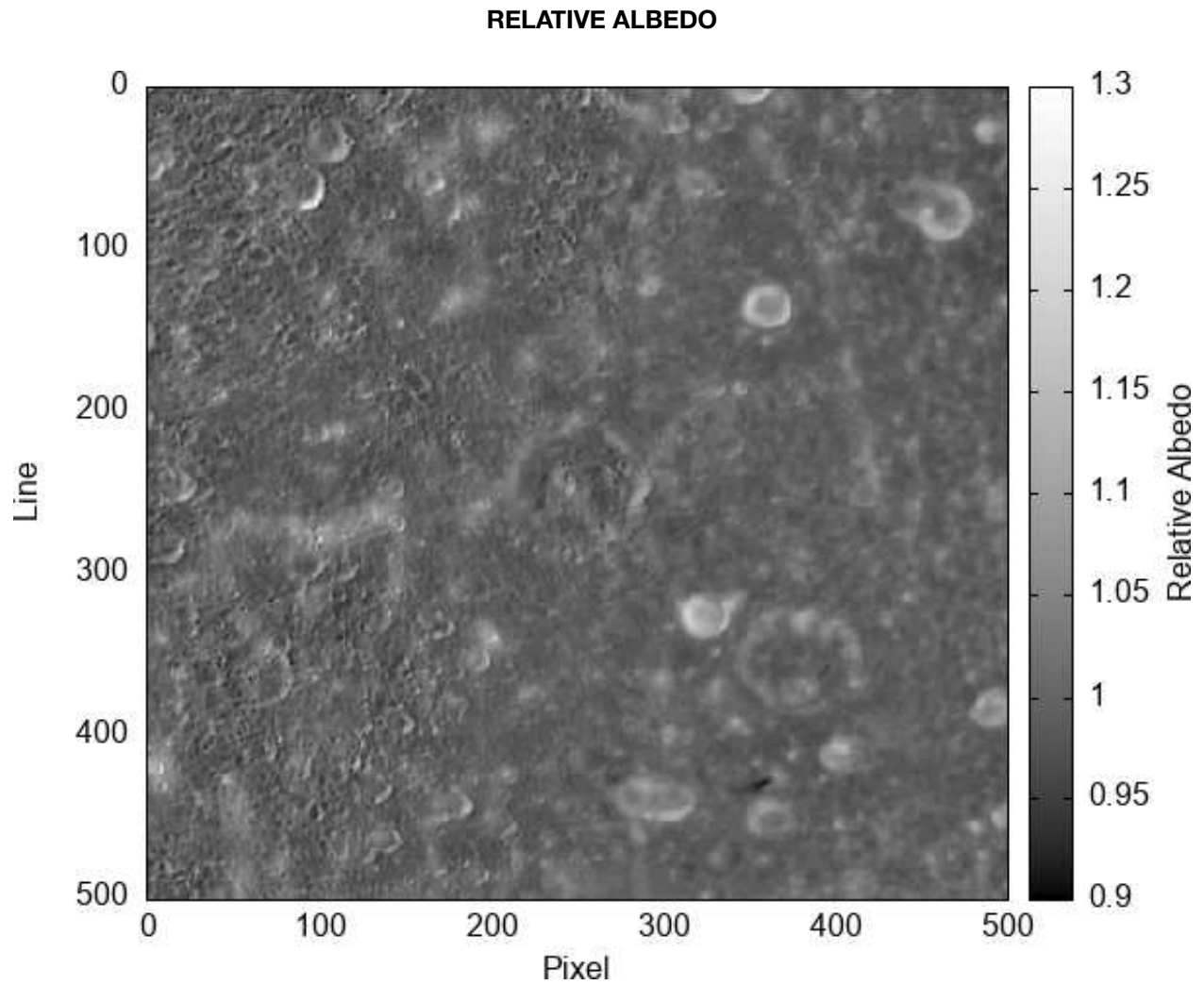


This figure presents the data in leqs00294_sigma_c.cub. The worst sigma is 314 m and the best sigma is ~1 m, with the average sigma ~82 m. Since the sigmas are everywhere less than twice that of the regional DTM GSD (405 m/vertex), the sigmas are not large enough to worsen the effective resolution of the topography. **As such, the reasons for higher sigmas in various regions are outside the scope of this project.**

Regional DTM Values



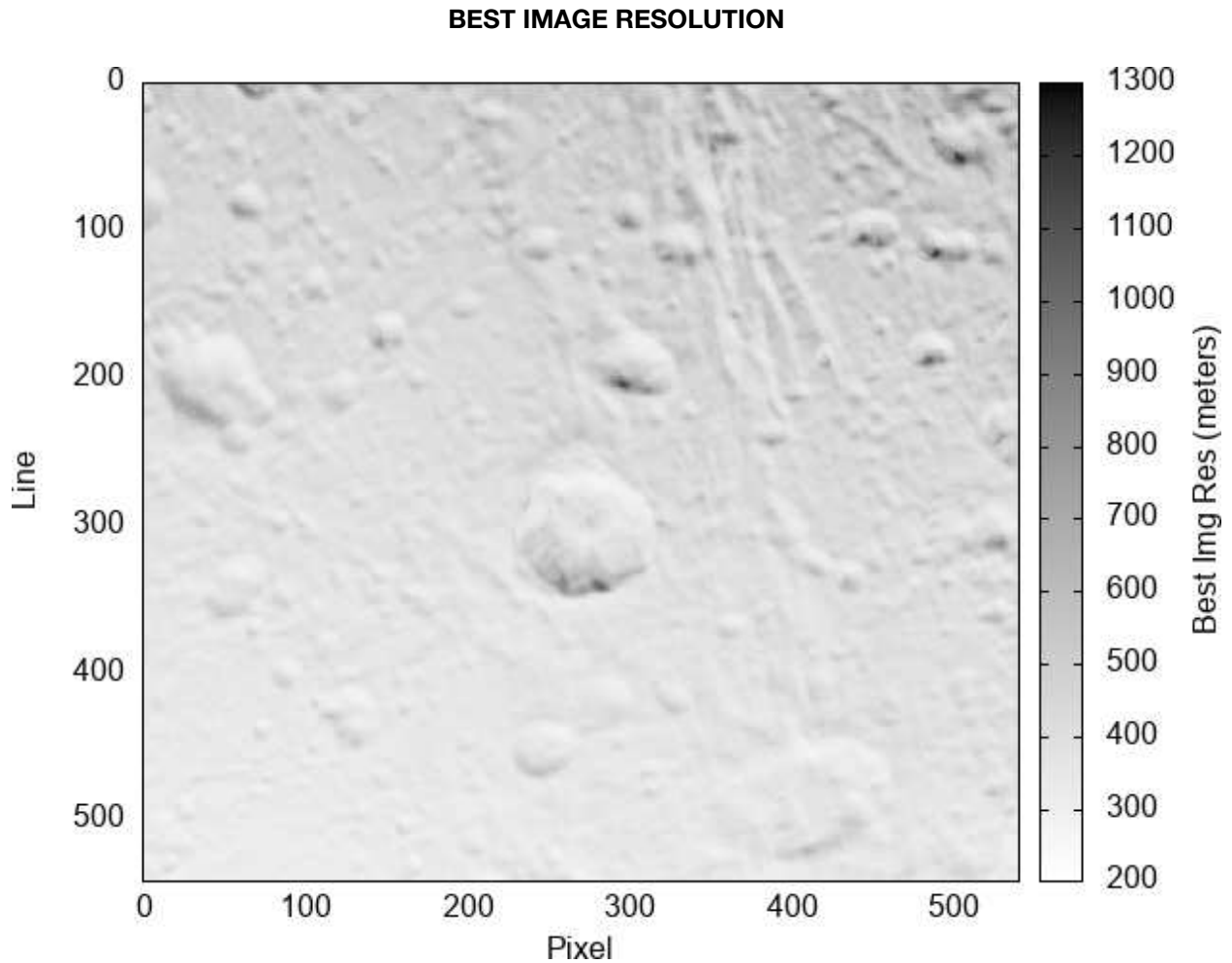
This figure presents the data in leqs00294_topo_c.cub and leqs00294_topo_g.tiff.



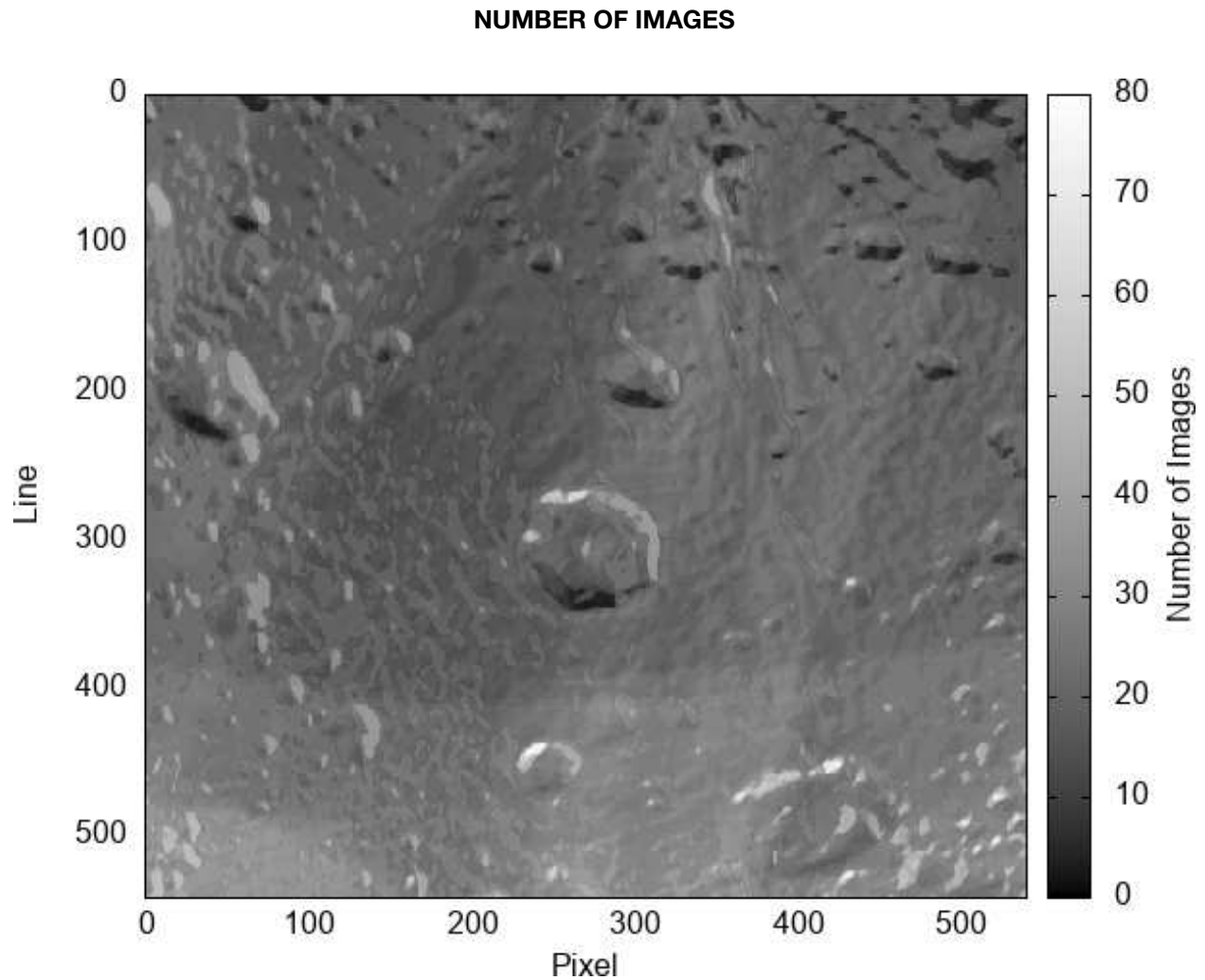
This figure presents the data in leqs00294_alb_c.cub and leqs00294_alb_g.tiff. Due to the limited imaging campaign there may be aliasing of topography into the albedo channel.

Dione Ihln50284

Spacecraft Imaging Campaign

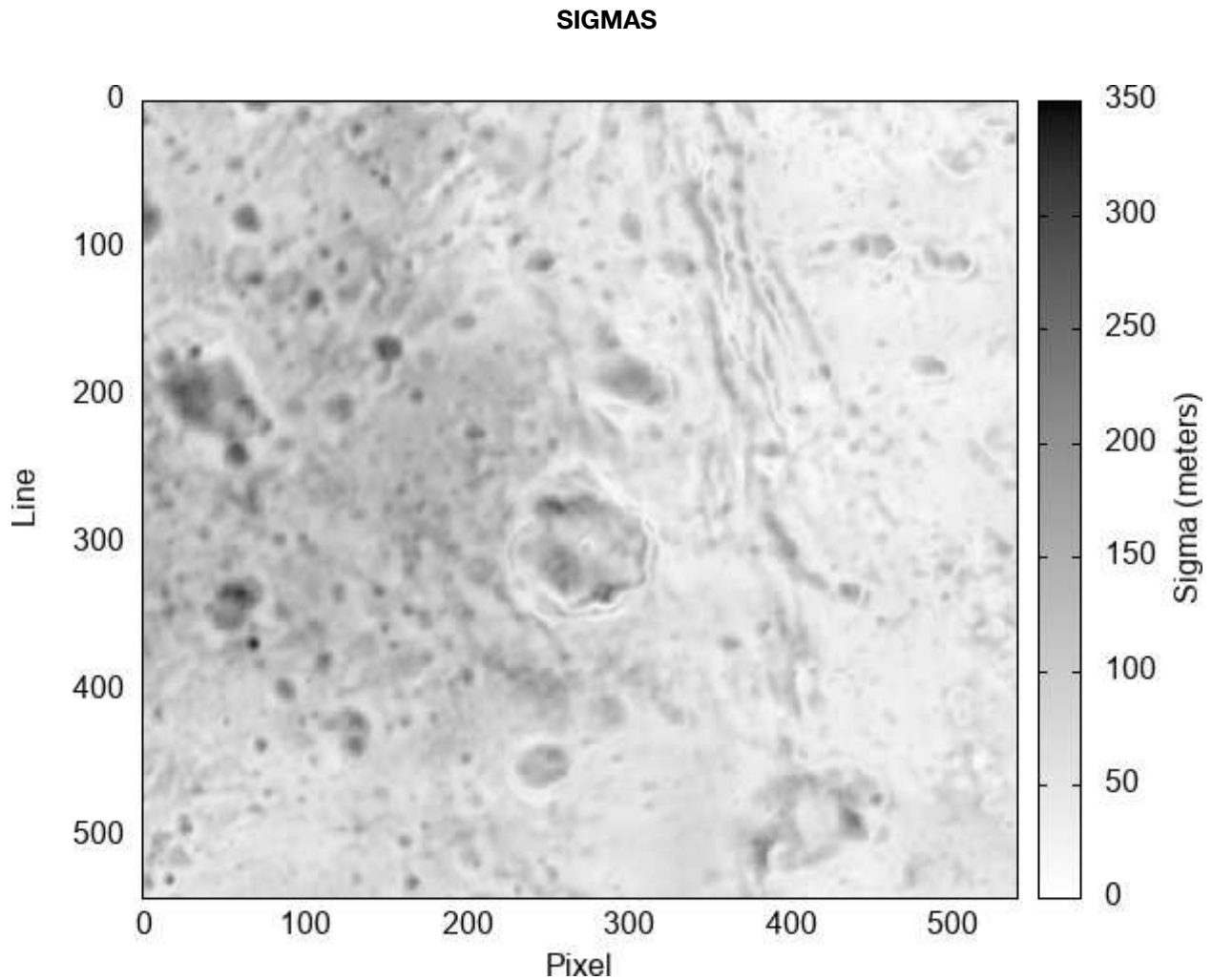


This figure presents the same information as Ihln50284_bestimg_c.cub. The worst image resolution is ~1242 m/px and the best is ~269 m/px. About 31% of the regional DTM (with a GSD of 370 m/vertex) under samples the best image resolution, and in these areas the effective resolution is that of the regional DTM GSD. The rest of the regional DTM over samples the best image resolution, and hence the effective resolution is usually limited by that of the best image resolution.



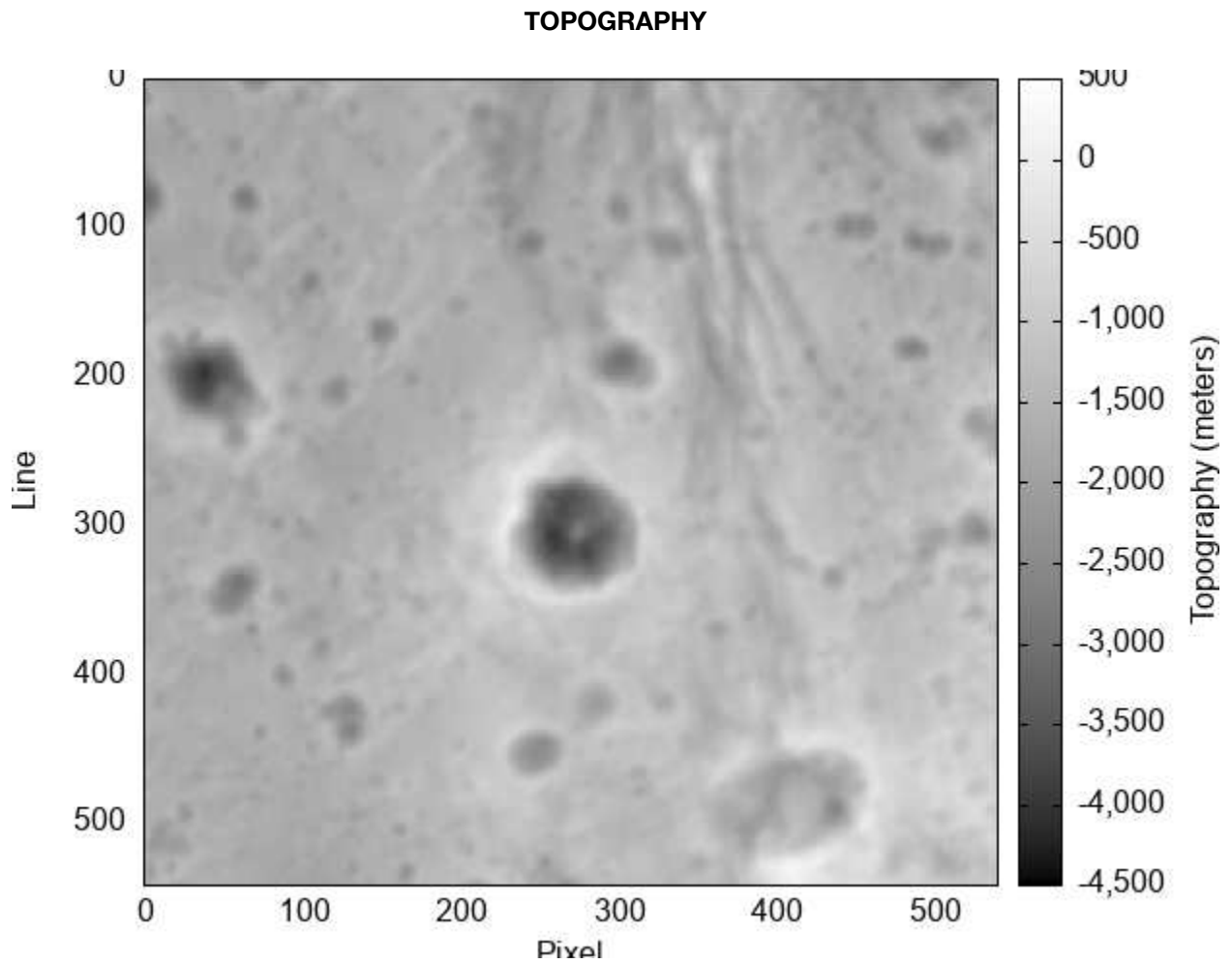
This figure presents the same information as `lhln50284_numimg_c.cub`. It only samples images up to 1,300 m/px. The number of images is everywhere at least 2 and up to a maximum of 80. The number of DTM vertices with fewer than 6 images is ~0.5%, indicating most vertices have the estimated topographic uncertainty. Vertices with fewer than 6 images will have greater uncertainty, especially those with less than 4 images. In particular, vertices with only 2 images should be treated with caution. Vertices with 2 or 3 images are near crater edges where the topography slopes away from the spacecraft, causing the resolution at that vertex to rise above 1,300 m/px.

Regional DTM Assessment

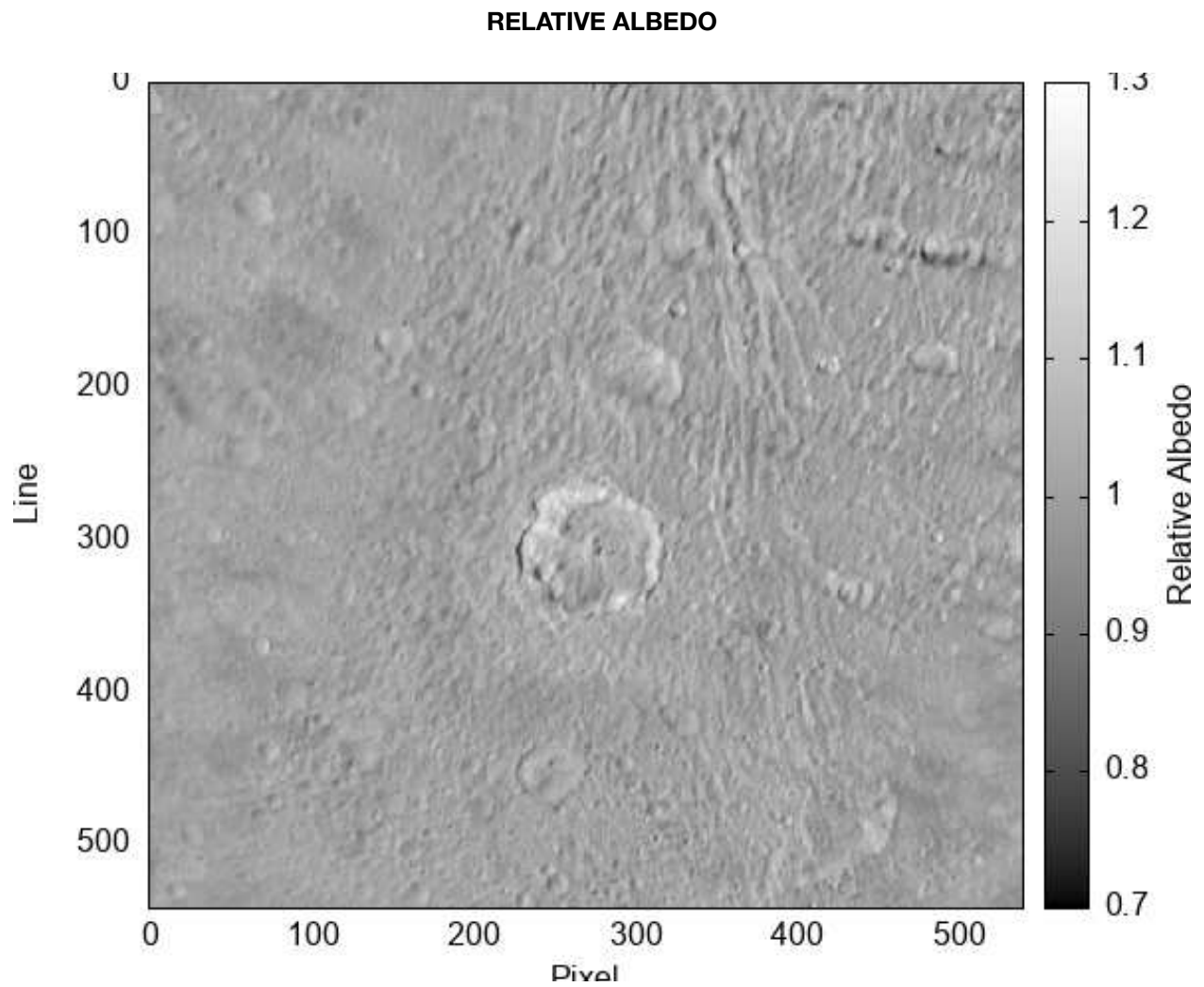


This figure presents the same information as `lhln50284_sigma_c.cub`. The worst sigma is 334 m and the best sigma is ~1 m, with the average sigma ~85 m. Since the sigmas are everywhere less than the regional DTM GSD (370 m/vertex), the sigmas are not large enough to worsen the effective resolution of the topography. **As such, the reasons for higher sigmas in various regions are outside the scope of this project.**

Regional DTM Values



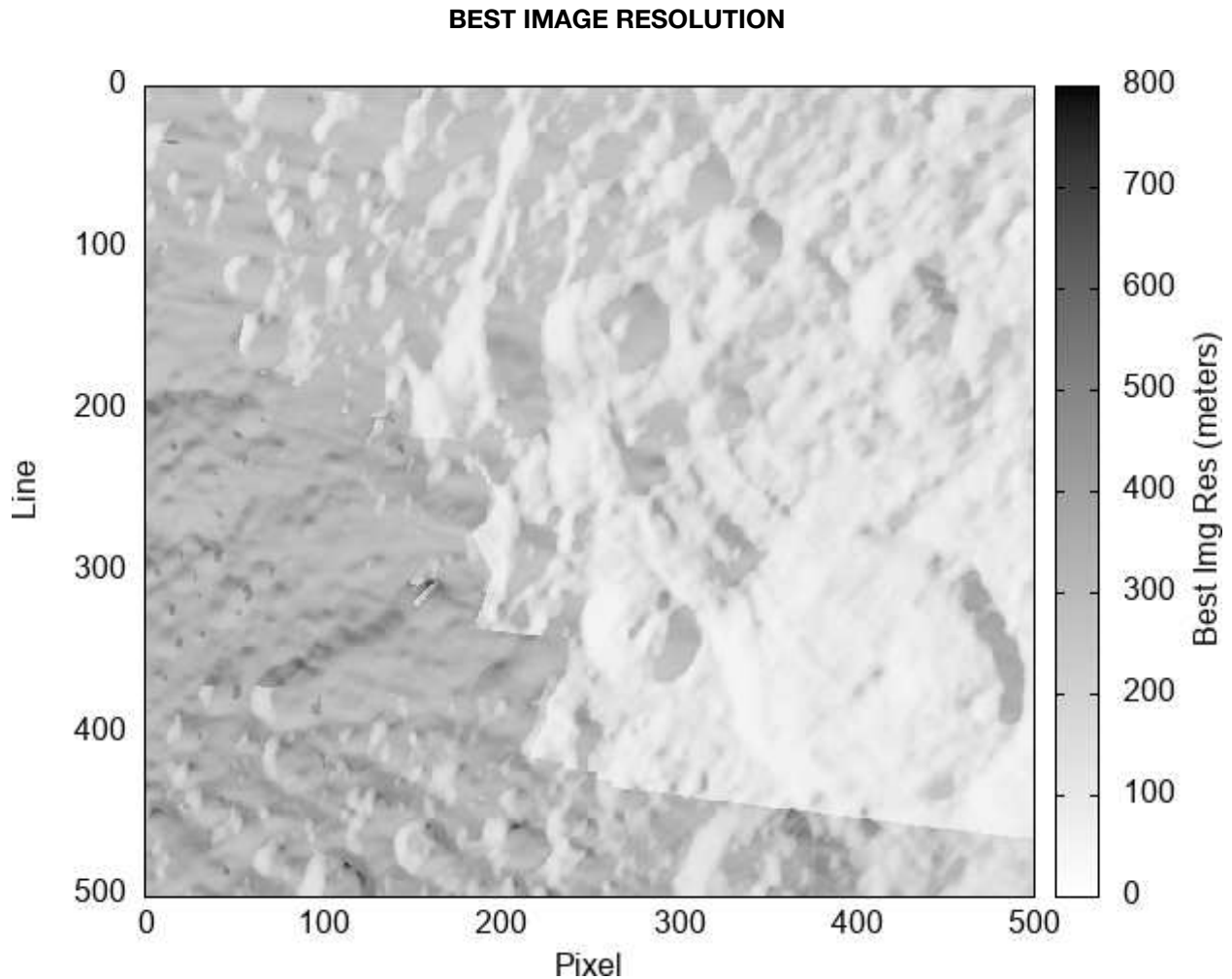
This figure presents the data in `lhln50284_topo_c.cub` and `lhln50284_topo_g.tif`.



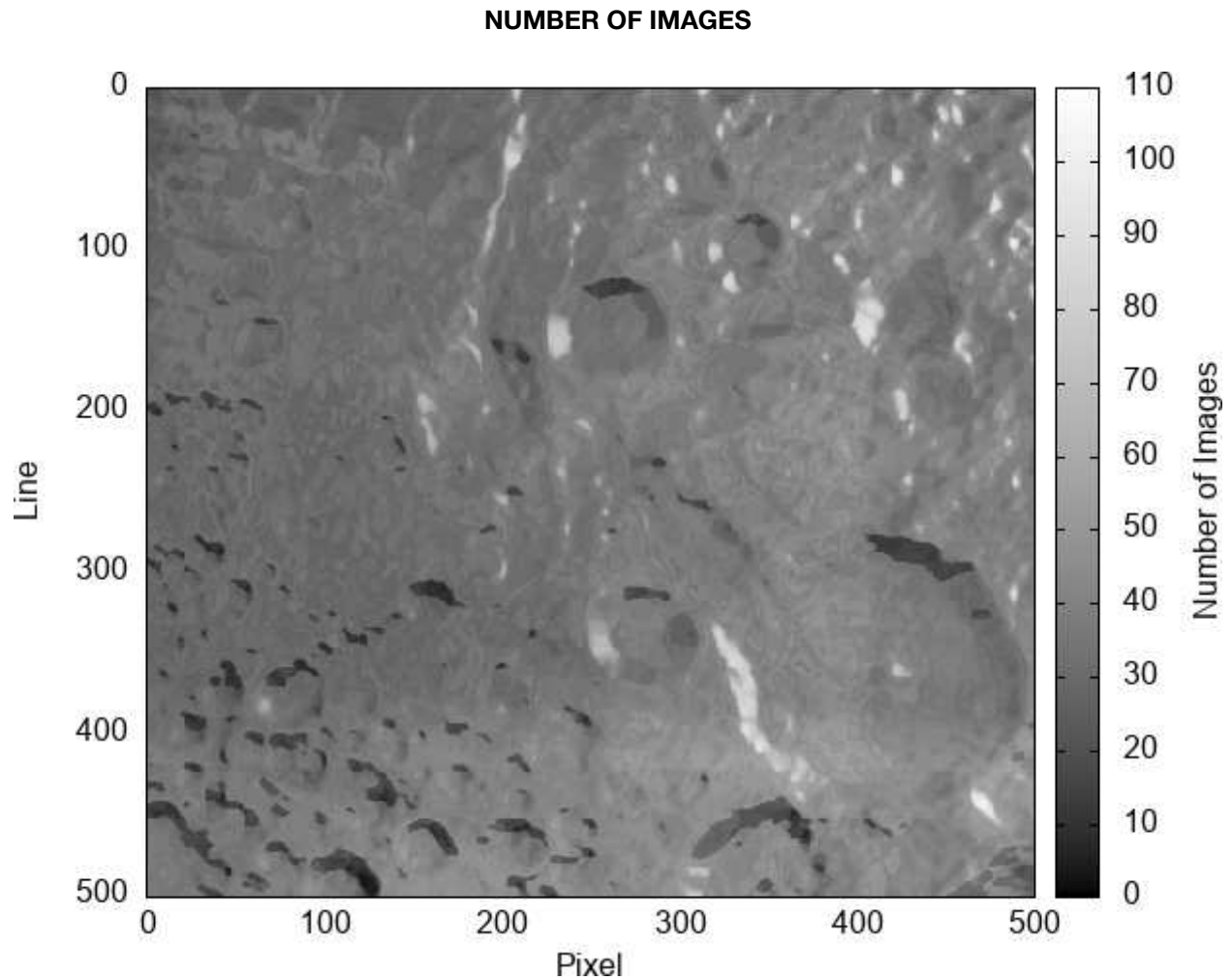
This figure presents the data in `lhln50284_alb_c.cub` and `lhln50284_alb_g.tif`. Due to the limited imaging campaign there may be aliasing of topography into the albedo channel.

Dione teqn01113

Spacecraft Imaging Campaign

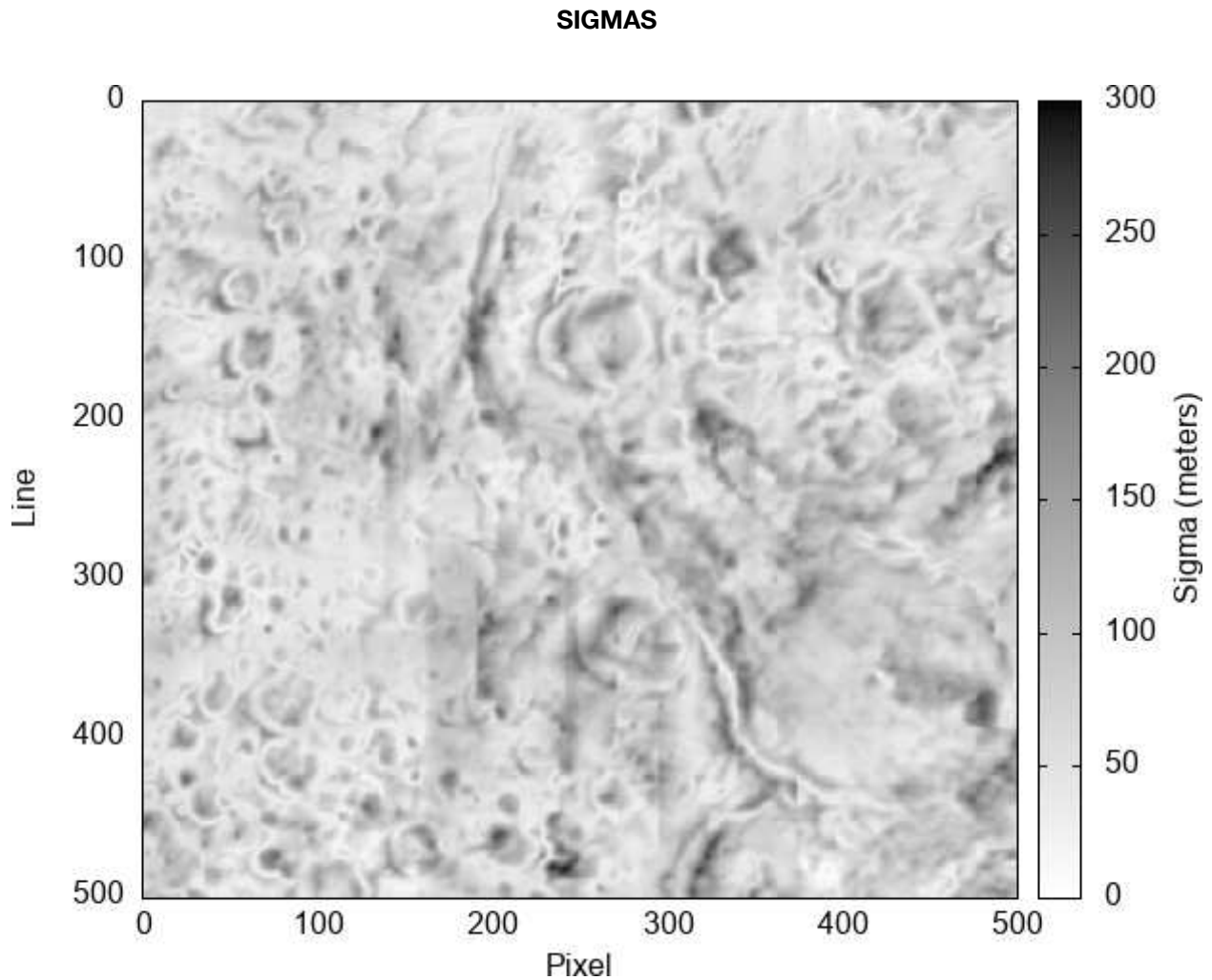


This figure presents the same information as `teqn01113_bestimg_c.cub`. The worst image resolution is ~ 800 m/px and the best images resolution is ~ 45 m/px. About 91% of the regional DTM (with a GSD of 360 m/vertex) under samples the best image resolution, and in these areas the effective resolution is that of the regional DTM GSD. The rest of the regional DTM over samples the best image resolution, and in those areas the effective resolution is limited by that of the best image resolution.



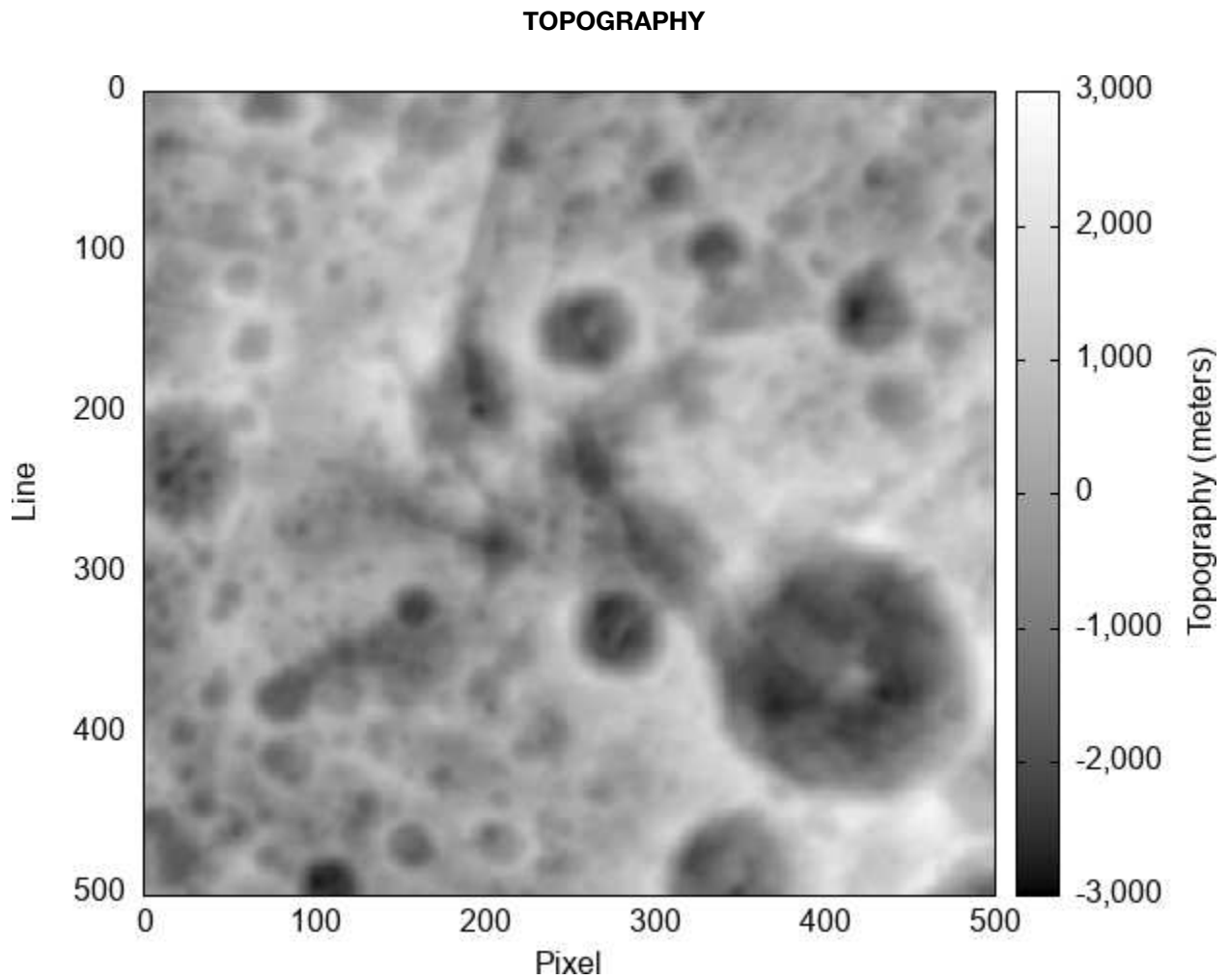
This figure presents the same information as `teqn01113_numimg_c.cub`. It only samples images up to 1,000 m/px. The number of images is everywhere at least 2 and up to a maximum of 101. However, the number of DTM vertices with fewer than 6 images is $<0.05\%$. Most images have these vertices in shadow, so these areas will have greater uncertainty, especially those with less than 4 images. In particular, vertices with only 2 images should be treated with caution. For vertices with 4 or more images, the number of images gives confidence to the estimated topographic uncertainties.

Regional DTM Assessment

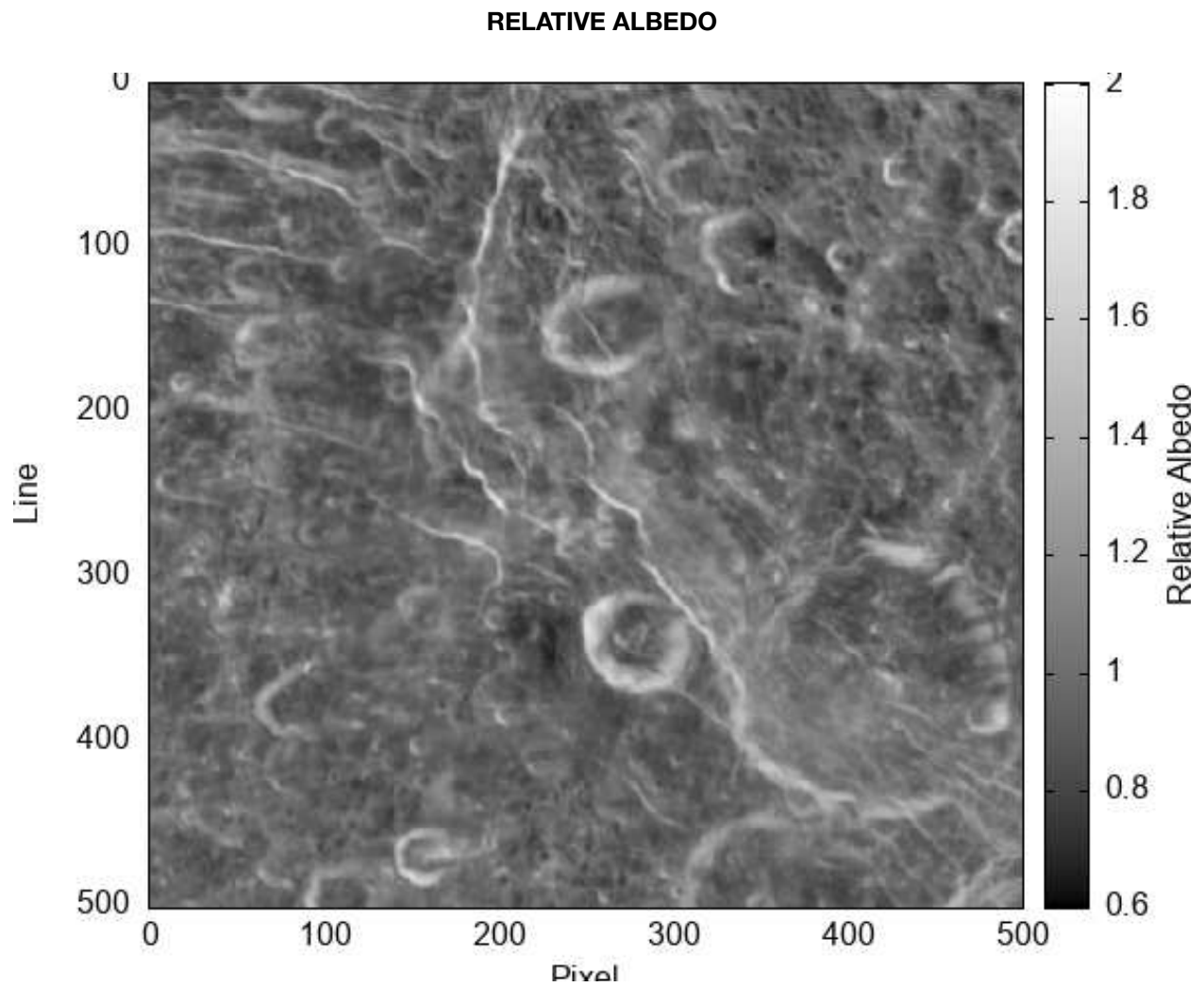


This figure presents the data in `teqn01113_sigma_c.cub`. The worst sigma is 291 m and the best sigma is ~1 m, with the average sigma ~81 m. Since the worst sigma is less than the regional DTM GSD (360 m/vertex), the sigmas are quite good. **As such, the reasons for higher sigmas in various regions are outside the scope of this project.**

Regional DTM Values



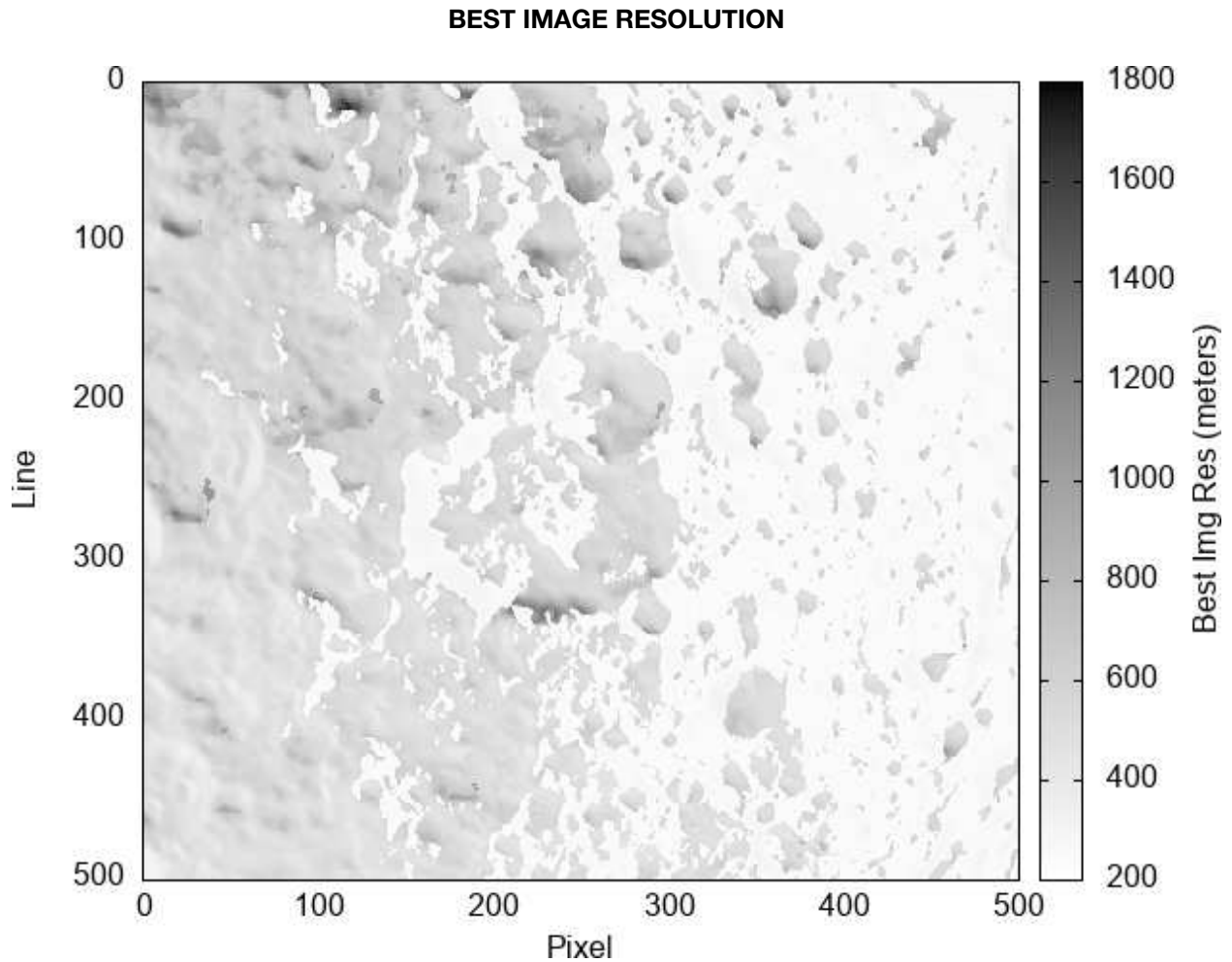
This figure presents the data in `teqn01113_topo_c.cub` and `teqn01113_topo_g.tif`.



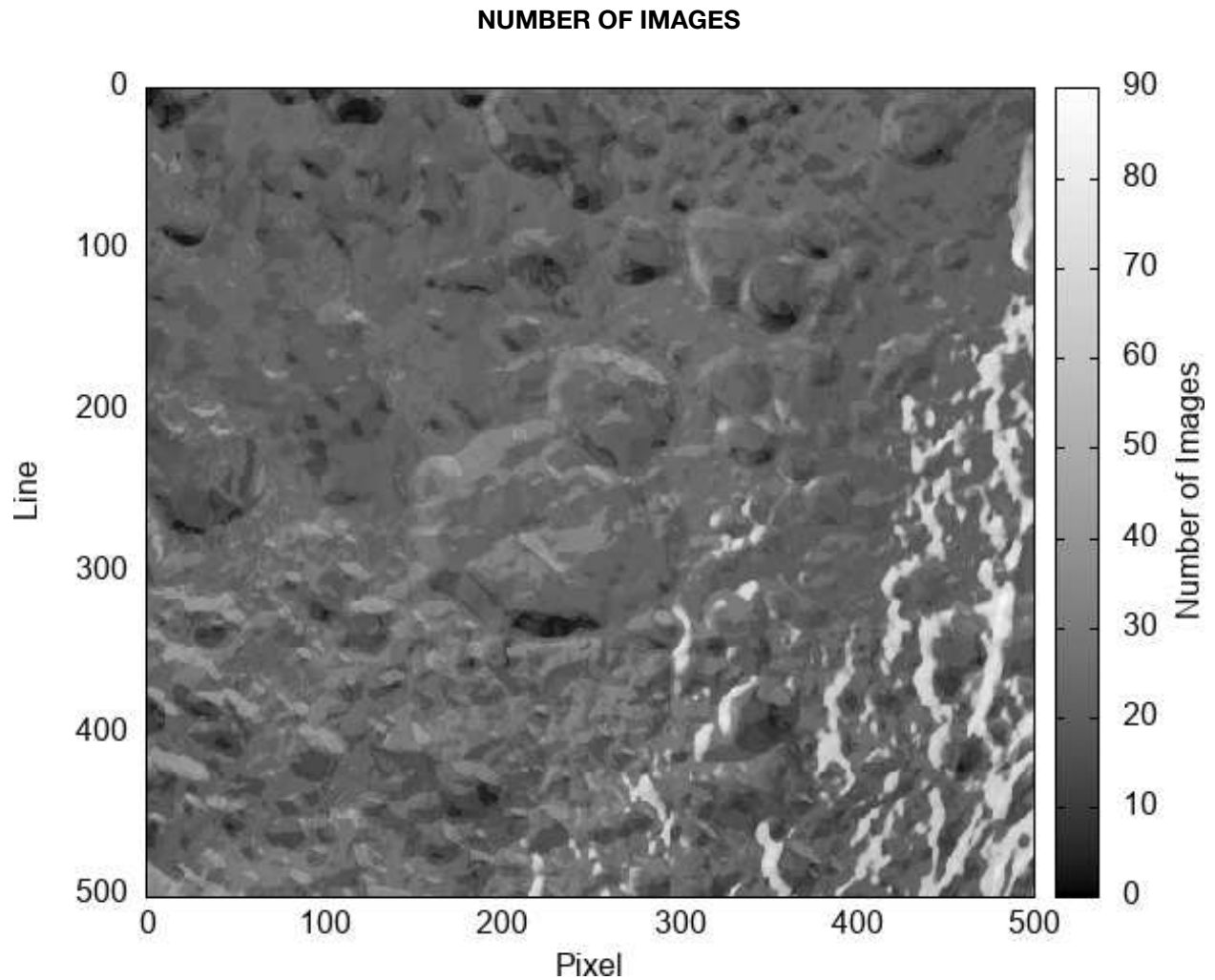
This figure presents the data in `teqn01113_alb_c.cub` and `teqn01113_alb_g.tif`. Due to the limited imaging campaign there may be aliasing of topography into the albedo channel.

Dione thln48083

Spacecraft Imaging Campaign

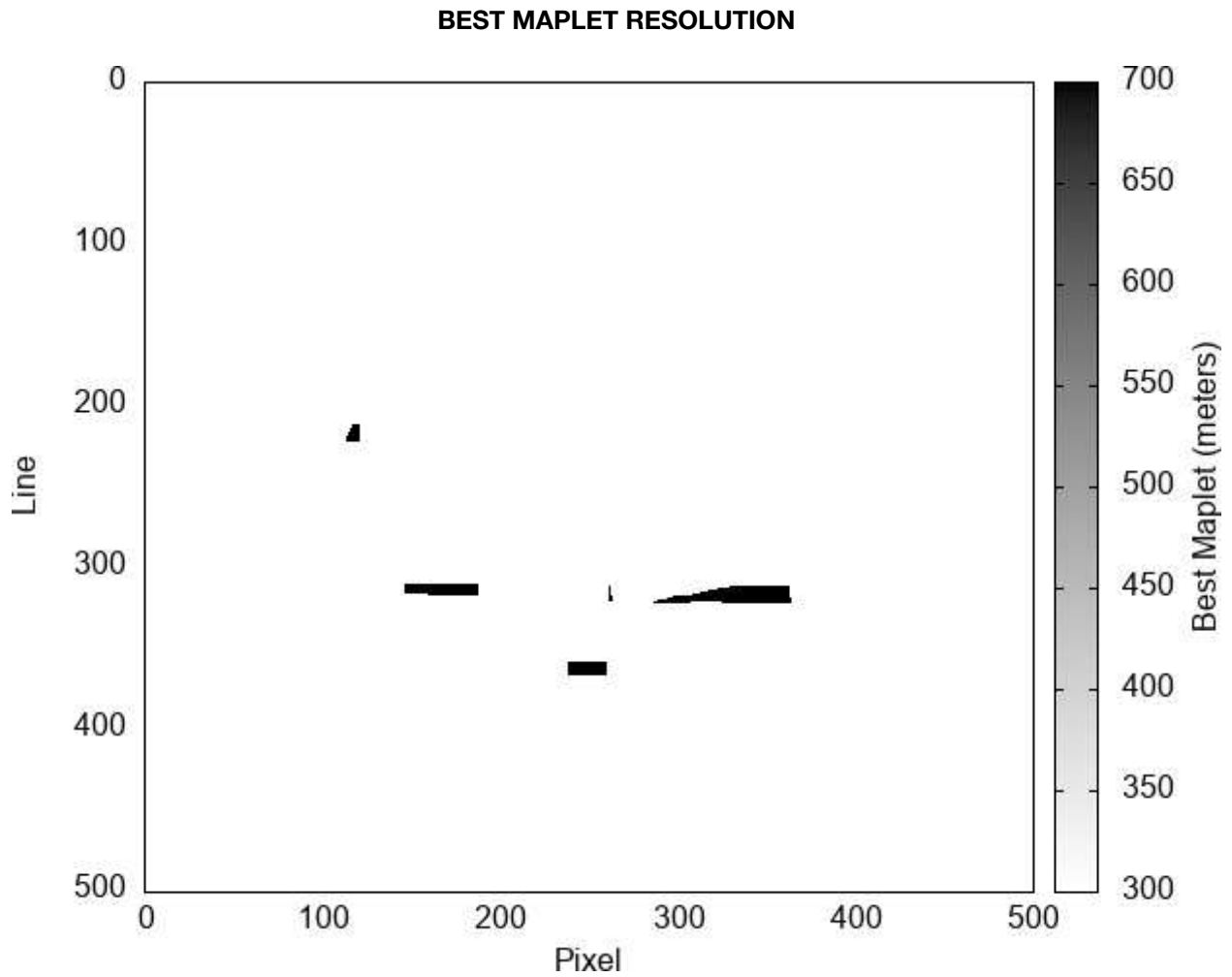


This figure presents the same information as thln48083_bestimg_c.cub. The worst image resolution is ~1725 m/px and the best is ~235 m/px. About 46% of the regional DTM (with a GSD of 400 m/vertex) under samples the best image resolution, and in these areas the effective resolution is that of the regional DTM GSD. The rest of the regional DTM over samples the best image resolution, and in those areas the effective resolution is limited by that of the best image resolution.

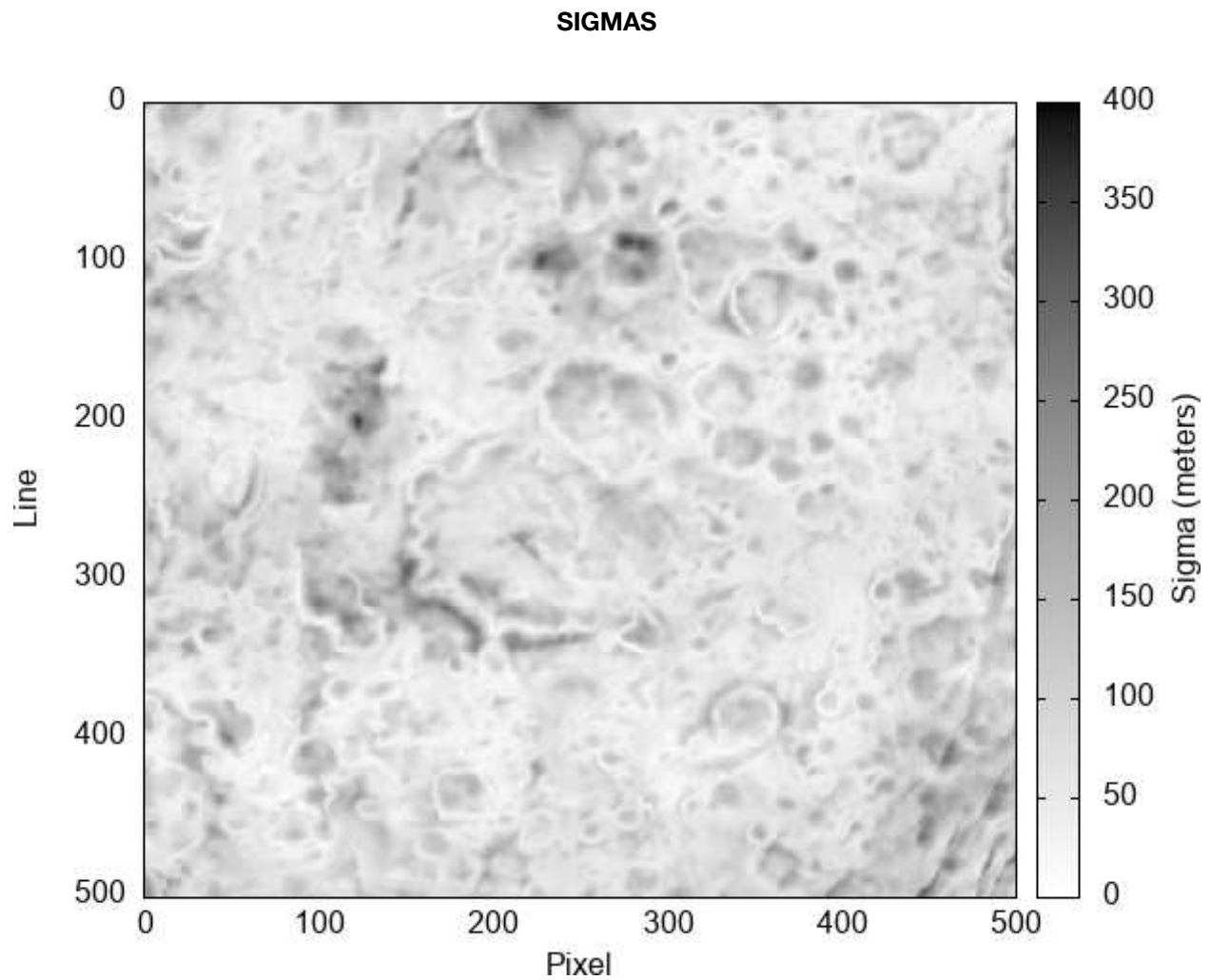


This figure presents the same information as `thln48083_numimg_c.cub`. It only samples images up to 1,800 m/px. The number of images is everywhere at least 1 and up to a maximum of 86. The number of DTM vertices with fewer than 6 images is ~0.6%, so for most vertices the number of images gives confidence to the estimated topographic uncertainties. A low number of images is due to either the image pixels being in shadow, or to topography sloping away from the spacecraft causing the resolution at that vertex to rise above 1,800 m/px. These areas will have greater uncertainty, especially those with less than 4 images. In particular, vertices with only 1 or 2 images should be treated with caution.

Regional DTM Assessment

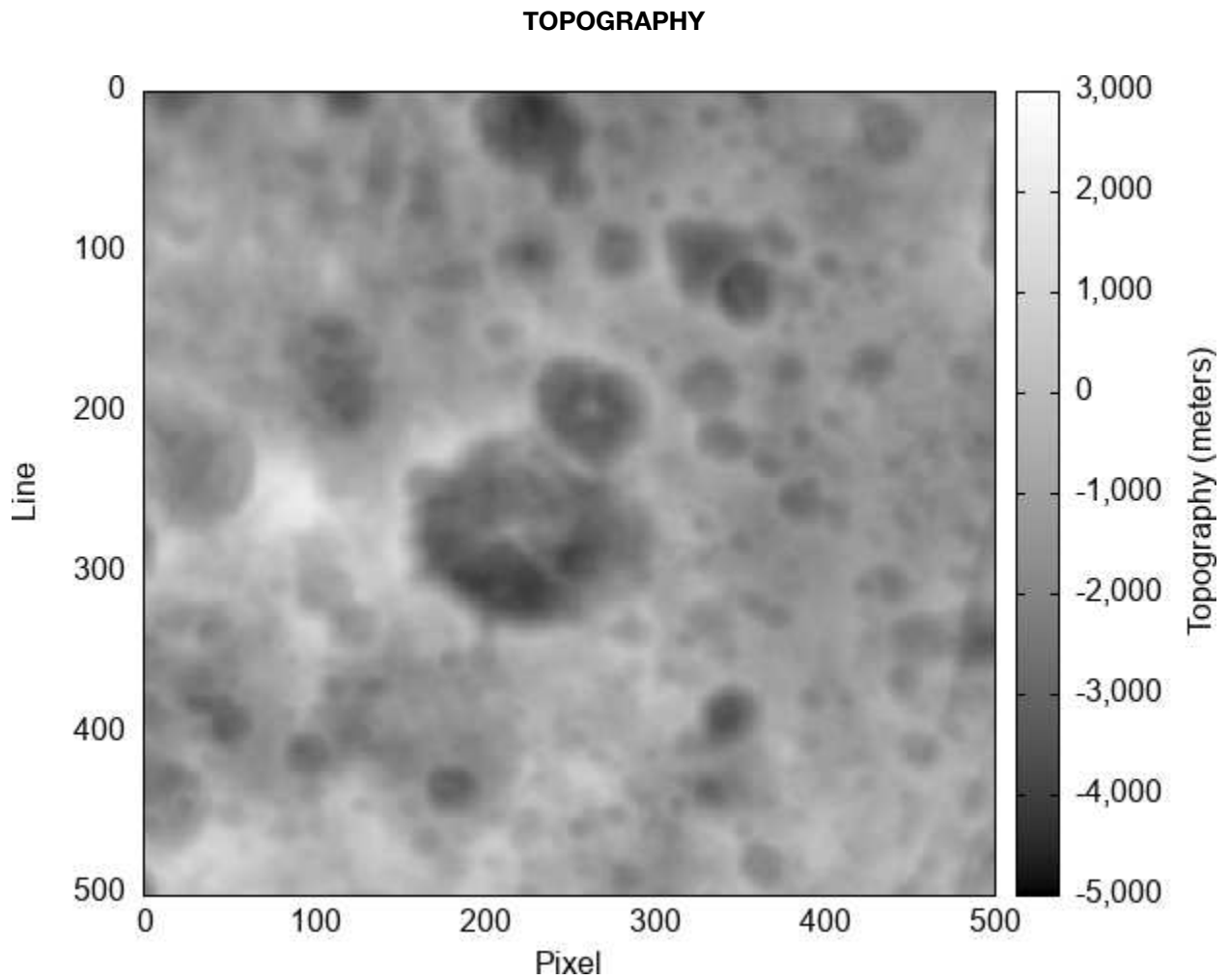


This figure presents the data in `thln48083_bestmap_c.cub`. The 300 m maplets drifted generating gaps that are only defined by the 700 m maplets. As a result the uncertainty in the dark regions is higher.

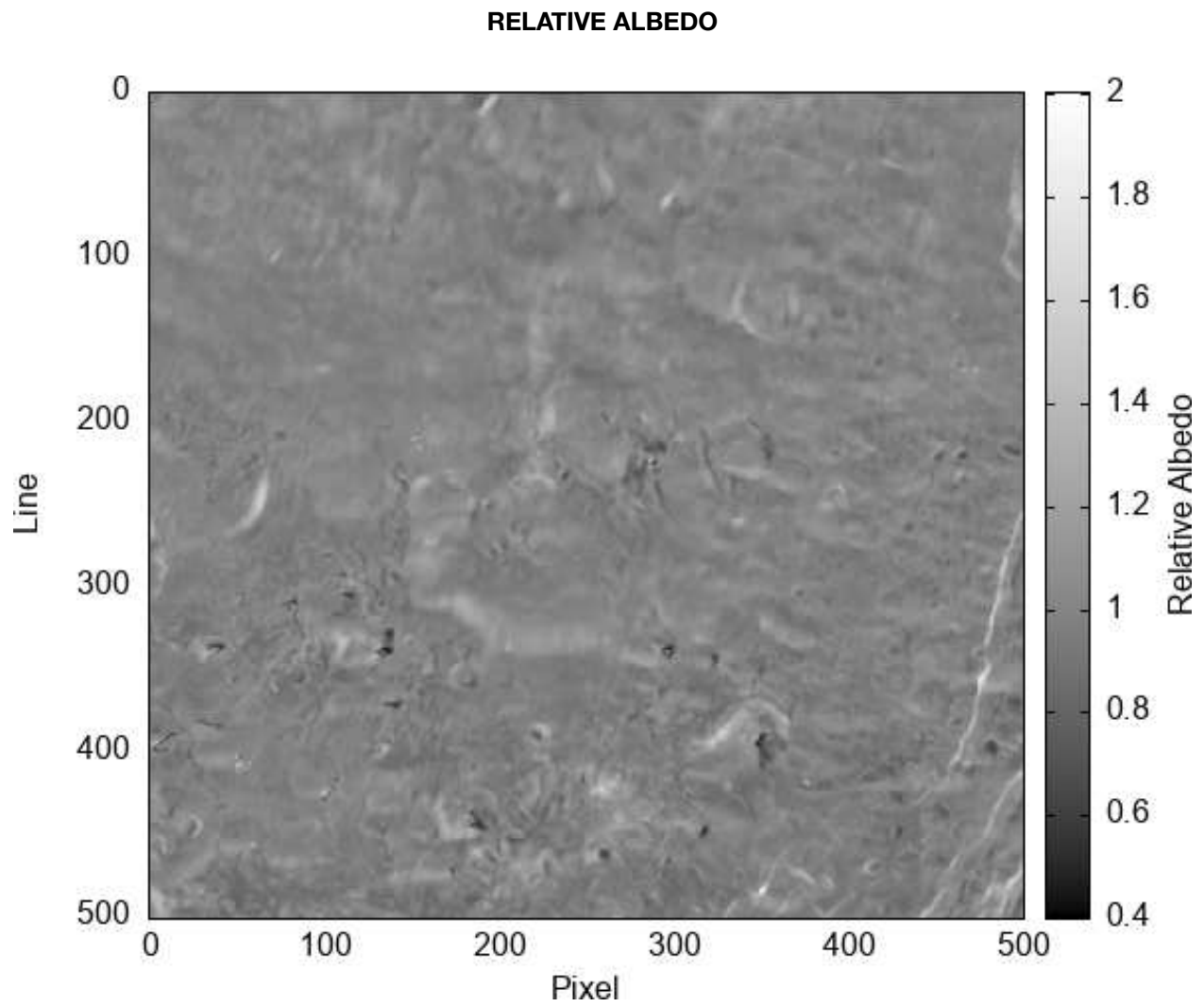


This figure presents the data in thln48083_sigma_c.cub. The worst sigma is 357 m and the best sigma is ~1 m, with the average sigma ~82 m. Since the worst sigma is less than the regional DTM GSD (400 m/vertex), the sigmas are quite good. **As such, the reasons for higher sigmas in various regions are outside the scope of this project.**

Regional DTM Values



This figure presents the data in thln48083_topo_c.cub and thln48083_topo_g.tif.



This figure presents the data in thln48083_alb_c.cub and thln48083_alb_g.tif. Due to the limited imaging campaign there may be aliasing of topography into the albedo channel.