



The super-solar abundance of methane in Saturn from Cassini CIRS spectra

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The Cassini Composite Infrared Spectrometer (CIRS) experiment took 3,460 spectra of Saturn at a latitude of 24°S (planographic) with its focal-plane-1 (FP1) spectrometer (10-600 cm⁻¹) between 13 September and 16 October, 2004. The coaddition of these spectra over this relatively homogeneous region provided an average which was suitable to analyze minor spectral features with good signal-to-noise. Strong absorption manifolds of rotational CH₄ lines near 73, 83, 94 and 104 cm⁻¹ were used to determine its abundance in Saturn's atmosphere. A value of $4.9 \pm 1.0 \times 10^{-3}$ for the CH₄ molar fraction was derived, assuming a modification of the line intensities in the GEISA and HITRAN spectroscopic parameters for rotational CH₄, based on archival and recent direct laboratory measurements. This value implies that C/H is over seven times the solar ratio, consistent with the core-accretion model for Saturn's formation, in which carbon is about twice as enriched in Saturn's atmosphere as in Jupiter's. Additional opportunities for measurements of the CH₄ abundance will also be discussed.