

Cataloging Craters on Saturn's Moon, Enceladus. B. A. Karpes and P. R. Stoddard, Department of Geology and Environmental Geosciences, Northern Illinois University, Davis Hall 312, Normal Rd., DeKalb, Illinois 60115 (bkarpes@niu.edu).

Introduction: The cataloging of craters on Enceladus will be a useful tool in the further study of this enigmatic moon. Enceladus has a unique history in that there is little potential for tidal heating and little radiogenic heating, yet there is much geologic activity [1]. Craters are a very important tool in deciphering surface histories and will therefore contribute a great deal to the further understanding of this activity. Preliminary studies showed that Enceladus' surface has varying degrees of crater impact densities ranging from tectonic terrains with little to no cratering to heavily cratered terrains [2][3]. Bray et al. also showed the distribution of craters varies by latitude, with craters being larger and densities being higher to the north [4].

Procedure: The location of craters is being cataloged based on publicly available images from the Cassini Imaging Central Laboratory for Operations (CICLOPS) web site [5]. We used CICLOPS images SE-10 through SE-6 and focused on latitudes from 10°N to 10°S. The images, which range from 70 – 2000+ m/px in resolution, were loaded into Photoshop where they were adjusted for best contrast to allow for easier identification of prominent features. The (x, y)-coordinate of each crater larger than 2.20 km (1° in diameter) was recorded and converted to latitude and longitude. The crater locations were then plotted (Figure 1). Craters that were equal to or larger than 4.40 km (1°), greater than 6.60 km (1.5°) and deformed craters are highlighted.

Discussion: All craters larger than 2.20 km (0.5°) between latitudes 10°N and 10°S were cataloged. Craters were then highlighted based on their size, less than 4.40km, greater than 4.4 km and greater than 6.60 km, and deformation (Figure 1). For this part of the project deformed craters are identified simply as those which are non-circular (Figure 2A). Though deformation is defined here as only a change in shape, there are many types of deformation evident on Enceladus. Many craters have been rifted (Figure 2B) and others show signs of viscous relaxation [1].

The highest density of craters is located between 216°W and 144°W, and centered nearly around 180°, which corresponds to image (SE-8) which has relatively high resolution (100-700 m/px). The largest craters, those over 4.40 km, were almost entirely found

in this same area. The high density of large craters in this region may be significant and require future study, or it may be due to the lower resolution of the other images. While it can be argued that the low resolution of some of the images could be a factor in the relative lack of craters, even at resolutions of 2 km/px craters the size of 4 km should take up 4 pixels and be identifiable. While few craters were found in the lowest resolution areas (Figure 3) there are areas (Figure 4) in which there were few craters though resolution of the image is high. This area contains a high degree of rifting and further study will be needed to identify any correlation.

Further work on this project will include cataloging the remaining surface craters, recording their sizes more accurately, along with identifying differing types of crater deformation.

References: [1] Smith D. E. et al. (2007) *LPI Contributions*, 6051. [2] Miller, D. J. et al. (2007) *LPI Contributions*, 1357, 95-96. [3] Smith D. E. et al. (2007) *LPS XXXVIII*, Abstract #2237. [4] Bray, V. J. et al. (2007) *LPS XXXVIII*, Abstract #1387. [5] DLR and NASA/JPL/Cassini Imaging Team (2007) <http://ciclops.org/view.php?id=2441>.

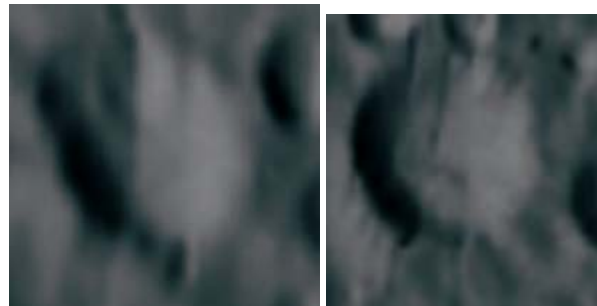


Figure 2A. Close up of a deformed crater (left image). Location is image SE-8, 196.03°W, 1.44°S.

Figure 2B. Example of a rifted crater (right image), location image SE-8 196.64°W 6.39°S. This type of deformation was noted highlighted in this preliminary catalog but will be in further work.

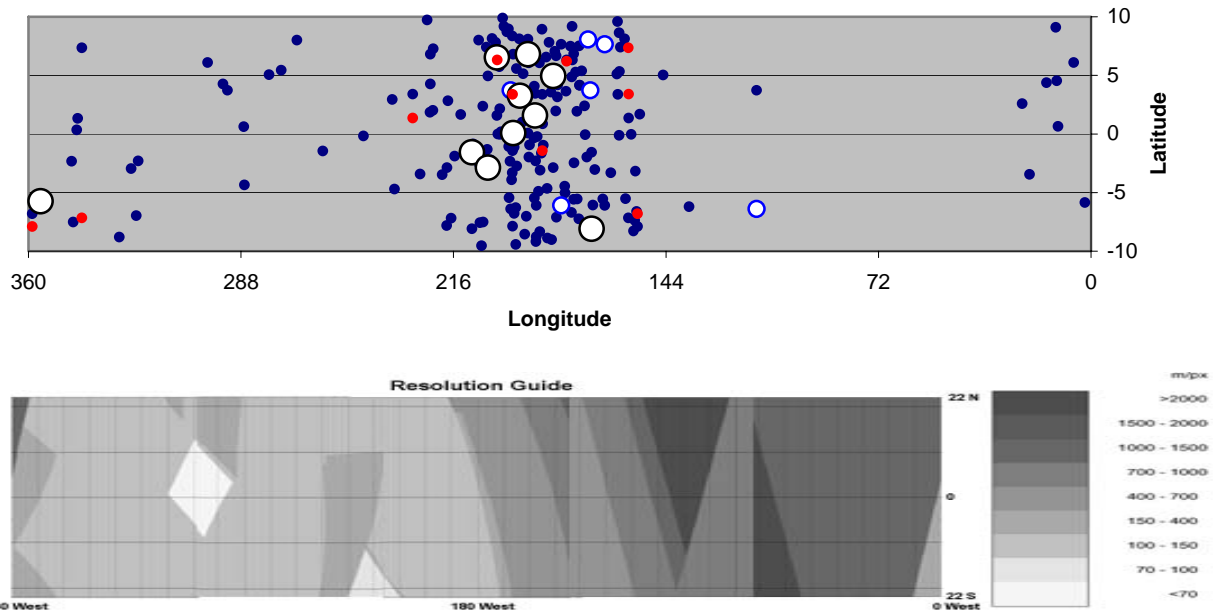


Figure 1a. Location of craters (larger than 2.20 km) plotted by longitude and latitude. Blue dots represent craters in the 2.20 – 4.40 km range, small blue outlined circle are craters in the 4.40 – 6.60 km range and the large black outlined circles are craters larger than 6.60 km. Deformed craters are represented with red dots. Figure 1b. Resolution for images used in crater cataloging. Lighter regions indicate higher resolution.

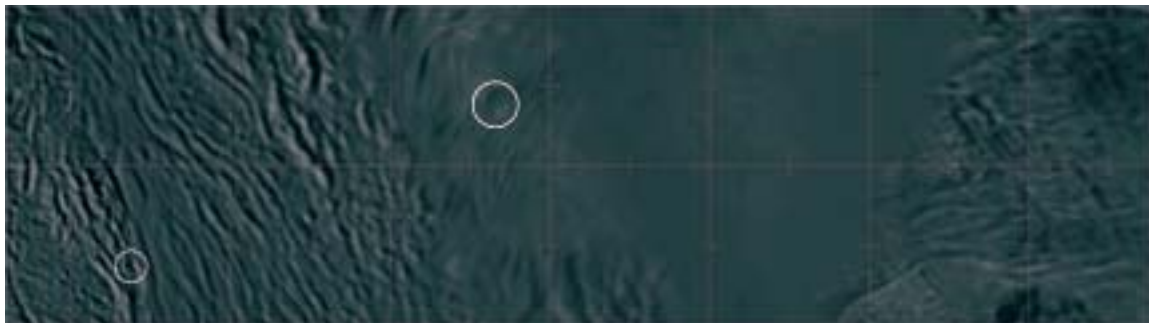


Figure 3. Image SE-7, this is an example of a low resolution image with the resolution ranging from 400 – 2000+ m/px, approximately 80% of this image is 700 m/px or worse. Only 2 craters (circled) could be identified from this image. Image ranges from 10°N to 10°S latitude and 144°W to 72° W longitudes.



Figure 4. CICLOPS image SE-9 with resolution ranging from < 70 – 400 m/px. This high-resolution image contains few craters especially on the left side where there is a high degree of tectonic activity.