



Atmospheric Far Infrared Spectroscopy

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The far infrared spectral region is rich with strong and weak spectroscopic features from many important molecules and is the primary region for the water vapor feedback mechanisms for the atmospheric outgoing radiative budget. The rotational transitions of water vapor have significant intensity throughout this region with a high dynamic range of intensities. This allows for retrievals of water vapor concentrations using both limb and nadir viewing orientations. Two balloon based instruments covering this spectral range exist that utilize this for water vapor (and its isotopes). Other molecules which have transitions that are usable for atmospheric sounding include O_3 , HCl, HF, HOCl, $ClNO_3$, N_2O , NO_2 , HNO_3 , N_2O_5 , HBr, HOBr, OH, HO_2 , H_2O_2 , acetone, CH_3CN , and other potential molecules. I will describe both the FIRS-2 and FIRST balloon instruments, sample spectra from these instruments, and sample retrievals from these observations.