Search for Young Massive Stars Associated with Warm and Dense Atomic Clouds in the Magellanic Clouds

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We present study of young embedded stars within the warm and dense atomic clouds in the HI bridge between the Large Magellanic Cloud (LMC) and Small Magellanic Cloud (SMC). We use *JHK* band of the 2MASS and CASPIR survey to search for potential sites of the triggered star formation caused by an expanding HI supershell situated in the HI bridge. We also search for young infrared clusters associated with an isolated HI clump in the bridge between the LMC and the SMC. We characterize the embedded star clusters from the fit of the *J-H*, *H-K* color-color diagrams.

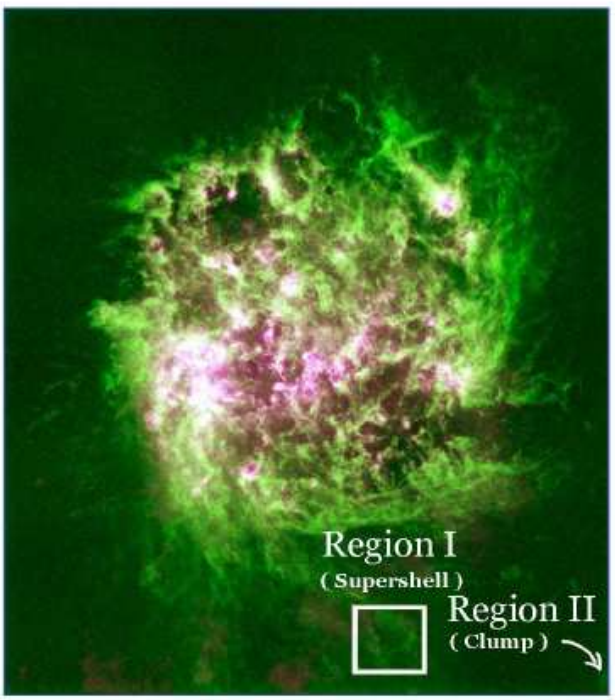

Fig.1 The 21cm ATCA (Kim et al. 1998 ApJ, 503, 674) + Parkes combined image (Kim et al. 2003 ApJS, 148, 473) of the Large Magellanic Cloud (Green Light). Pink color indicates the warm dust (100 micron IRAS Image). The HI aperture synthesis mosaic of the Large Magellanic Cloud (LMC), made by combining data from 1344 separate pointing centers using the Australia Telescope Compact Array (ATCA) and the 64m single-dish Parkes telescope.

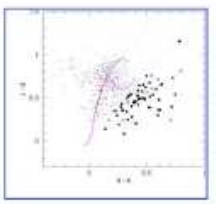

Fig.3a The Color-Color diagram of the detected IR sources in Region I.

Region I includes the HI expanding shell. Black filled circles indicate pre-main sequence star (PMS) candidates located within the HI expanding shell, while blue double circles indicate PMS candidates along the rim of the HI shell.

• The extinction measurements for stars without near infrared excess emission yield $E_{J-H}/E_{H-K} = 1.53 \pm 0.04$.

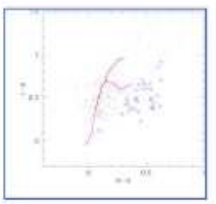

Fig.3b Color-Color diagram of the detected IR sources in Region II.

Region II includes the HI isolated clump. Open circles represent stars with infrared excess. Solid lines denote Giants and Dwarfs from Bessell & Brett (1988). The field stars follow a tight locus along an interstellar reddening curve (long and short dashed line) from the region of intrinsic colors of Giants and Dwarfs.

• PMS candidates often show a characteristic near infrared excess compared with reddened main-sequence stars.

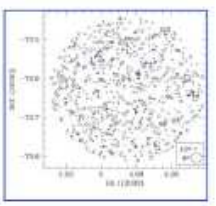

Fig.4a Star chart of Region I.

The distribution of PMS candidates of Region I. Association members with strong IR excesses are indicated by open circles. Blue circles indicate stars projected within the HI shell, while red circles indicate stars located along the rim of the HI shell.

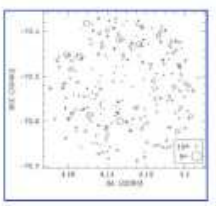

Fig.4b Star chart of Region II.

The distribution of PMS candidates of the isolated HI cloud in Region II. Association members with strong IR excesses are indicated by blue open circles.

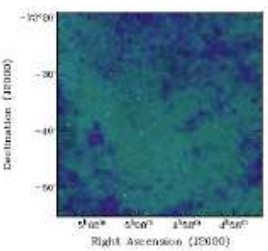

Fig.2a HI aperture synthesis map of Region I (Blue Light) is overlaid on the K image (Green Light). An HI expanding shell is situated in the HI bridge between the LMC and the SMC. The expansion of this HI shell is 31.8 $km\ s^{-1}$.

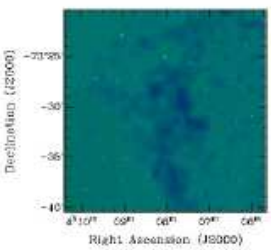

Fig.2b HI aperture synthesis map of Region II (Blue Light) is overlaid on the K image (Green Light). An HI isolated clump is found in the intergalactic medium between the LMC and the SMC.

Discussion

- **The results of JHK survey and subsequent photometry of an isolated HI clump and HI supershell in the bridge between the LMC and the SMC certainly show the PMS candidates associated with the regions.**
- **However, the current data do not show that the young cluster members are predominantly concentrated in the denser HI regions.**

References

Balog, Z., et al. 2004 AJ 128. 2942B
Bessell, M. S., Brett, J. M. 1988 PASP. 100. 1134B
Chabrier, G., Baraffe, I., Allard, F., & Hauschildt, P. 2000, ApJ, 542, 464c
Gomez, M., Kenyon, S. J., Hartmann, L. 1994, AJ, 107, 1854
Kenyon, S. J., Hartmann, L. 1995, ApJS, 101, 117
Kim, S., et al. 1998, ApJ, 503, 674
Kim, S., et al. 2003, ApJS, 148, 473

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