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# All in a day's work: morning/afternoon ring temperature variations from Cassini CIRS observations

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Since entering orbit around Saturn, Cassini has observed the Saturnian ring system at unprecedented spatial and spectral resolution from the extreme ultraviolet out to submillimeter wavelengths at viewing geometries that are unattainable from the Earth. Here we report on observations made by Cassini's Composite Infrared Spectrometer (CIRS), particularly two radial scans taken during December 2004. CIRS is a Fourier transform spectrometer, whose spectral range spans 10 to 1400 cm$^{-1}$ (1 mm to 7 $\mu$m) and covers the blackbody peak of the rings' thermal emission.

On 14 December 2004 CIRS obtained thermal spectra of the morning and afternoon ansae of the unilluminated side of Saturn's rings from a distance of $4.7 \times 10^5$ km ($7.8\,R_S$). The morning ansa of the ring plane was observed at a phase angle of $\sim 50^\circ$. Subsequently, the afternoon ansa was scanned at a phase angle of $\sim 30^\circ$. On 15 December scans of the illuminated side of Saturn's rings were obtained from a distance of $6.1 \times 10^5$ km ($10.1\,R_S$). Spectra of the morning and afternoon ansae were taken from phase angles of $\sim 150$ and $\sim 130^\circ$, respectively. The rings were sampled every $\sim 50$ km in radius at a spectral resolution of 15.5 cm$^{-1}$ during both observations.

Ring temperatures were obtained by fitting blackbody curves to the CIRS spectra. Analysis of the ring temperatures reveal a number of intriguing behaviors. Whereas the C ring and Cassini Division show a consistent morning-afternoon temperature asymmetry of $\sim 3 - 4$ K on both days, the lit and unlit sides of the A ring show relatively little temperature variation. This is consistent with observations made during Saturn orbit insertion [1]. The outer half of the unlit B ring shows little temperature

variation (a complete scan was not returned). Yet, curiously, the illuminated B ring *does* exhibit a morning-afternoon temperature difference. Moreover, this difference is most pronounced in the optically thick B ring core. We will discuss these results in the context of Voyager IRIS and other CIRS ring observations. We will attempt to relate these behaviors to factors such as ring optical depth, viewing geometry and solar elevation angle.

[1] F.M. Flasar, *et al*. “Science”, submitted.