

Saturn C Ring Thermal and Energy Balance Measurements from Voyager 1 IRIS Data

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During the Voyager 1 and 2 flybys infrared measurements of Saturn's rings were obtained by the Voyager infrared interferometer spectrometer (IRIS). Analysis of C ring observations on the lit and unlit sides of the rings is being performed. We report on continuing analysis of these data. Low phase angle observations of the unlit side of the outer C ring yield brightness temperatures that range from 81 to 85 K and optical depths that range from 0.05 to 0.09. Higher phase angle (134 deg) observations of the lit C ring at similar resolution and local time yield comparable optical depths and temperatures that are at least 5 degrees cooler. These results are consistent with slowly rotating or perhaps tidally locked C ring particles.

A pronounced temperature variation is also present in the unlit radial profile of the C ring. We examined the influence of Saturnshine on this radial temperature profile. Ring particles are mainly heated by the absorption of direct solar light but they can also absorb solar radiation reflected by Saturn, Saturn IR emission and energy emitted by neighboring ring particles. Even if it is not negligible in the C ring, Saturn's contribution alone cannot account for the magnitude of the observed temperature variation in this case. A radial variation in the Bond albedo appears necessary. The radial profile of temperature on the lit face that fits our data is very similar to the radial variation of the visible single scattering albedo derived by Cooke (1991).

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