

MIRO Capabilities and Calibration Approach

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The MIRO instrument will measure the abundance of key volatile species - H₂O, CO, CH₃OH, and NH₃ - along with the isotope ratios - ¹⁷O/¹⁶O and ¹⁸O/¹⁶O, with very high spectral resolution ($\lambda/\Delta\lambda \sim 1 \times 10^7$). In addition it will measure the cometary nucleus surface temperature and gradient. The instrument consists of a dual-frequency heterodyne radiometer operating in the submillimeter -wave range near 560 GHz and the millimeter-wave range near 190 GHz. A 30 cm diameter telescope couples radiation to the radiometers. The two radiometers are co-aligned, the 190 GHz radiometer having a beam size of about 22', while the submillimeter wave radiometer has a beam size of about 7'. The radiometers down-convert the observed spectra to the microwave regime where a Chirp Transform Spectrometer provide the spectral analysis. Radiometric calibration is obtained by observing two blackbody targets maintained at two different temperatures. During spectroscopic observations the submillimeter radiometer is operated in a "frequency switched" mode to eliminate baseline ripple. Pointing will be verified in flight by observing the Earth, Moon, and Mars during flybys and astronomical sources of opportunity.