R06a CO excitation and its connection to star formation and outflow in NGC 1365

Fumi Egusa (IoA, UT), Yulong Gao (USTC/Nanjing U.), Kana Morokuma-Matsui (IoA, UT), Guilin Liu (USTC), Fumiya Maeda (IoA, UT)

NGC 1365 is the nearby ($D = 18.1$ Mpc) barred spiral galaxy with a Seyfert 1.8 nucleus in the southern hemisphere. We use CO(1–0) and CO(2–1) data from ALMA and VLT/MUSE data to explore the central region of this galaxy at a spatial resolution of $\simeq 200$ pc. In the past annual meetings (2019b (R10b), 2021b (R09a)), we reported that CO(2–1)/CO(1–0) ratios (R_{21}) vary within the 2 kpc $\times$ 3 kpc FoV and that they are positively correlated with SFR indicators. The positive correlation is consistent with previous studies at kpc resolutions and suggests that molecular gas around recent star formation is dense and/or warm.

Since the previous presentation, the masks for making CO moment maps and their ratios have been updated following Maeda et al. (2020). As an SFR indicator, a new extinction-corrected Hα map has been created using data provided by the PHANGS-MUSE project (Emsellem et al. 2022). These updates enabled us to measure CO and Hα fluxes where emission lines are weak. While the median R_{21} becomes slightly lower (0.67), the positive correlation with Hα still holds.

In addition, we have performed Gaussian fitting to spectra for selected positions. In the positions, where the spectra show double-peaked profiles, the fitted R_{21} are different between the two components. The one with a lower ratio likely corresponds to the outflow parallel to the disk that is first reported by Gao et al. (2021). Our result suggests that density and/or temperature are lower in such outflowing gas than in the disk.