HIGH RESOLUTION MOLECULAR SPECTROSCOPY FOR PLANETARY EXPLORATION

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A significant number of NASA's planetary science goals require measurement of chemical composition, abundance and isotopic ratios. The current *in situ* state-of-the-art is defined by mass spectroscopy often coupled with a gas chromatograph. The remote state-of-the-art is defined by long wavelength astronomy. Since both approaches have their limitations, there are a number of opportunities to apply high resolution spectroscopy to planetary science. A variety of techniques, which are often well known in spectroscopy but are new to planetary science, have been proposed or developed including *in situ* rotational and vibrational spectroscopy, limb sounding, and rotational spectroscopy with radar techniques. These approaches offer potentially enormous advantages in chemical and isotopic specificity and in many cases absolute sensitivity. The sensitivity and limitations of the various techniques are compared and potential planetary applications are discussed.