P112b Mopra mapping observations with multi-lines of dense cores in Lupus I and Lupus III

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We have conducted MOPRA multi-line mapping observations covered on 0.02 - 0.2 pc scale of dense cores in a nearby ($\sim$ 140 pc) filamentary cloud of Lupus I and Lupus III during 2013 Sep.-Oct and 2014 Sep.-Oct. Our aim of observations is to reveal the kinematic structure around dense cores. We have obtained the maps of $C^{18}O(1-0)$ ($n_{\rm crit} \sim 2\times10^3\,{\rm cm^{-3}}$), $N_2H^+(1-0)$ ($n_{\rm crit} \sim 10^5\,{\rm cm^{-3}}$) and $HC_3N(10-9)$ ($n_{\rm crit} \sim 6\times10^5\,{\rm cm^{-3}}$). Here, we report the two main results as follows. (1) The different dense gas tracers show different velocity fields in some dense cores. The direction of the velocity gradient of $C^{18}O$ is different from that of N_2H^+ or HC_3N by $\Delta\theta \sim 90°$. The denser tracer of N_2H^+ or HC_3N should show the kinematics of the dense core while the relatively diffuse tracer of $C^{18}O$ would show the motion in lage scale of filament. (2) The rotational axis, determined by the velocity gradient of the densest tracer in each core, shows randomly directed compared with the elongation of the filament. This trend is consistent with past dust continuum observation which shows that the elongations of a core are not correlated with the elongation of the filament. Therefore, it is suggested that the direction of angular momentum of a core are determined by local physical condition such as the direction of local magnetic field. Actually, some cores have rotational axis parallel to the direction of magnetic field.