CO MULTITRANSITION OBSERVATIONS OF L 1228 : A MOLECULAR OUTFLOW DESTRUCTING ITS PARENT CLOUD?

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Abstract. CO, J=3→2, J=2→1 and J=1→0 observations of the extended molecular outflow in the high latitude cloud L 1228 are presented. The ^{12}CO, J=3→2 and J=2→1 observations reveal a well collimated and extended outflow. The ^{12}CO, J=1→0 observations show that the red shifted part of the outflow has blown a large cavity into the parent cloud and has thus dispersed a significant part of the surrounding cloud.

L 1228 is a high latitude (111.°6 , 20.°1) dark cloud. The distance to the cloud is not known but a reasonable estimate is 100 to 200 pc. CO, J=1→0 observations of the cloud are described in Haikala and Laureijs (1989). Strong ^{12}CO self absorption in L 1228 is observed over a one by half a degree area in the cloud.

The outflow has been mapped in the ^{12}CO, J=3→2 (KOSMA 3m telescope) and J=2→1 (POM-2) transitions. The outflow is well collimated (Fig. 1) and nearly identical in both CO transitions. The Onsala 20m telescope was used to make cross scans of the outflow in the CO, J=1→0 transition.

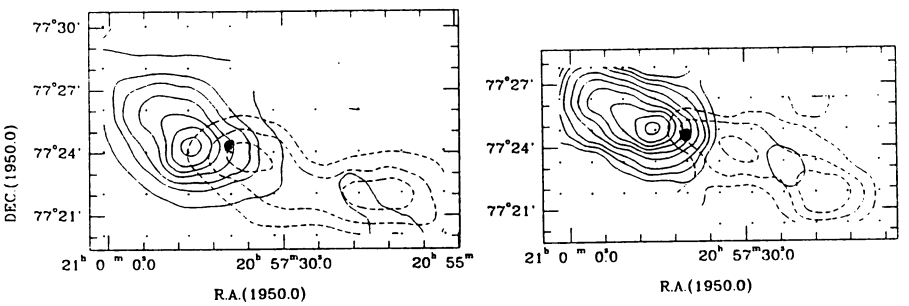

Fig. 1. The blue shifted (continuous line) and red shifted (dashed) ^{12}CO, J=3→2 (KOSMA, on the left) and J=2→1 (POM2, on the right) emission in L 1228. The outflow central source IRAS 20582+7724 is marked in th plot.

In the centre of the blue lobe of the outflow CO emission is totally dominated by the emission coming from the outflowing gas (Fig. 2c). Due to different beam sizes the individual spectra of different transitions cannot be compared directly.

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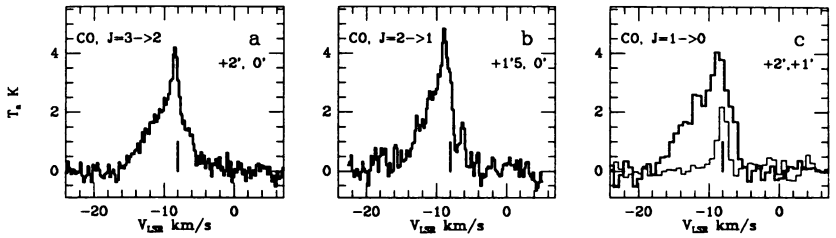

Fig. 2. ^{12}CO, J=3→2 (beam 1'3), J=2→1 (2'5) and J=1→0 (33") spectra in the centre of the blue lobe. The offsets are given from IRAS 20582+7724. ^{13}CO is shown in c (thin line). The tick line is at velocity -8.0 $km\ s^{-1}$

Contour map of the red shifted (-5.5 $km\ s^{-1}$ to 0 $km\ s^{-1}$) emission in L 1228 is shown in Fig. 4a. A large cone like feature extends to the west from the outflow central source. No such feature is seen in the blue shifted emission. This extended red feature is better seen at velocity interval -5.5 to -4.6 $km\ s^{-1}$ (Fig. 4b). The angular size of the cone is half a degree.

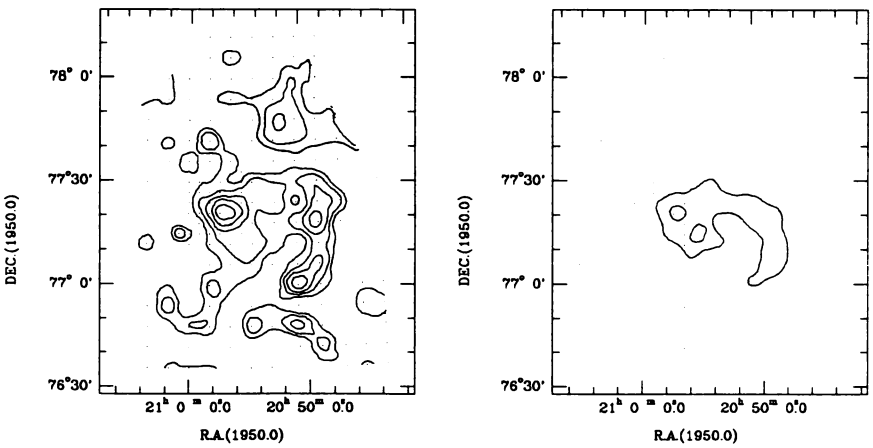

Fig. 3. Red shifted ^{12}CO emission in L 1228. **a** -5.5 $km\ s^{-1}$ to 0 $km\ s^{-1}$ and **b** -5.5 $km\ s^{-1}$ to -4.6 $km\ s^{-1}$

The optical extinction to the west of outflow is low. The northern rim of the red cone feature falls into this low opacity hole. The high opacity part of the cloud north of the cone is traced by the slightly blue shifted emission. The cone feature suggests that the outflow has blown a large hole into the parent cloud and has thus destructed at least a part of its parent cloud.

References

Haikala, L.K. and Laureijs, R. : 1989, *Astron. Astrophys.*, **223**,287