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# Preliminary Results from Cassini/CIRS: Measuring Deep Elemental Abundances and Isotopic Ratios on Saturn

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The presence of the Cassini Huygens spacecraft in the Saturnian system provides and unique and unprecedented opportunity to study the gas giant, its rings and satellites, in more detail than ever before. The Composite Infrared Spectrometer (CIRS) is a pair of spectrometers covering the far (10-600cm$^{-1}$) and mid (600-1400cm$^{-1}$) infrared spectrum of thermal radiation from the planet, with an apodized spectral resolution as high as 0.5cm$^{-1}$. Following its arrival in orbit around Saturn in July 2004, we have developed a non-linear optimal estimation retrieval code to utilise the wealth of excellent data from Saturn and Titan returned by CIRS, to retrieve vertical profiles of temperature, composition and aerosol abundance.

We present the temperature and compositional results obtained for Saturn during the first 9 months of orbital operations. These include the mapping of temperatures and para-hydrogen fractions across the southern hemisphere of Saturn and the detection of a hot southern pole; the measurement of vertical phosphine and ammonia distributions and their latitudinal variation; the combination of limb viewing and nadir viewing to constrain methane abundances, hydrogen ([D]/[H] and [$CH_3D$]/[$CH_4$]) and carbon ([$^{13}CH_4$]/[$^{12}CH_4$]) isotopic ratios; plus further deep elemental abundances and isotopic ratios on the gas giant. We also discuss future intended analysis of the CIRS data, as Cassini continues its four-year mission around Saturn, with the intention of constraining and evaluating theories on the formation of the giant planets.