Report ARC CO

The interaction between radio jets with the ISM has been revealed that relativistic jets can drive molecular and atomic gas outflows, as in the case of the radio bright Seyfert IC 5063 (Morganti et al. 2015; Dasyra et al. 2016). ALMA observations have even revealed previously unknown jets thanks to collimated molecular outflows detected in CO (e.g. in NGC 1377 and ESO 420-G13, Aalto et al. 2016; Fernandez-Ontiveros et al. 2020, respectively). To quantify the impact of radio jets on host galaxies, we built a representative sample of radio galaxies observed with ALMA, the ALMA Radio-source Catalogue, even exploring calibrators.

We have selected a sample of galaxies from the NVSS radio survey in which the ALMA tuning configuration of the observations are suitable to detected possible CO emission lines up to the transition J 4→3. The selection criteria applied for galaxies are to be flux limited at 1.4 GHz, $f_{1.4} \geqslant 0.4$ Jy, to have an ALMA integration time minimum of 3 minutes and a spectroscopically estimate for their redshifts. The final sample is representative of radio galaxies and it comprises 70 sources and the basic properties of the galaxies and the project identification number (PID) used for the ALMA observations are listed in Table 1.

Among the ALMA archival observations, some objects were observed as targets but the majority of the sources were observed as calibrators (phase, flux, bandpass and polarisation), providing a promising approach to explore the scientific value of these observations. Calibration was performed using the CASA pipeline and for the imaging process we developed a script in CASA to optimize the procedure. We provide final continuum+line and only line emission datacubes using both natural (robust parameter 2) and uniform weighting (robust 0.5), in order to achieve more sensitivity or resolution, respectively. In cases in which the high spectral resolution, we also made the line emission datacubes for 20, 60 and 100 km/s resolution. Self-calibration was performed for the target observations when the CO emission was detected.

We have detected CO emission in 18 objects out of 70 galaxies in the sample, corresponding to a detection rate of ∼25%. In Figure 1 we present the intensity maps and corresponding integrated spectra for a sub-sample of the detections. The derived molecular masses range from $2 \times 10^7 < M_{mol} < 5 \times 10^{10} M_\odot$. In addition to the 70 galaxies sample, we have imaged another 12 sources as part of an extended sample to characterize the evolution of the molecular gas content with redshift.

All details of the survey can be found at: https://arxiv.org/pdf/2203.15486.pdf

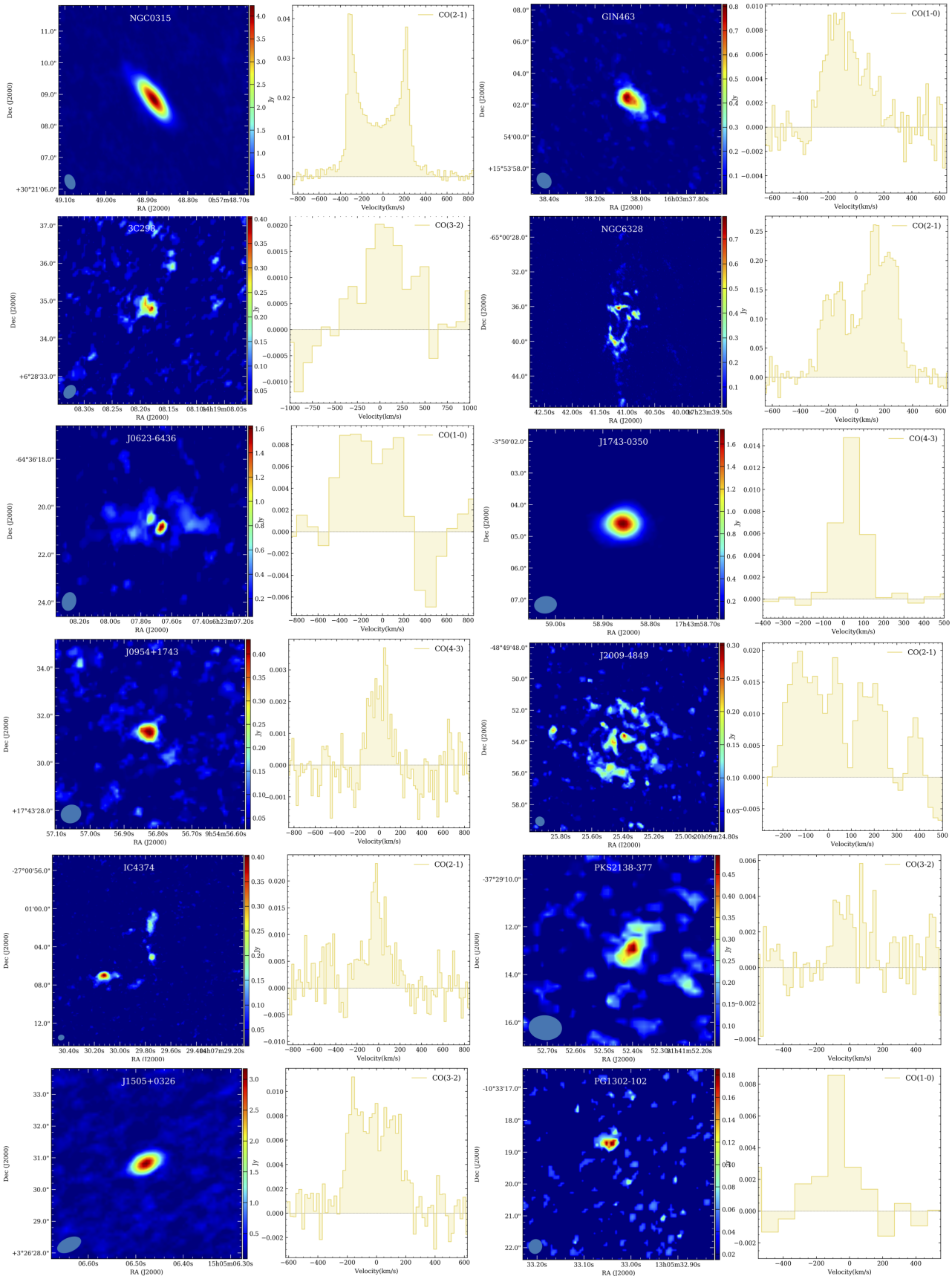

Figure 1: Integrated intensity maps and spectra of the CO emission for a sub-sample of the detections among our sample. The maps have units of $Jy/beam\ .\ km/s$ and the integrated spectra are in Jy. The beam sizes are indicated by the ellipses on the bottom left of each map.