NH AND CH IN THE ACE SATELLITE SOLAR SPECTRUM

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The Canadian ACE (Atmospheric Chemistry Experiment) mission has a high resolution (0.02 cm^{-1}) Fourier transform spectrometer (FTS) in low earth orbit. The primary ACE mission goal is the study ozone chemistry in the stratosphere although it is making a wide range of other measurements, for example, of organic molecules in the troposphere. In the normal operating mode, the ACE-FTS measures a sequence of atmospheric absorption spectra during sunrise and sunset ("solar occultation"). As part of the measurement sequence about 16 high sun exoatmospheric spectra are recorded for each occultation to serve as reference spectra. We have co-added 224782 pure solar spectra to produce the ACE solar atlas in the 750–4400 cm^{-1} spectral region [Hase et al., JQSRT 111, 521 (2010), see http://www.ace.uwaterloo.ca/solaratlas.html]. The ACE solar spectrum displays prominent vibration-rotation bands of CO, OH, NH and CH, and pure rotational lines of OH and NH. An improved spectroscopic analysis for OH has already been published [Bernath and Colin, JMS 257, 20 (2009)] and we now report on similar work for NH and CH. The vibration-rotation spectra of NH have been reinvestigated using laboratory spectra and infrared solar spectra recorded from orbit by the ACE and ATMOS instruments. In addition to identifying the previously unobserved $6-5$ vibration-rotation band in the laboratory spectra, many additional high N rotational lines have been observed. By combining the new observations with the previously published data and recent far infrared data, an improved set of molecular constants and term values have been derived for the NH $X^3\Sigma^-$ and $A^3\Pi$ states. Vibration-rotation spectra of the CH $X^2\Pi$ ground state have also been re-analyzed based on laboratory spectra, the ACE solar spectrum and published data. The previously unobserved $5-4$ band has been measured and the other four bands ($1-0$ to $4-3$) have been extended to higher J values.