

## Molecular Gas Properties of Early-Type Galaxies

*A. F. Crocker (UMass Amherst), M. Krips (IRAM Grenoble, France), L. M. Young (New Mexico Tech), M. Bureau (Oxford University, United Kingdom), F. Combes (Observatoire de Paris, LERMA, France), Atlas3D Team*

A recent volume-limited survey of early-type galaxies (the Atlas3D sample) has detected  $^{12}\text{CO}$  emission from molecular gas in approximately 25%. To study the properties of the molecular gas in early-type galaxies we have recently followed up the brightest of these  $^{12}\text{CO}$  detections in  $^{13}\text{CO}$ , HCN and  $\text{HCO}^+$  using the IRAM 30m telescope. All of these molecules trace denser gas than  $^{12}\text{CO}$ , although opacity and abundance effects can also have major roles (especially if AGN are present). The observations detect 15/15 observed in  $^{13}\text{CO}(1-0)$ , 10/12 in HCN(1-0) and 5/12 in  $\text{HCO}^+(1-0)$ . Comparing the line ratios (based on integrated intensities in a central pointing) of these lines with those found for spiral galaxies reveals that most early-type galaxies with molecular gas have similar dense gas fractions, opacities and abundances to spirals. However, three galaxies are outliers in both the  $^{13}\text{CO}/^{12}\text{CO}$  and HCN/ $^{12}\text{CO}$  ratios indicating a higher fraction of dense gas than normally found in spiral disks. Additionally, the ratio of HCN/ $\text{HCO}^+$  is higher than that found for spiral disks in several early-type galaxies, possibly reflecting the effect of an AGN depleting the  $\text{HCO}^+$ .