OBSERVATIONS OF HC_5N (J=12-11 AND 13-12) AND HC_7N (J=28-27), INCLUDING A DETECTION OF B335

Å. Hjalmarson and P. Friberg
Onsala Space Observatory, S-430 34 Onsala, Sweden

The Onsala 20 m telescope, equipped with a travelling wave maser (frequency range ~29-35 GHz; zenith system noise temperature ~90-160 K) has been used in a search for HC_5N (J=12-11 and 13-12) and HC_7N (J = 28-27) to a low detection limit. In addition to observations of the Taurus dust clouds TMC1, TMC2 and L1544, the HC_5N (J =13-12) transition has been detected at a low level ($T_A^* \sim 0.1$ K; p-t-p noise ~ 0.1 K for a velocity resolution of 0.04 km s^{-1}) in the isolated globule B335. The total HC_5N column density estimated from the very narrow line ($\Delta v \sim$ 0.2 km s^{-1}) is $6 \cdot 10^{11}$ cm^{-2}. From our non-detection of HC_5N in L134N a total column density $\lesssim 5 \cdot 10^{11}$ cm^{-2} is deduced.

It is interesting to compare our HC_5N column densities with published NH_3 data. The NH_3/HC_5N abundance ratio is estimated to be ~ 1-10 in the Taurus clouds, ~ 10^3 for B335 and $\gtrsim 2 \cdot 10^3$ for L134N. Although the statistical sample is poor due to the very few detections of HC_5N in dust clouds, it is tempting to suggest that the observed NH_3/HC_5N abundance ratios may give a clue to our understanding of the chemistry of the cyanopolyynes. Perhaps we are observing the competition between formation/destruction of NH_3 and HC_5N - presumably a result of time dependent gas-phase chemistry. The chemical equilibrium time scale may be greater that the gravitational collapse free-fall time. Effelsberg NH_3 and HC_5N observations of TMC1 seem to indicate that the two species have maxima at different positions in the cloud (G. Winnewisser, private communication).

Information on the excitation conditions in the Taurus clouds can be obtained by comparison of our data with published results for lower frequency transitions.

B. H. Andrew (ed.), Interstellar Molecules, 69–70.

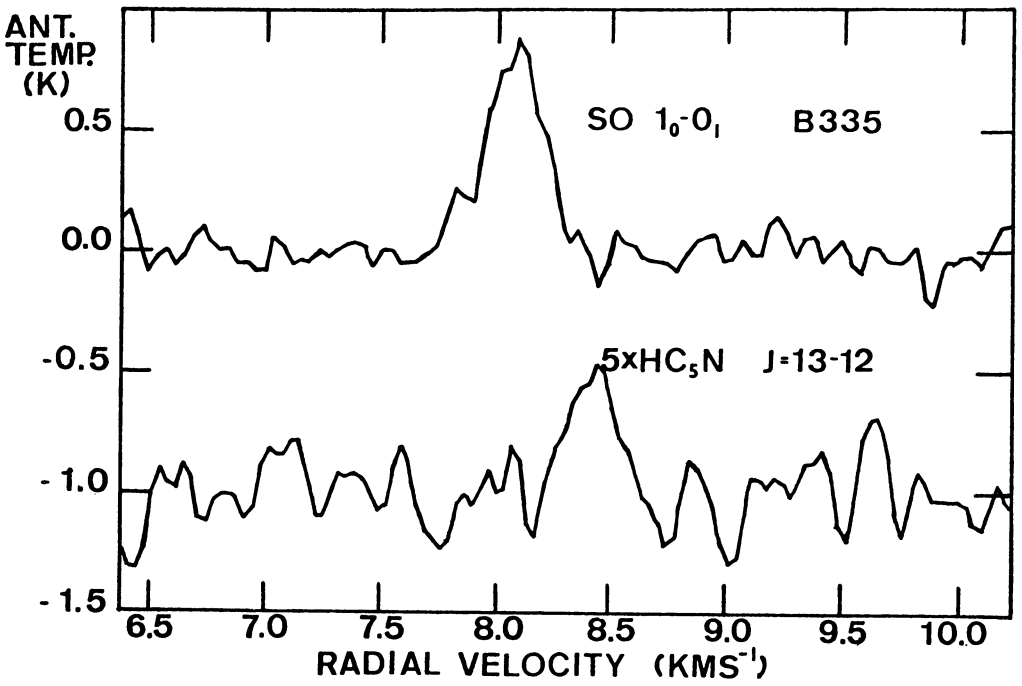

Figure 1. Observed HC_5N and SO spectra towards B335. The antenna temperatures are corrected for radome, atmospheric and antenna losses. The HC_5N intensity is multiplied by five. Spectral resolution is 0.04 km s^{-1}.

https://doi.org/10.1017/S007418090007217X Published online by Cambridge University Press