

## INFRARED SPECTROSCOPY OF HOT METHANE: EMPIRICAL LINE LISTS WITHIN THE 1 - 2 $\mu\text{m}$ REGION

ANDY WONG, ROBERT J. HARGREAVES, PETER F. BERNATH, *Department of Chemistry and Biochemistry, Old Dominion University, Norfolk, VA, USA.*

Methane is one of the many hydrocarbons that is found in cool planetary atmospheres in our solar system. Its prominence also extends to hot sub-stellar environments such as brown dwarfs and hot Jupiter exoplanets. High resolution transmission spectra ( $0.02\text{ cm}^{-1}$ ) have been recorded at eight different temperatures (between 294 - 1000 K) within the 1 - 2  $\mu\text{m}$  region using a Fourier transform infrared spectrometer and tube furnace. From these observations, temperature dependent empirical line lists have been produced that include line position, intensity, lower state energy and possible quantum number assignments. Our line lists and spectra can be used to directly simulate the atmospheric spectra of brown dwarfs and exoplanets. These experimental line lists are also compared to predictions from *ab initio* variational calculations that are known to have diminished accuracy in the 1 - 2  $\mu\text{m}$  region.