Dark Crater Surfaces in Bright Areas on the Saturn Moon Iapetus

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The global brightness dichotomy of Iapetus has raised interesting questions since its discovery more than 300 years ago: What is the bright material, what the dark one? How did the dark areas evolve? Those questions are satisfyingly solved only for the dark area covering two fifth of the surface on the leading side, called *Cassini Regio*. It has been suggested by Spencer [1, 2] that dark organic material is embedded in ice on the whole surface of Iapetus, only some areas are suited for an enrichment of dark material on the surface. A runaway process of local heating enables the sublimation of ice which in turn enables the enrichment of the dark material and leads to decreasing albedo and therefore increased absorption and increased local heating. Within *Cassini Regio* the process was very probably triggered by exogenous material [3]. A remaining question is how the troughs und crater bottoms in the bright area on the trailing side darkened. Here exogenic material can be excluded and an intrinsic mechanism has to be found as a trigger for the runaway process.

Models of the darkening of the craters

We suggest that the scattering of sunlight on the crater surface led to a local increase in intensity on the inside of the crater comparable to the caustic of a concave mirror. This increase triggered the aforementioned runaway process in case of the crater surfaces. Models of this effect using geometrical optics and radiative transfer theory will be presented in the contribution.

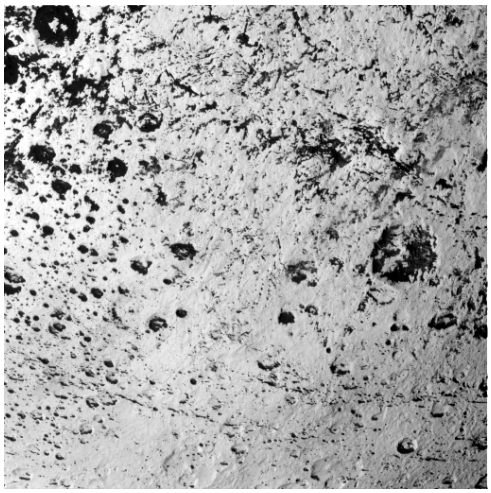

Figure 1: Cassini ISS image of darkened craters

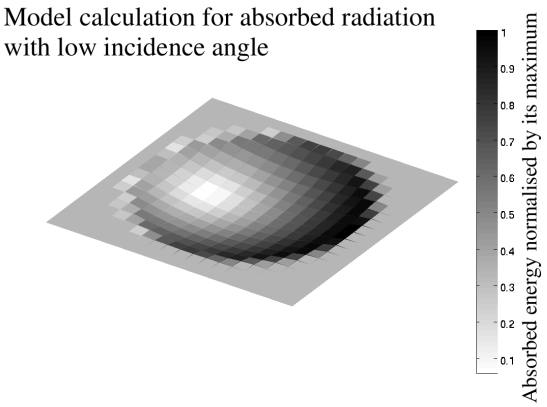

Figure 2: A model calculation for absorbed radiation at a crater surface

References

[1] J. R. Spencer, J. C Pearl, M. Segura, and Cassini CIRS Team. Iapetus Surface Temperatures, and the Influence of Sublimation on the Albedo Dichotomy: Cassini CIRS Constraints. In *37th DPS Meeting*, 2005.

[2] J. R. Spencer, J. C. Pearl, M. Segura, and Cassini CIRS Team. New Cassini CIRS Observations of Temperatures on Iapetus and Other Saturnian Satellites. In *39th DPS Meeting*, 2007.

[3] Tilmann Denk and J. R. Spencer. Iapetus: A Two-step Explanation for its Unique Global Appearance. In *40th DPS Meeting*, 2008.