

PRE-DISCOVERY DETECTION OF THE PLUMES OF ENCELADUS. T. Stryk, Humanities Division, Roane State Community College, Oak Ridge, Tennessee, United States 37830 (strykt@roanestate.edu).

Introduction: A sequence of wide angle images taken by Voyager 1 on 13 November 1980 include a serendipitous appearance by the moon Enceladus. Unlike the better images taken prior to closest approach, these images were taken at a very high phase angle, showing both solar illuminated areas as well as areas illuminated by planetshine. Most importantly, this sequence represents a pre-discovery detection of the south polar plumes. Here the images are described, with comments on the possibility of other observations or applications of this observation.

Voyager Images: Voyager 1 flew by Saturn on November 12, 1980, returning imagery of the planet, rings, and moons [1]. It did not pass close to Enceladus, though it did do some distant imagery during approach.

As the spacecraft receded from Saturn, it obtained high phase imagery of the receding planet. While it never targeted Enceladus as it departed, it did make a cameo. The first image to contain Enceladus was taken at 16:30, with the last at 18:21. The useful images are C3496526, C3496533, C3496608, C3496650, C3496657, C3496704, C3496711, and C3496718. Figure 1 shows an example of one of these images.

The images were calibrated and cleaned. They were then added, with preference given to the better quality images. The result, rotated to place south at the bottom and enlarged 2x for visibility, is Figure 2. The area to the right is the crescent sunlit part, the area to the left is in planetshine. It shows a small extension at the bottom that is consistent with the plume observations made in recent years by Cassini (2). The plume was also detectable using various subgroups from the imagery to exclude the possibility of a bit of noise in one of the images dominating the stack. Also, similar images of several moons, such as Mimas and Tethys, were processed in the same manner and no plume-like features appeared, increasing confidence in the result.

Applications: This result indicates that the plumes of Enceladus erupt continuously, which is consistent with Cassini results over the past thirteen years but extends the observational baseline considerably. It is possible that further processing of this dataset and others like it, should they exist, might provide quantitative information useful in studying the long-term development of the plumes

References: [1] Smith B. A. et al. (1981) *Science*, 212, 163-191. [2] Hansen, C. J. et al. (2006) *Science*, 311, 1422-1425.

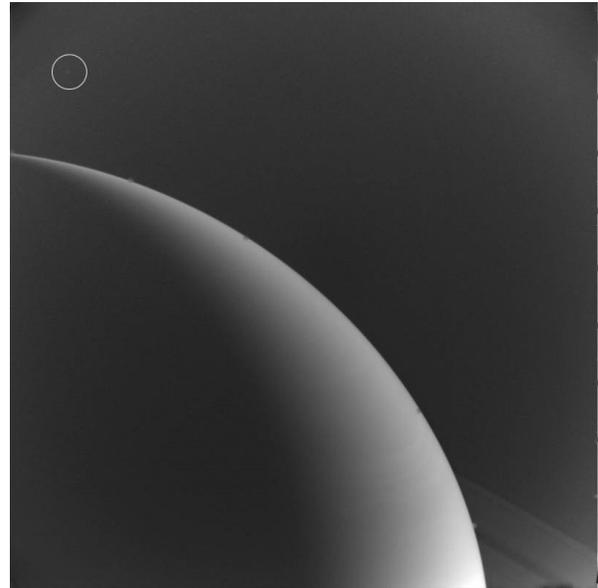


Figure 1. Voyager image C3496728, with Enceladus circled.

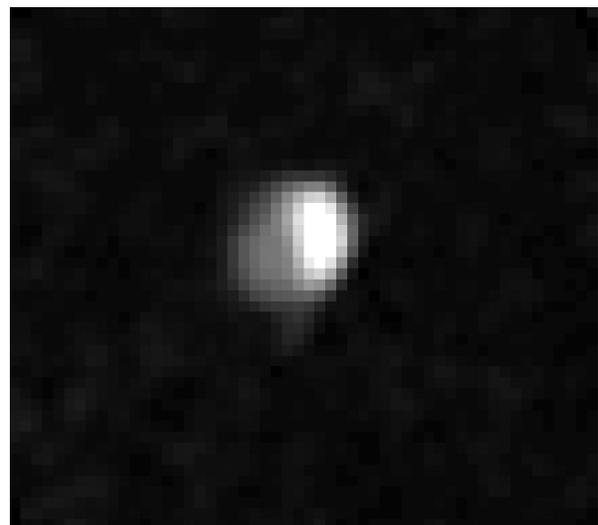


Figure 2. The result after the processing described in the text, showing a distinct plume.