R09a Molecular gas conditions in the central region of NGC 1365

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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 order to explore dynamical conditions, we apply the fitting tool 3DBarolo to the CO(1–0) data cube and model the galactic rotation. After subtracting the circular rotation component, we find two non-circular components: (1) an inflow due to the bar, and (2) an outflow motion almost parallel to the disk. The latter component is also found in the Hα data, and our interpretation is that molecular and ionized gas in the disk surface is swept out by the nuclear outflow that was already found in MUSE [O III] data. We estimate the velocity of the new outflow to be 50–100 km/s and the mass outflow rate to be 30–50 $M_\odot$/yr, which is about an order of magnitude larger than SFR in the central region. These results are published in Gao at al. 2021, ApJ, 913, 139.

Meanwhile, we explore physical conditions based on the CO(2–1)/CO(1–0) ratio (R21). As we have already reported in 2019 Autumn Annual Meeting (R10b), the ratio shows a significant variation within this galaxy. With several modifications to the analysis since then, the median ratio is now 0.74. Using an extinction-corrected Hα as an indicator of SFR instead of GALEX NUV, we confirm the trends that we found: (1) where SFR is low the R21 scatter is large, and (2) where SFR is not low R21 positively correlates with SFR.