Spectroscopic study of submillimeter lines from dark, quiescent clouds

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Precise knowledge of the physical conditions within a molecular cloud is vital for the interpretation of the observations and the extraction of chemical abundances. In this regard it is essential to understand the Physics and Chemistry of star forming regions through their molecular spectral lines, such as CO, one of the major coolants. Dark, quiescent cloud, such as L134N, reveals complex molecular emission distributions, which are suggestive of real chemical abundance and density gradients. For this the excitation state of the molecule must be well understood in order to derive abundance information from molecular line data. This can be achieved with the aid of radiative transfer models. We have carried out the spectral line modeling of CO lines using the 1-D code RATRAN (Hogerheijde et.al) assuming spherical symmetry of the cloud. The results are presented here along with the observational results of ^{12}CO (1-0) at 115.271 GHz and ^{13}CO (3-2) at 330.588 GHz lines from L134N, carried out using CSO-10m and NRAO-12m telescopes.Radiative transfer modeling of these lines demonstrate the relative sensitivity of the expected emission line characteristics to the various free parameters, which can thus be used to identify the important characteristics of the molecules in the dark clouds.