EMBEDDED STELLAR CLUSTERS IN THE MOST DISTANT MOLECULAR CLOUD IN FAR OUTER GALAXY: A LABORATORY FOR SUPERNOVA TRIGGERED STAR FORMATION. N. Kobayashi, *Institute of Astronomy, University of Tokyo, 2-21-1 Osawa, Mitaka, Tokyo 181-0015, Japan (naoto@ioa.s.u-tokyo.ac.jp)*, C. Yasui, *Institute of Astronomy, University of Tokyo,* A. Tokunaga, *Institute for Astronomy, University of Hawaii, 2680 Woodlawn Drive, Honolulu, HI 96822, USA,* M. Saito, *ALMA Project, National Astronomical Observatory of Japan, 2-21-1 Osawa, Mitaka, Tokyo 181-8588, Japan*.

We report a discovery of embedded stellar clusters in Digel's Cloud 2 [1], which is known as the most distant molecular cloud in far outer Galaxy at the probable Galactic radius of $\sim$19 kpc. The estimated star formation rate in this molecular cloud is consistent with the typical values for local star forming regions. Our results support the earlier suggestion by Santos et al. [2] or Snell, Carpenter, & Heyer [3] that the stellar cluster forming activity is ubiquitously present even in such a low density and low metallicity environment in the far outer Galaxy. The unique nature of Cloud 2 is that the formation of the molecular cloud and the resultant star formation were clearly triggered by an expanding supernova shell, GSH 138-01-94, as reported by Stil & Irwin [4].

Following the discovery of young stellar objects in Cloud 2 [5], deeper near-infrared images of Cloud 2 in the standard J-, H-, and K-band filters were obtained using QUIRC at the University of Hawaii 2.2 m telescope on Mauna Kea. QUIRC uses a 1024 $\times$ 1024 HgCdTe HAWAII array and was used at f/10 focus to provide a plate scale of $0''.1886$ pixel^{-1} with the field of view of roughly $3'.2 \times 3'.2$. The entire arc-shaped Cloud 2 was covered with 8 mosaics of QUIRC fields. For the present poster paper, we used only the data set with the best seeing condition ($\sim 0''.5$) and the stellar clusters were clearly resolved into each stars.

Figure 1 shows JHK three color image of Cloud2. Two embedded stellar clusters were identified: one in the northern CO cloud (Cloud2-N) and the other in the southern CO cloud (Cloud2-S). It is interesting to note that the northern cluster is a stellar T-association while the southern cluster is a dense stellar cluster. We discuss the possible cause of these two completely different star formation modes in the same molecular cloud.

The star formation seems to proceed sequentially outward of the HI shell: starting from the B1 star (MR-1 [6]), isolated medium-mass stars IRS1,4,5 are located outward the center of the HI shell [5]. Finally the two clusters are being formed outermost in the molecular clouds.

Because of the simple environment such as low gas density and/or no strong perturbation from spiral arms in the far outer Galaxy, Cloud 2 serves as an excellent laboratory of star formation process, especially supernova triggered star formation. More detail of the clusters is presented in a poster paper by Yasui et al. in this conference.

References

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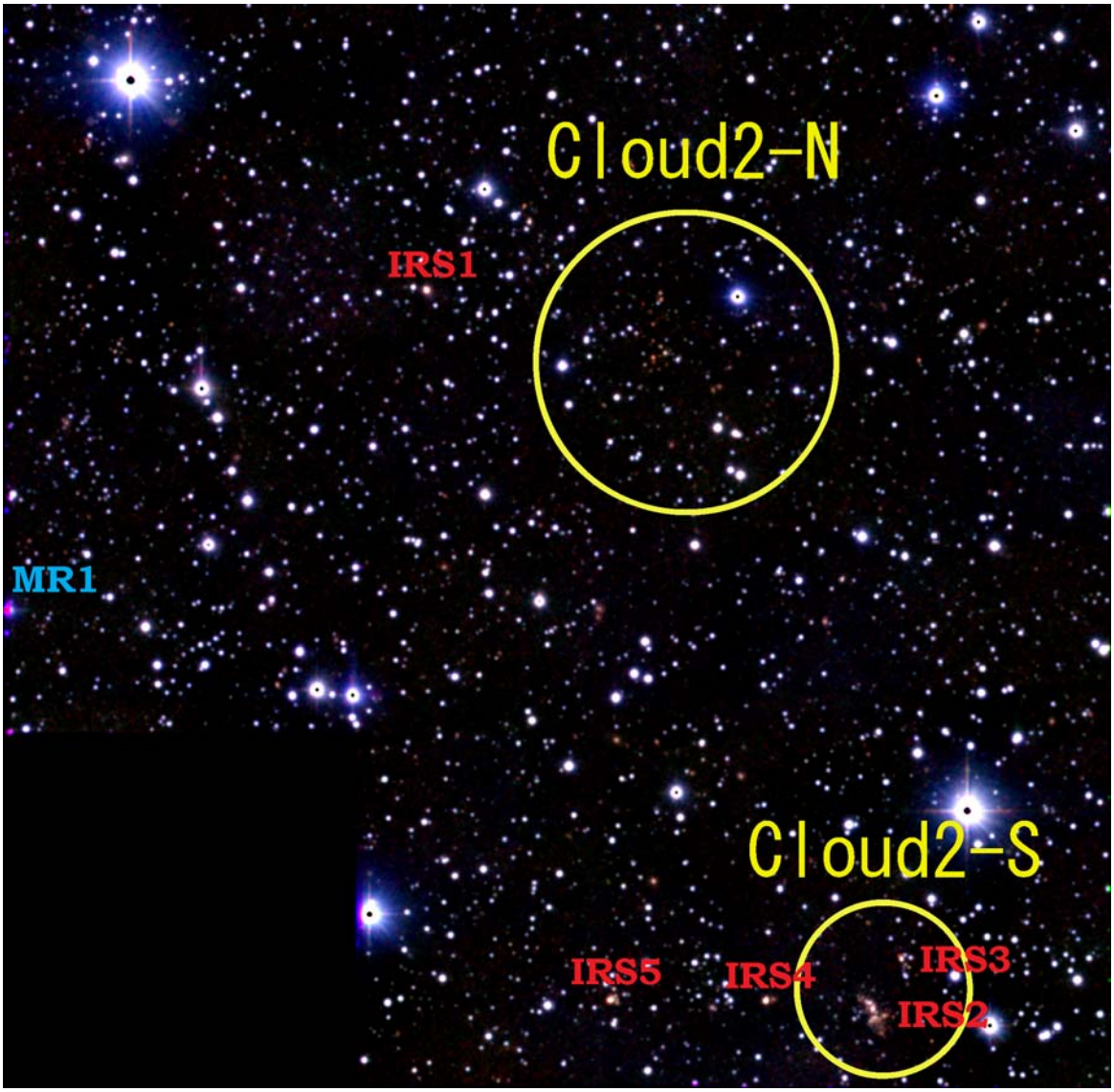

Figure 1: **Near-infrared Three Color Image of Cloud 2**
Three color image of Cloud 2 from J (1.25 μm), H (1.65 μm), and K (2.2 μm)-band mosaiced images obtained with the QUIRC infrared camera at the University of Hawaii 2.2m telescope. The field-of-view is about $10' \times 10'$. Two embedded stellar clusters were identified with their red colors: one in the northern CO cloud (Cloud2-N) and the other in the southern CO cloud (Cloud2-S). The previously reported YSOs [5] are shown with IRS numbers and the location of the B1 star, MR1 [6], is also shown. The center of the supernova shell is toward the left-bottom side of this image.