URSI GASS 2023, Sapporo, Japan, 19 – 26 August 2023

An unbiased census of giant molecular clouds in the low-metal dwarf galaxy NGC 6822

Tomoka Tosaki*(1), Shinji Fujita(2), Takeshi Kamazaki(3), Kunihiko Tanaka(4), Bunyo Hatsukade(2), Fumi Egusa(2), Yutaka Komiyama(5), Hiroyuki Kaneko(1) and Kotaro Kohno(2)
(1) Joetsu University of Education; e-mail: tosaki@juen.ac.jp
(2) Institute of Astronomy, Graduate School of Science, The University of Tokyo
(3) National Astronomical Observatory of Japan
(4) Department of Physics, Faculty of Science and Technology, Keio University
(5) Faculty of Science and Engineering, Hosei University

We present the results of the Atacama Large Millimeter/submillimeter Array (ALMA) - Atacama Compact Array (ACA, a.k.a. Morita Array) ^{12}CO(J =1–0) observations toward the local low-metal dwarf galaxy NGC 6822. Giant Molecular Clouds (GMCs), which are the materials of star formation, are essential for understanding the growth and evolution of galaxies, and investigating the properties and evolutionary processes of molecular clouds in the Baryon cycle in galaxies is one of the most critical issues in galaxy studies. In particular, recent observations of the interstellar medium in low-metallicity, low-mass galaxies at high redshift have been progressing. There is an urgent need for wide-area, spatially resolved observations of nearby low-metallicity galaxies in order to improve the interpretation of galaxies at high redshift, where spatially resolved observations are still challenging. The dwarf galaxy NGC 6822 (distance 476 kpc), which belongs to the local group, is considered to have a lower metal abundance ($\sim 1/5Z_{\odot}$) than the LMC ($\sim 1/2Z_{\odot}$), making it a good template for low-metallicity, low-mass galaxies in the early Universe. The thermal dust emission has been observed in the far-infrared with PACS/SPIRE on the *Herschel* space telescope, and there is a wealth of ancillary multi-wavelength data including the Subaru narrow-band Hα imaging and *Spitzer* mid-infrared images. Since catalogs of young star clusters and other young stellar objects (YSOs) already exist, comparisons with the star formation evolution are straightforward. We used ALMA-ACA to perform mapping observations over $15' \times 20'$(= 2.2 kpc × 2.9 kpc) covering a wide central region of ^{12}CO(J = 1–0) for NGC 6822 The spatial and velocity resolutions are $17'' \times 9''$(= 41 pc × 21 pc), 1 km s^{-1}, respectively. The typical noise level is 40 mJy beam^{-1} (1 σ) in the dV = 1 km s^{-1} cube. For this 3D data cube, we applied CLUMPFIND to identify independent clouds, yielding 54 secure detections of CO-emitting molecular clouds. The virial masses of identified clouds are $\sim 10^{3-5} M_{\odot}$ and are considered to correspond to those of GMCs. While many GMCs have YSO and HII regions associated with them, several GMCs have no signs of star formation. In this paper, we will report on the physical properties of these GMCs and their relation to atomic gas traced by HI observations and star formation. Our plan of a wide area [CI] mapping using new XFFTS spectrometers on ASTE 10-m telescope will also be presented.

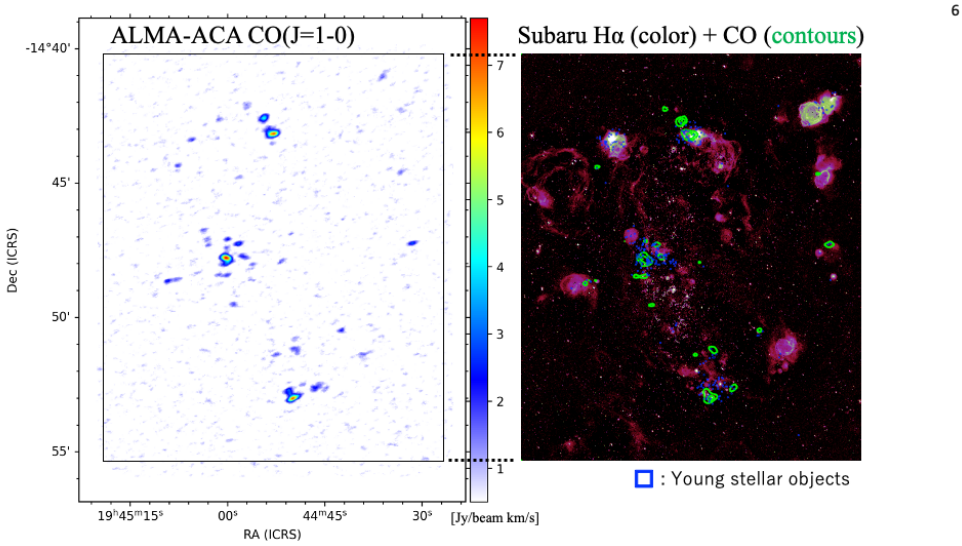

Figure 1. (left) ^{12}CO(J=1–0) integrated intensity map of NGC 6822. (right) CO map (green contour) superposed on Hα (color) and Young Stellar Object (blue box).