

ABSTRACT

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Spectroscopic Observations of Low Lying Gas Clouds: Sensitivity of Detection by Method of Covariance Matrix

The spectroscopic observation of gas clouds near the earth's surface may normally be expected to be strongly affected by distortions due to the intervening atmosphere. The most sensitive region to make such observations is in the thermal IR, where we expect to find the fundamental vibration-rotation bands. In this region the sensitivity of detection is approximately the same for night time and daytime observations. The sensitivity of observation is determined by simulating the observation using the line-by-line **FASCODE**. The spectrum is computed with a spectral resolution of 0.01 cm⁻¹ in order to completely account for line broadening in the lower atmosphere. Real instrument resolution is simulated by convolving the high resolution spectrum appropriately. Appropriate noise is added to the simulation and the covariance matrix is computed based on a particular set of retrieval parameters. The parameter set is varied to see if the covariance matrix can be improved. The covariance relating to the gas plume density is coupled to various other parameters; numerical results are given for a specific example in terms of spectral resolution and signal/noise.