Line Survey of Large Organic Molecules toward Orion IRc2 in the 73-89 GHz region

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Orion cloud located distance at 440 pc (1400 ly) is the nearest massive star−forming region. IRc2, which is an infrared star, is located at the center of this cloud and the region toward this star has been investigated so far. In this survey, we observed between 73 and 89 GHz by using 45m telescope of the Nobeyama Radio Observatory (NRO), which has a narrow beam size of ~20″. As major examples, the 17 lines of methyl formate $HCOOCH_3$, the 20 lines of dimethyl ether CH_3OCH_3, and the 4 lines of the ^{13}C isotopic species of acetonitrile $CH_3{}^{13}CN$ were detected in this cloud.

Large saturated organic molecules, such as methyl formate, are often found in cores of massive star-forming regions. Methyl formate is one of the molecules responsible for many rotational transitions in such regions. Thus, detection of the vibrational excited states of methyl formate can give us information of physical condition of molecules. The rotational lines of the vibrational excited states for methyl formate have been reported for v_t = 1 and 2 by Kobayashi *et al*. [1] and Takano *et al*. [2], respectively. However, the number of the lines on the vibrational excited states is still limited. In this survey, the 12 lines in the v_t = 1 state were newly detected.

The present observations show that the center of this cloud has a higher vibrational temperature than outside, because the narrow beam size of this telescope gives new lines of the vibrational exited state.

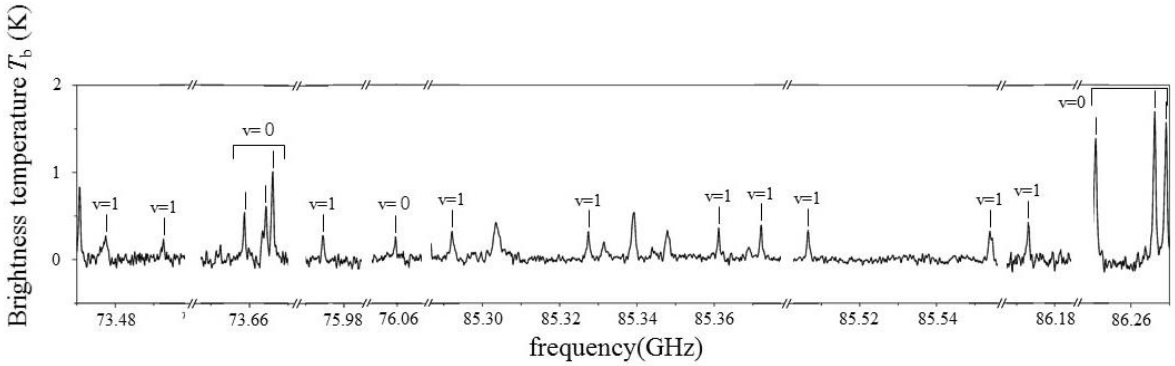

Figure 1 : Observed spectra of methyl formate toward Orion IRC2

References

[1] Takano *et al., PASJ,* 64, 89 (2012)
[2] Kobayashi *et al., ApJ,* 657, 17 (2007)