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Nine Months of Iapetus Observations by the Cassini ISS Camera

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Since Saturn arrival in June 2004, Iapetus has been observed intensively by the Cassini ISS camera at various distances. The closest approach occured on Dec. 31, 2004 at a minimum altitude of 123,400 km when the spacecraft was over the northern leading hemisphere (named "B/C flyby"). The pixel scales of the highest-resolution images are 740 m, >12x better than the best Voyager data. This was the second best Iapetus opportunity during Cassini's nominal mission (an ˜100x closer flyby is planned for Sep 2007). Earlier observations in 2004 included imaging of the dark leading side (named Cassini Regio), the anti-Saturn side, and of wide parts of the so far unknown southern hemisphere at resolutions of 4.3 km/pxl or worse.

The images revealed previously unknown surface features on Iapetus, and led to clear views of features where Voyager data gave only hints. Here's an incomplete list:

1. Most important and enigmatic is the "bellyband" of Iapetus, a ridge or chain of mountains that follows Iapetus' equator precisely over at least 1300 km, probably over more than 2000 km within Cassini Regio (from 50°W to at least 210°W longitude). The highest measured peak rises ˜20 km over the surroundings. No other solar system body is known to harbor a similar structure. Its origin is unclear so far, but it appears to be heavily cratered and therefore old.

2. Four giant basins of diameters ˜390 to 550 km were detected, three of them are located within Cassini Regio. These are similar in size or even larger than the big Odysseus and Tirawa basins (both ˜450 km) on Tethys and Rhea.

3. Impact craters were confirmed to be the main geological feature within Cassini Regio. They were also detected at high numbers on the southern hemisphere.

4. Numerous craters within bright terrain and the transition zone *on the leading side* show dark walls and central peaks roughly facing towards the center of Iapetus' leading side. There were indications for this phenomenon in Voyager data, but the Cassini images clearly confirmed it.

5. The dark material is very probably a blanket over underlying bright ice. Besides local albedo patterns, bright steep polewards-facing crater walls are highly suggestive for this.

6. The dark-layer thickness is probably below ˜1/2 km at ˜30°N latitude. This is inferred from oblique views on crater walls that do not exhibit obvious layering.

7. No bright-floor ("punch-through") craters were detected within Cassini Regio. This finding and the probably low layer thickness imply that the dark layer is either a relatively young phenomenon, or permanently re-newed.

8. At the time of this writing, the dark/ bright dichotomy origin debate remains unresolved.