

Cassini CIRS Observations of the Thermal Emission from Saturn’s Icy Satellites

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The Cassini CIRS instrument obtains spectra of the thermal emission from bodies in the Saturn system from 7 – ~300 μm , with a spatial resolution of 0.29 mrad from 7 to 16 μm and 3.9 mrad at longer wavelengths. Thermal emission from most of the “icy” satellites (i.e. those other than Titan) will be observed during the tour, and at the time of writing we have detailed observations of the emission from Phoebe [1], Iapetus, and Enceladus. Diurnal temperature variations constrain the surface thermal inertia, which in turn constrains the surface texture. Phoebe and the dark side of Iapetus have similar thermal inertias near $3 \times 10^4 \text{ erg cm}^{-2} \text{ s}^{-1/2} \text{ K}^{-1}$, while the much higher albedo surface of Enceladus appears to have a significantly lower thermal inertia. Strong topographic effects are seen in the temperatures on Phoebe and Iapetus. Thermal emission spectra are bland, though we are looking for subtle deviations from blackbody behavior that might provide compositional clues.

Table 1. Preliminary Results from CIRS Observations of the Icy Saturnian Satellites

Satellite	Maximum Daytime Temperature (K)	Minimum Nighttime Temperature at Low Latitudes (K)	Thermal Inertia ($\text{erg cm}^{-2} \text{ s}^{-1/2} \text{ K}^{-1}$)	Bolometric Albedo
Phoebe	110	82	3×10^4	<0.15
Iapetus (Dark Material)	130	-	3×10^4	<0.15
Iapetus (Bright Material)	-	45	-	-
Enceladus	78	52	$\sim 1 \times 10^4$	~ 0.8

References

[1] M. Flasar et al., *Science*. **307**, 1247 (2005).