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ALMA Observations of Molecular Complexity in the Large Magellanic Cloud: Probing the Star-forming Region N 160

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Hot molecular cores represent one of the earliest stages of high mass star formation, yet the number of known extragalactic hot cores is currently very small (six). A typical Galactic hot core found around a forming massive star is small, dense, hot, and it is rich in complex organic molecules (COMs; six or more atoms including carbon). In this presentation, we report the results of 1.2 mm continuum and molecular line single-pointing observations with the Atacama Large Millimeter/submillimeter Array (ALMA) of the field in the Large Magellanic Cloud (LMC) we dubbed N160A–mm. The goal of our study is to investigate the chemical complexity in this region and search for hot cores. The LMC is an ideal location for studying hot core chemistry in an environment distinctly different from the Milky Way due to its lower metallicity and strong UV radiation.

N160A–mm is located in the star-forming region N160 south of 30 Doradus. It hosts two dominant young stellar objects and water (H_2O), methanol (CH_3OH), and hydroxyl (OH) masers, indicating ongoing star formation. We detect six 1.2 mm continuum sources, five of which are associated with the CH_3OH emission peaks and/or extended emission. Methyl cyanide (CH_3CN), another COM, is found towards the brightest continuum source in N160A–mm (N160A–mm A), and smaller molecules typically associated with Galactic hot cores (e.g., SO_2, SO) are detected in four sources. Using spectral modeling, we estimate the rotational temperatures and column densities of the continuum sources. Based on the derived temperature of above 100 K, we identify N160–mm A as a hot core candidate. Most of the sources in N160A–mm exhibit a complex kinematic structure, providing evidence for large scale motions in the region (e.g., outflows, rotation). We compare the molecular abundances measured for N160-mm A to those found in Galactic hot cores and other LMC hot cores to investigate the impact of the environment on hot core chemistry.