Study of photon dominated regions in IC 348

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Abstract. We present fine structure line of neutral carbon at 492 GHz ($^3P_1$–$^3P_0$, hereafter [C I] 1–0) and ^{12}CO 4–3 KOSMA observations. This data has been combined with FCRAO ^{12}CO 1–0 and ^{13}CO 1–0 data. We have used these observations to understand the emission from the photon dominated regions (PRDs) in IC 348. We confirm the anti-correlation between N(C)/N(CO) and N(H$_2$) as seen in most Galactic PDRs (Mookerjea *et al.* 2006).
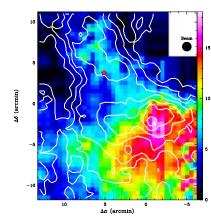
1. Results

Figure 1. Integrated intensities of [C I] 1–0 emission (*color*) overlayed with contours of ^{12}CO 4–3 (*contours*) in IC 348. The center of the map is at $\alpha = 03^h44^m10^s$, $\delta = 32°06'$ (J2000). The intensities are integrated from V_{LSR} 2 km s^{-1} to 14 km s^{-1}. The contour levels are from 10 K km s^{-1} to 58 K km s^{-1} by a step of 8 K km s^{-1}. Both data are shown at a common resolution of 70″. The black star denotes the position of HD 281159, a B 5 type star.

IC 348 is one of the most studied young open clusters, which lies at a distance of 320 pc. The [C I] 1–0 emission peaks to the south-west of the mapped region (Fig. 1). The emission extends towards the east and the north-east. The ^{12}CO 4–3 intensity also peaks almost at the same position of the [C I] peak, but shows a second peak lying to the north of HD 281159 and elongated along the north-south direction. The features in the ^{12}CO 4–3 map agree quite well with those in ^{12}CO 3–2 map (Sun *et al.* 2006). We attribute the difference in the intensity distributions of [C I] and ^{12}CO 4–3 to the fact that ^{12}CO 4–3 traces regions of higher temperature, while [C I] traces the embedded PDR surfaces of the molecular clouds with high column density. A plot of the N(C)/N(CO) ratio vs. the H$_2$ column density in IC 348 shows a clear anti-correlation. A linear fit to the data in logarithmic coordinates gives a slope of -0.59 (cf. Fig. 6, Mookerjea *et al.* 2006).

References

Mookerjea, B. *et al.* 2006, *A&A* 456, 235
Sun, K. *et al.* 2006, *A&A* 451, 539