URANUS SATELLITES: ALBEDO AND COLOR MAPS FROM VOYAGER IMAGING. P. Helfenstein, J. Hillier, J. Veverka, J. Moersch, and C. Weitz, Center for Radiophysics and Space Research, Cornell University, Ithaca, NY 14853.

Maps portraying the variations of albedos and colors on planetary surfaces are often our only available tools for interpreting differences in surface composition related to geology. Here, we present new global albedo maps of the major Uranian satellites derived from Voyager 2 broadband imaging data and report their respective variety in albedo and color.

The most complete surface-resolved imaging coverage of the Uranian satellites, in terms of both viewing and illumination geometry, is provided by Voyager narrow angle camera clear-filter (~0.48 microns) data. In order to produce images in which brightness represents visual normal albedo (the reflectance at 0° incidence and emission angles), we performed shading corrections to radiometrically calibrated Voyager clear-filter images using Hapke's[1] photometric equation and average global values of its parameters[2] for each satellite. Polar stereographic projections of these albedo images were then registered to control points[3] and mosaicked to create the clear-filter albedo maps shown in Fig. 1. For our analysis of satellite colors, similar albedo maps were constructed from Voyager UV (0.35 μm), violet (0.41 μm), green (0.56 μm) and clear (0.48 μm) filter images; however, for these we applied recently reported broadband parameters of the Minnaert photometric equation[4] to perform the shading correction.

Table I summarizes some results of our analysis of the clear filter albedos of the Uranian satellites. The lowest albedos occur in dark deposits on floors of bright-rayed craters on Oberon ($r_n = 0.15$) and in quasi-polygonal dark terrains[5] on Umbriel ($r_n = 0.19$). The highest albedos occur in the bright rays of craters on Ariel ($r_n = 0.55$). There is no apparent systematic variation of average albedo[6] or albedo contrast with orbital distance from Uranus. There is no direct correlation of albedo with age implied by crater densities[7] on any of the satellites, however, it is generally true that the largest albedo contrasts occur in the youngest terrains. We searched the albedo maps in Fig. 1 for systematic changes of average albedo with longitude, but found no significant variations that could not easily be attributed to the placement of bright craters or obvious terrain boundaries.

The average colors of the satellites are all similarly spectrally grey and bland. Across the four inner satellites (Miranda, Ariel, Umbriel and Titania), no significant variation in color is observed, however, there may be a slight tendency for crater rays on Titania to be bluer than average[8]. In particular, there is no correlation between albedo and color on the inner four satellites. By contrast, the outermost Uranian satellite, Oberon, shows a significant variation of color across its surface. Bright crater rays on Oberon are significantly bluer than the average surface while the dark crater floor materials appear similar to, or slightly redder than, Oberon's average surface.

References: 1) Hapke, B. (1986) *Icarus 67*, 264-280. 2) Helfenstein et al. (1988) *Icarus 74*, 231-239. 3) Davies, M. et al. (1987), *Icarus 71*, 137-147. 4) Veverka et al. (1989) *Icarus*, in press. 5) Helfenstein, P. et al. (1989) *Nature*, in press. 6) Smith et al. (1986) *Science 233*, 43-64. 7) Strom, R. (1987) *Icarus 70*, 517-535. 8) Thomas, P. et al. (1987). *JGR 92*, 14,911-14,917.

Table I: Normal albedos and contrast ratios for Uranian satellites

Satellite	Average r_n	Max r_n	Min r_n	Max/Min
Miranda	0.36	0.48	0.25	1.9
Ariel	0.37	0.55	0.25	2.2
Umbriel	0.21	0.49	0.19	2.6
Titania	0.28	0.31	0.21	1.5
Oberon	0.23	0.34	0.15	2.2

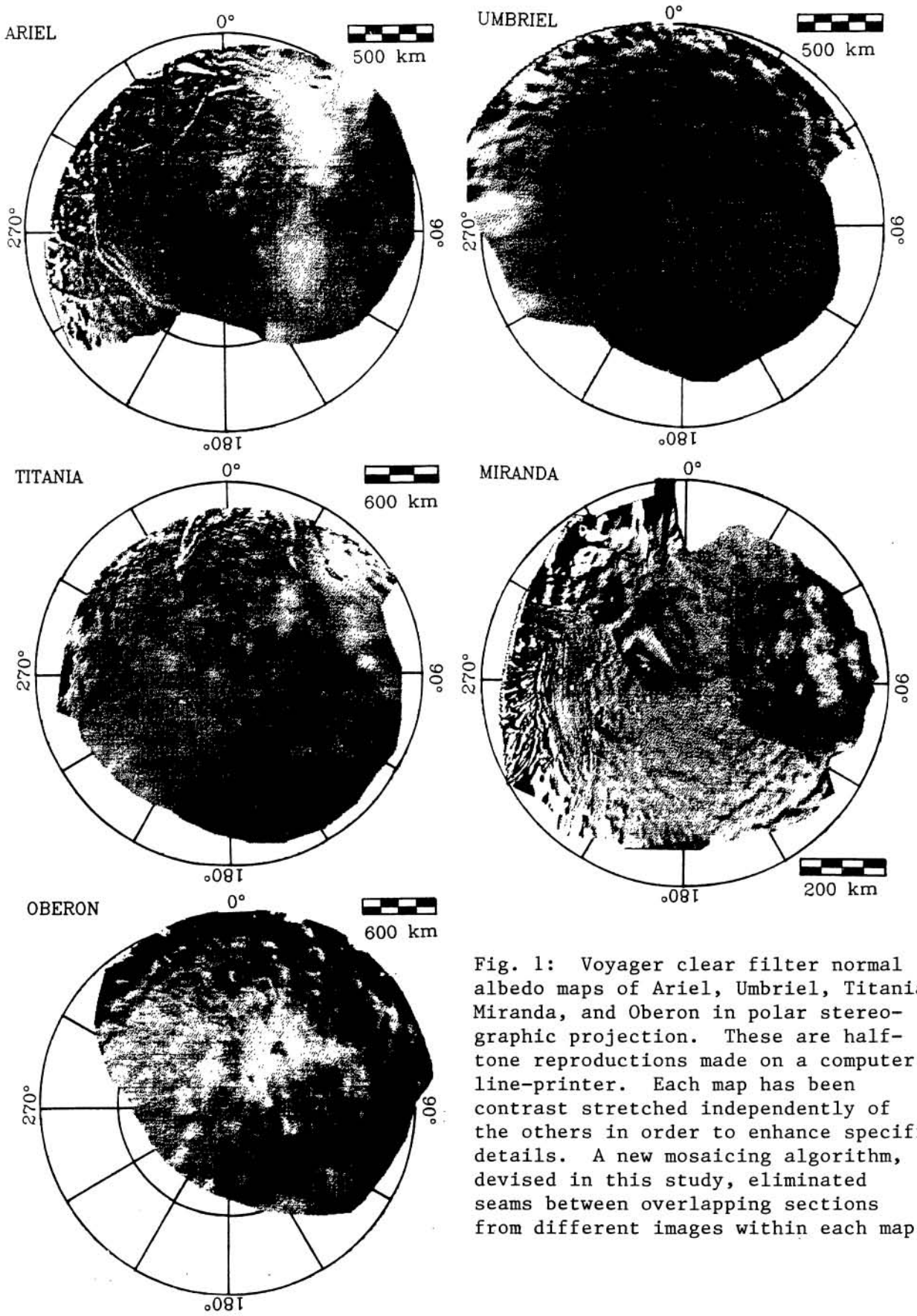

Fig. 1: Voyager clear filter normal albedo maps of Ariel, Umbriel, Titania, Miranda, and Oberon in polar stereographic projection. These are half-tone reproductions made on a computer line-printer. Each map has been contrast stretched independently of the others in order to enhance specific details. A new mosaicing algorithm, devised in this study, eliminated seams between overlapping sections from different images within each map.