THE MORPHOLOGY OF SIMPLE MOLECULES IN THE NUCLEI OF NEARBY GALAXIES

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We present results of the first high spatial resolution ($5'' - 7''$) imaging survey of simple molecules in the nuclei of several external galaxies. The data is used to address the chemistry of the ambient interstellar medium, in contrast to Galactic studies which focus on specific localized environments. Nuclei of the nearby star forming galaxies, IC 342, Maffei 2 and M 82 have been mapped with the BIMA and OVRO millimeter interferometers at selected frequencies between 87 - 113 GHz. Detected species include primarily low energy rotational transitions of HCN, HNC, HCO^+, SiO, C_2H, HNCO, HC_3N, N_2H^+, $C^{34}S$, CH_3OH, and CN.
Certain species (C_2H, CN, CH_3OH and HNCO) exhibit surprisingly strong variations both in absolute intensity and morphology, demonstrating that chemistry of extragalactic interstellar media are not uniform on large (>50 pc) scales. We use the similarity in morphology of individual species to establish links between their formation pathways. Each subgrouping of species is compared with the distribution of gas excitation, star formation and galactic structure to further constrain the relevant chemistry. Particular examples that will be discussed include the photochemical formation of the radicals, C_2H and CN, and the linking of HNCO to CH_3OH and SiO through grain surface chemistry.