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THE MAGELLANIC MOPRA ASSESSMENT (MAGMA). I. THE MOLECULAR CLOUD POPULATION OF THE LARGE MAGELLANIC CLOUD

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Abstract

We present the properties of an extensive sample of molecular clouds in the Large Magellanic Cloud (LMC) mapped at 11 pc resolution in the CO(1-0) line. Targets were chosen based on a limiting CO flux and peak brightness as measured by the NANTEN survey. The observations were conducted with the ATNF Mopra Telescope as part of the Magellanic Mopra Assessment. We identify clouds as regions of connected CO emission and find that the distributions of cloud sizes, fluxes, and masses are sensitive to the choice of decomposition parameters. In all cases, however, the luminosity function of CO clouds is steeper than $dN/dL \propto L^{-2}$, suggesting that a substantial fraction of mass is in low-mass clouds. A correlation between size and linewidth, while apparent for the largest emission structures, breaks down when those structures are decomposed into smaller structures. We argue that the correlation between virial mass and CO luminosity is the result of comparing two covariant quantities, with the correlation appearing tighter on larger scales where a size-linewidth relation holds. The virial parameter (the ratio of a cloud's kinetic to self-gravitational energy) shows a wide range of values and exhibits no clear trends with the CO luminosity or the likelihood of hosting young stellar object (YSO) candidates, casting further doubt on the assumption of virialization for molecular clouds in the LMC. Higher CO luminosity increases the likelihood of a cloud harboring a YSO candidate, and more luminous YSOs are more likely to be coincident with detectable CO emission, confirming the close link between giant molecular clouds and massive star formation.

Keywords
galaxies: ISM; ISM: molecules; Magellanic Clouds; stars: formation

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