

**DEEP NEAR INFRARED SURVEY TOWARD VELA MOLECULAR RIDGE** C. D. Baba, (*baba@z.phys.nagoya-u.ac.jp*), S. Sato, D. Kato, Y. Haba, *Department of Astrophysics, Nagoya University, Chikusa-ku, Nagoya 464-8602, Japan*, T. Nagata, *Department of Astronomy, Kyoto University, Sakyo-ku, Kyoto, 606-8502, Japan*, M. Tamura, *National Astronomical Observatory of Japan, Mitaka, Tokyo 181-8588, Japan*, K. Sugitani, *Institute of Natural Sciences, Nagoya City University, Mizuho-ku, Nagoya 467-8501, Japan*.

Vela Molecular Ridge is one of the nearest giant molecular cloud (GMC) complex, being composed of at least four molecular clouds (named A, B, C, and D) with individual mass exceeding  $10^5 M_{\odot}$  [1]. The clouds A, C, and D are located at  $700 \pm 200$  pc, and the cloud B is located at  $\sim 2$  kpc [2]. Yamaguchi et al. (1999) [3] identified 13  $C^{18}O$  clumps in the cloud C of the Vela Molecular Ridge (hereafter Vela C), and suggested that Vela C is the richest in molecular gas and the least evolved. Because of its proximity and youth, Vela C is one of the best sites to study the earliest stage of star forming processes in GMCs. Since both embedded clusters and protostars are considered to have a significant influence on the star formation in the molecular cloud, it is indispensable to search for them. In Vela C, two protostars and two embedded clusters are known so far [4] [5]. We have carried out a deep simultaneous *JHKS*-bands imaging survey toward Vela C. The survey covered a  $\sim 1.5$  deg<sup>2</sup> region of Vela C. We present new candidates for isolated protostars and embedded clusters identified from our imaging survey.

We selected isolated protostar candidates and embedded clusters based on the association of IRAS and/or MSX point

sources. For the isolated sources, we selected the sources having a positive slope of their spectral energy distributions from  $2 \mu m$  to  $25 \mu m$ . The total number of the isolated protostar candidates and embedded clusters are 31 and 5, respectively. The bolometric luminosities of the isolated protostar candidates range from 5 to  $104 L_{\odot}$ . Assuming the age of 0.1 Myr, we estimated the stellar masses ranging from 0.9 to  $3.7 M_{\odot}$  [6]. The numbers of the sources included in each embedded cluster range from  $\sim 10$  to  $\sim 350$ . Only RCW 36 cluster, which have  $\sim 350$  members, harbors massive stars [7]. Almost all the sources are closely associated with the  $C^{18}O$  clumps. We suggest that the star formation is still ongoing in these clumps.

**References:** [1] Murpy, D. C., & May, J. 1991, *A&A*, 247, 202, [2] Liseu, R., Lorenzetti, D., Nisini, B., Spinoglio, L., & Moneti, A. 1992, *A&A*, 265, 577, [3] Yamaguchi, N., Mizuno, N., Saito, H., Matsunaga, K., Mizuno, A., Ogawa, H., & Fukui, Y. 1999, *PASJ*, 51, 775, [4] Reipurth, B., & Graham, J. A. 1988, *A&A*, 202, 219, [5] Massi, F., Lorenzetti, D., & Giannini, T. 2003, *A&A*, 399, 147, [6] Palla, F., & Stahler, S. W. 1999 *ApJ*, 525, 772, [7] Baba, D., et al. 2004, *ApJ*, 614, 818

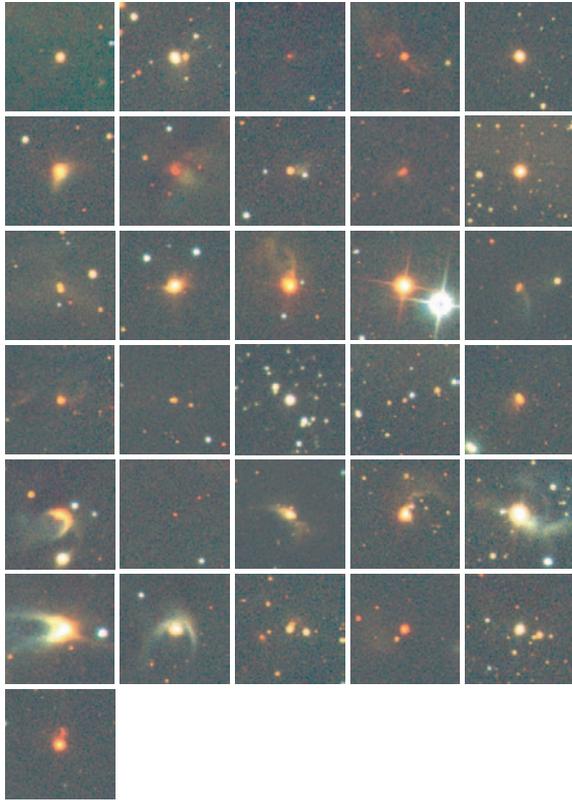


Figure 1:  $JHK_S$  three-color composite image of the isolated protostar candidates in Vela C ( $J$  : blue,  $H$  : green,  $K_S$  : red) obtained with IRSF/SIRIUS. North is up, and east is to the left. The image size is trimmed to  $1' \times 1'$ . The protostars are located on the image center.

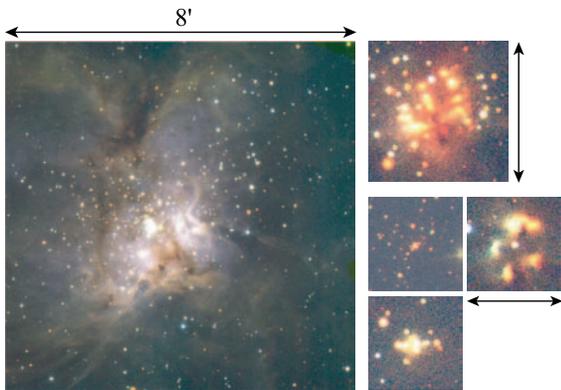


Figure 2:  $JHK_S$  three-color composite image of the embedded clusters in Vela C ( $J$  : blue,  $H$  : green,  $K_S$  : red) obtained with IRSF/SIRIUS. North is up, and east is to the left.

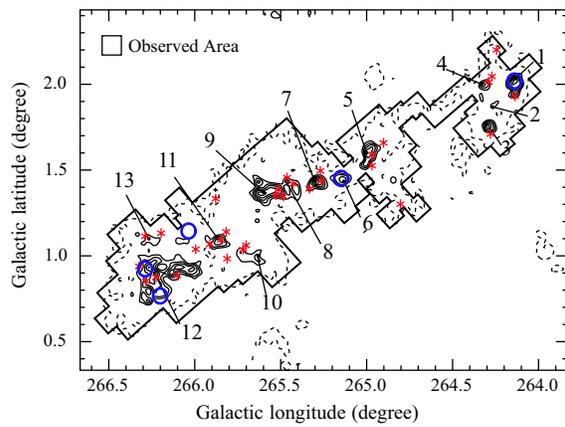


Figure 3: The distribution of the protostar candidates and the embedded clusters in Vela C. They are superimposed on  $C^{18}O$  clumps [3]. The asterisks and the circles represent the positions of the protostar candidates and the embedded clusters, respectively.