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"KAGONMA" NH_3 mapping observations of molecular clouds with Nobeyama 45m telescope.

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Abstract. In the collapsing phase of a molecular cloud, the molecular gas temperature is a key to understand the evolutionary process from a dense molecular cloud to stars. In order to know this, mapping observations in NH_3 lines are required. Therefore, we made them based on the FUGIN (FOREST Unbiased Galactic plane Imaging survey with Nobeyama 45m telescope). The 6 maps were observed in NH_3 (J,K) = (1,1), (2,2), (3,3) and H_2O maser lines and obtained temperature maps; some show temperature gradient in a cloud. Additionally 72 cores were observed. These candidates were called as KAGONMA or KAG objects as abbreviation of KAgoshima Galactic Object survey with Nobeyama 45-M telescope in Ammonia lines. We show the results of two regions in W33 and discuss their astrophysical properties.

Keywords. stars: formation, ISM: clouds, radio lines: ISM

1. Observations

We observed W33 star formation region (KAG64) and CMa OB1 east filament (KAG71) with the Nobeyama 45-m radio telescope since 2016 December. The NH_3 (J,K) = (1,1), (2,2), (3,3) and H_2O maser lines were observed simulaneously. We observed 703 positions with a 37.5" grid along the equatorial coordinates using the position switch method. The pointing accuracy was checked using known H_2O maser sources and was better than 5". We integrated at least 20 min at each position. The typically system noise temperature was between 100 and 300 K. The rms noise level was typically 0.035 K in T_a^* at each observed position.

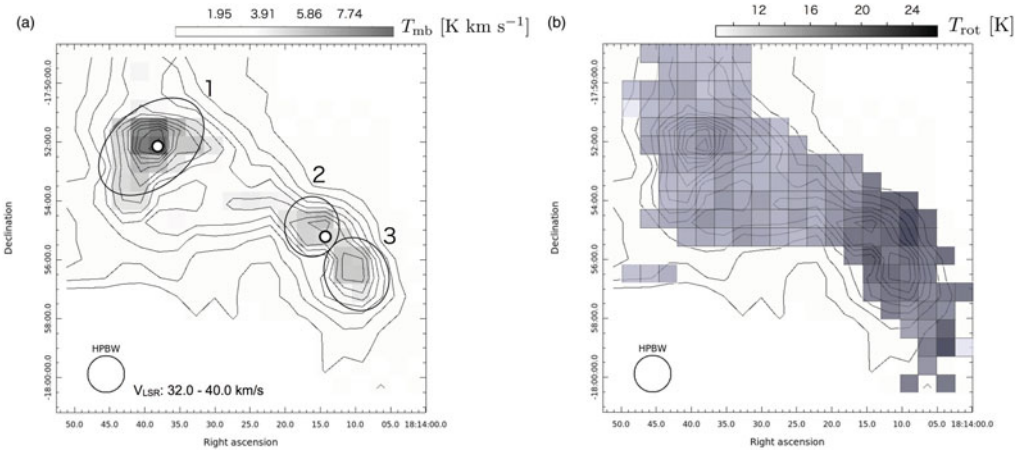

Figure 1. (panel a) The integrated intensity map in $NH_3(J, K) = (1, 1)$ line of KAG 64. Contour interval is 0.675 K in $T_{\rm mb}$. Three clumps we defined are enclosed with black ellipses. Two circles show the positions of H_2O masers found in our observations. (panel b) The rotation temperature distribution of KAG 64. Contours are the same as in panel a.

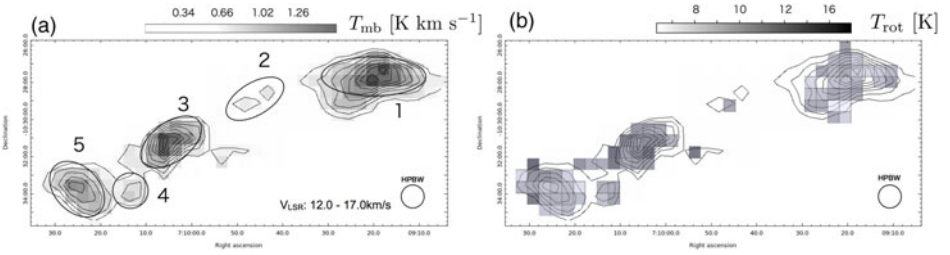

Figure 2. (panel a) The integrated intensity map in $NH_3(J, K) = (1, 1)$ line of KAG 71. Contour interval is 0.175 K in $T_{\rm mb}$. Five clumps we defined are enclosed with black ellipses. (panel b) The rotation temperature distribution of KAG 71.

2. Results

We show the preliminary results of two sources; KAG64 (W33 star formation region) and KAG71 (CMa OB1 east filament). The optical depth, the rotational temperature and the column density were estimated using KAGONMA data. These physical parameters were estimated for positions with over-3σ detection in the NH_3 (J,K) = (1,1) line.

KAG64, the 3 clumps were detected in NH_3 (J,K)=(1,1) emission. Based on our observations the western and eastern parts of this region show a clear rotational temperature difference. Furthermore, H_2O maser lines were observed in each part. Radio recombination lines (RRLs) were detected between clump 2 and clump 3, where also the ammonia rotational temperature peaks.

In KAG71, we found 5 clumps in NH_3 (J,K)=(1,1) emission. The rotational temperature values show that these clumps are almost the same between 11 and 15 K. KAG71 is well traced also in 250 μm continuum emission and dust temperature is consistent to our results (Elia *et al.* 2013).

References

Elia, D. *et al.* 2013, *ApJ*, 772, 45.

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