THE CASSINI TARGETED IAPETUS FLYBY WILL TAKE PLACE IN SEPTEMBER, 2007.

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The ISS camera onboard the Cassini Spacecraft orbiting Saturn has observed the enigmatic moon Iapetus for over three years now, but always from great distance. The so-far closest approach occurred at New-Year's Eve 2005 when a range of 124000 km was achieved. Numerous discoveries have been made so far [e.g., 1,2,3]: The equatorial ridge on the leading and anti-Saturn side, a latitude dependence of the characteristics of the dark terrain, an unusually high number of giant impact basins, the latitudinal dependence of bright and dark crater rims, a global color dichotomy that shows different boundaries than the more obvious brightness dichotomy, the true (crater) nature of the "moat" feature, and so on. Earlier discoveries from Voyager data [4,5] such as the irregular boundary between the bright and the dark hemispheres, the giant bright mountains on the anti- and sub-Saturn side ("Voyager" mountains), the ellipsoidal shape of the whole moon, impact craters within the dark terrain, the reddish color of the dark terrain, etc., have been confirmed. Promising attempts were made to explain the formations of the brightness and color dichotomies [6,7] and the ellipsoidal shape [8]. Besides many unanswered questions, a major missing piece is a very close-up view on the surface. This is planned for the targeted flyby on Sept. 10, 2007. Our Cassini group at FU and DLR in Berlin has the responsibility for the imaging observation planning.

The spacecraft will approach Iapetus over the mainly unlit, very-low albedo Saturn-facing hemisphere. Closest approach will occur at 1600 km altitude over the anti-Saturn side. This area is close to the (as far as we know) highest parts of the ridge. On the outbound trajectory, Cassini will look back on the as-yet only poorly imaged bright trailing side of Iapetus at low phase angle. A spacecraft trajectory tweak to significantly improve the observation conditions [9] was approved by the project in early 2007.

There will be many scientific highlights during the flyby. A few examples are: Spatial resolution down to 10 m/pxl with the ISS narrow angle camera; ridge imaging at high and low phase angles; a large mosaic of the equatorial transition zone; global mapping of the trailing side at ~400 m/pxl; the only SAR observation of an icy satellite (RADAR); a star occultation to look for a tenuous atmosphere (UVIS); very high-resolution thermal observations (CIRS); best-ever examination of outer-solar system dark material (VIMS); and much more.

A small subset of questions that might be addressed with these data are: What is the geologic nature and origin of the ridge and the bright "Voyager" mountains? How far does the ridge extend into the trailing side? What is the thickness of the dark terrain blanket? Does it harbor small bright "holes" due to recent small impacts? What is the chemical and mineralogical nature of the dark material? How is the distribution of the dark material on the trailing side? What is the overall cause for the existence of the tremendous brightness dichotomy, the color dichotomy, the complex brightness patterns on the transition zones?

References: [1] Porco, C.C., *et al.* (2005): Cassini Imaging Science: Initial Results on Phoebe and Iapetus. *Science 307*, 1237-1242. [2] Denk, T., *et al.* (2005): LPSC XXXVI, abstracts #2262 and #2268. [3] Giese *et al.* (2007): The Topography of Iapetus' Leading Side. *Icarus*, in press. [4] Morrison *et al.* (1986): The Satellites of Saturn. In: *Satellites*, UofA Press, 764-801. [5] Denk *et al.* (2000) LPSC XXXI, abstract #1596. [6] Spencer, J.R. *et al.* (2005), 37th *DPS*, abstract #39.08. [7] Denk *et al.* (2006) 38th DPS Conference, abstract #69.07. [8] Castillo-Rogez *et al.* (2007): Iapetus' Geophysics: Rotation Rate, Shape, and Equatorial Ridge. *Icarus*, doi:10.1016/j.icarus.2007.02.018. [9] Pelletier, F.J. (2006): Cassini Iapetus-1 Flyby Variations. JPL IOM-343J-06-049.

Fig.1: Anti-Saturn side of Iapetus, observed in October 2004 at ~7 km/pxl. In September, 2007, it is planned to image the bright "Voyager" mountains and the equatorial ridge at very high resolution (down to ~10 m/pxl).

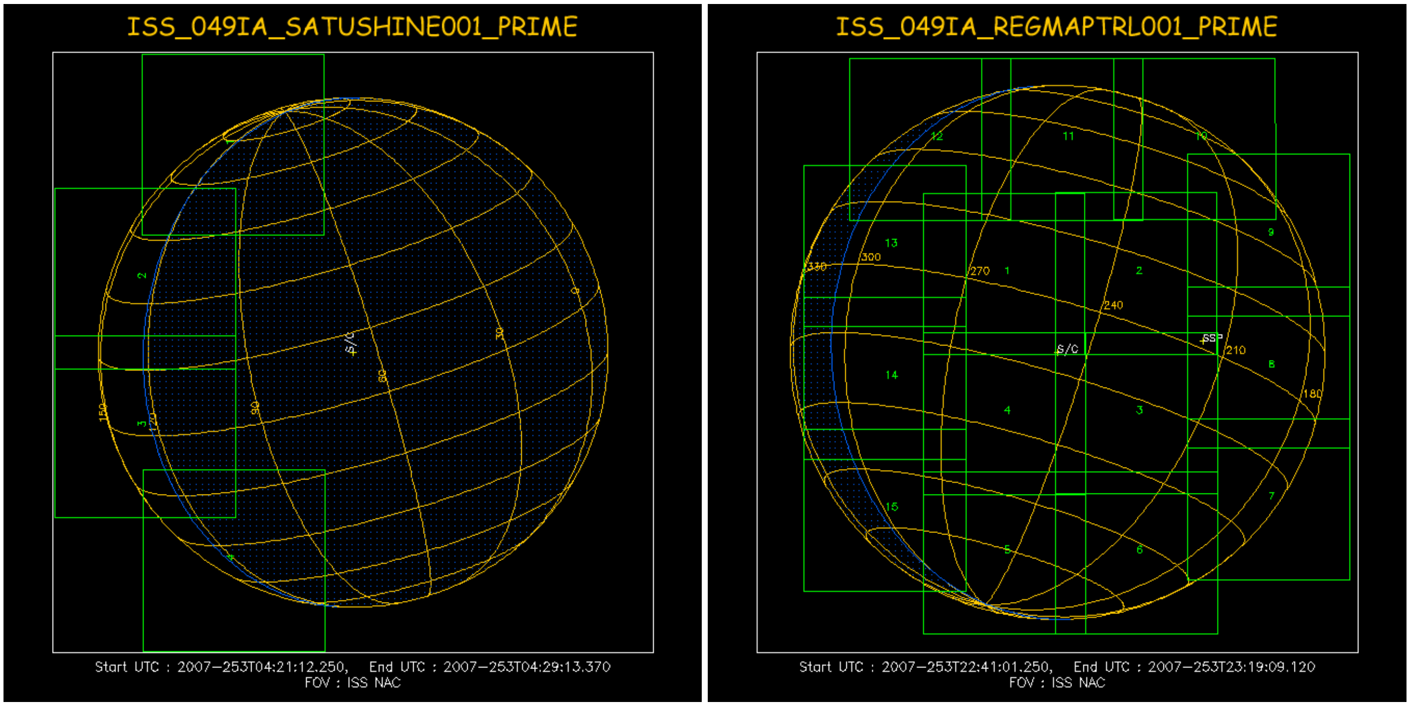

Fig. 2: Iapetus global mapping examples before (left) and after closest approach (right). Spatial resolution will be ~490 m/pxl and ~440 m/pxl, respectively. 270°W marks the center of the trailing side.

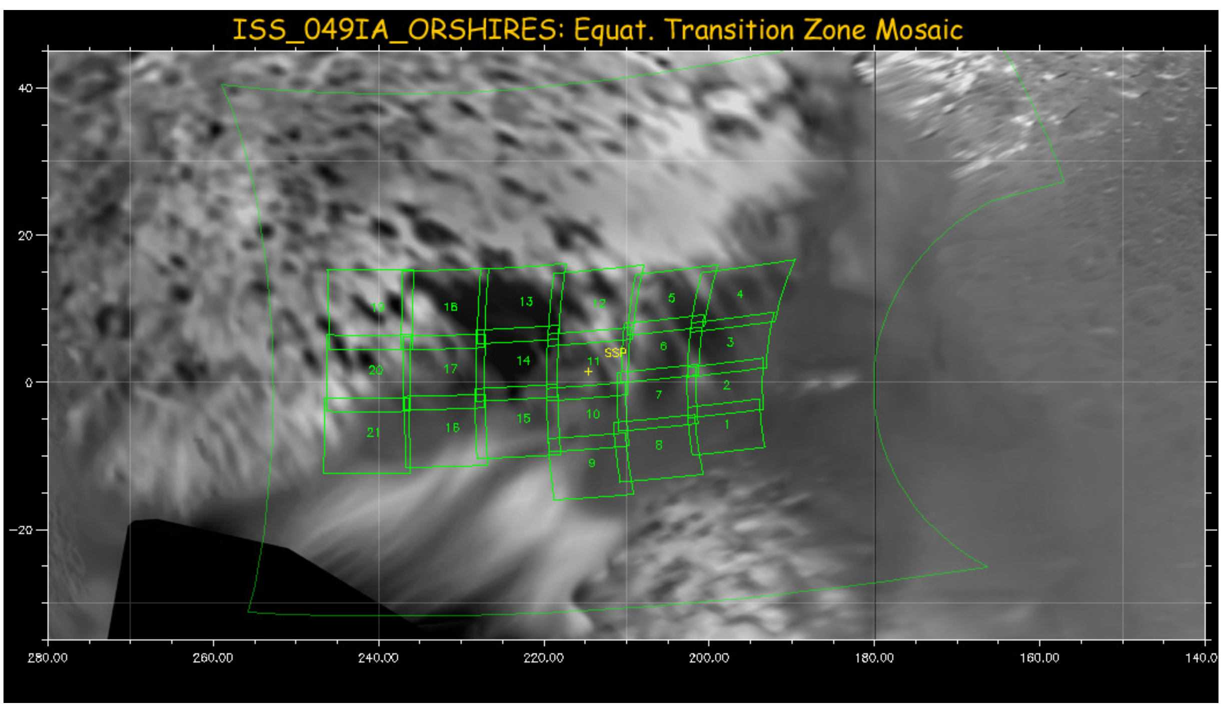

Fig. 3: Planned equatorial transition zone 4x3+3x3 mosaic. The ISS narrow-angle camera images will have a spatial resolution of 82-131 m/pxl. This is the largest of eleven mosaics planned for the time period -55 to +180 min around closest approach.