

Surface Temperatures on Titan: Changes during the Cassini Mission

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Surface brightness temperatures on Titan measured by the Composite Infrared Spectrometer (CIRS) aboard Cassini span the period from late northern winter to early spring. The CIRS observations cover all latitudes and can be used to study meridional changes with season. CIRS previously reported surface temperatures from 2004-2008 which were 93.7 K at the equator with decreases of 2 K toward the south pole and 3 K toward the north pole¹. From a comparison of the equinox period with the earlier data, CIRS can now detect a seasonal shift in the latitudinal distribution of temperatures. Around the time of the equinox the meridional distribution was more symmetric about the equator than had been found earlier in the mission. The equatorial surface temperatures remained close to 94 K, but in the south the temperatures had decreased by about 0.5 K and in the north had increased by about 0.5 K. The CIRS equinox results are similar to what was seen near the previous vernal equinox by Voyager IRIS^{2,3}. The observed surface temperatures can help constrain the type of surface material by comparison with predictions from general circulation models. Of the three cases treated by Tokano⁴, our measurements most closely match a porous-ice regolith. As Cassini continues through Titan's northern spring CIRS will extend its temporal and spatial coverage and will continue to search for seasonal variations in surface temperature.

¹Jennings *et al.*, *Astrophysical Journal Letters* 69, L103 (2009).

²Flasar, F. M., Samuelson, R. E., & Conrath, B. J., *Nature* 292, 693 (1981).

³Courtin, R., & Kim, S. J., *Planetary and Space Science* 50, 309 (2002).

⁴Tokano, T., *Icarus* 204, 619 (2005).