

Molecular Gas Around the Infrared Dust Bubbles

Yan Gong^{1,2,3}, Ruiqing Mao^{1,2}, Min Fang^{1,2}, Jixian Sun^{1,2}, and Dengrong Lu^{1,2}

¹Purple Mountain Observatory, Chinese Academy of Sciences,
West Beijing Road, Nanjing 210008, China

²Key Laboratory of Radio Astronomy, Chinese Academy of Sciences

³University of Chinese Academy of Sciences

email:ygong@pmo.ac.cn

Abstract. We have conducted a mapping survey toward a sample of 17 infrared dust bubbles in three 3 mm waveband CO isotopic lines simultaneously. Such bubbles are candidates to search for triggered massive star formation. We present the data and report preliminary results.

Keywords. ISM: molecules — ISM: clouds — stars: formation — radio lines: ISM

Dust infrared bubbles, revealed in the GLIMPSE $8\mu\text{m}$ images (Churchwell *et al.* 2006, 2007, Deharveng *et al.* 2010), are good candidates for studying triggered star formation process. Using a newly installed 3×3 -beam Superconducting Spectroscopic Array Receiver (SSAR) at Delingha 13.7m telescope, we have conducted a simultaneous $^{12}\text{CO}/^{13}\text{CO}/\text{C}^{18}\text{O}$ ($J=1-0$) mapping survey toward a sample of 17 such bubbles (see Fig. 1 for an example), all of which are associated with signs of massive star formation (e.g. UCHII and/or methanol masers). Molecular gas around these bubbles is found to be closely related to HII regions; ring or arc like structures are very common in position-velocity diagrams, suggesting an expansion most likely due to the evolution of HII regions. In addition, the mapping survey found 33 dense fragments which deserve a follow-up high spatial resolution study for detailed clump structures and kinematics. These are crucial for searching kinematic evidence of interactions between HII regions and molecular clouds and testing the collect and collapse process.

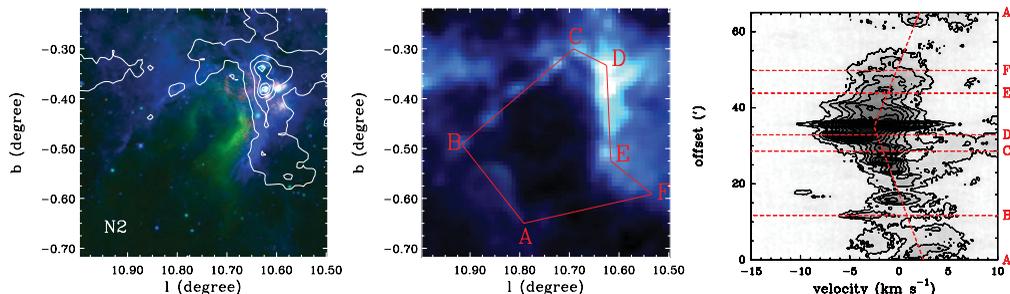


Figure 1. The infrared bubble N2. *Left:* Integrated $\text{C}^{18}\text{O}(1-0)$ intensity contours overlaid on a color composite image ($8\mu\text{m}$: blue, $24\mu\text{m}$: green, 20cm : red); *middle:* A color composite image of integrated $^{12}\text{CO}/^{13}\text{CO}/\text{C}^{18}\text{O}$ (1-0) lines intensities (^{12}CO : blue, ^{13}CO : green, C^{18}O : red); *right:* ^{12}CO p-v map along the red line A-B-C-D-E-F-A in the central panel, showing two velocity gradients and the ring/arc structures in this panel. (The color version of this figure will be available online.)

References

- Churchwell, E., Povich, M. S., Allen, D., *et al.* 2006, *ApJ*, 649, 759
Churchwell, E., Watson, D. F., Povich, M. S., *et al.* 2007, *ApJ*, 670, 428
Deharveng, L., Schuller, F., Anderson, L. D., *et al.* 2010, *A&A*, 523, A6