METHYL-CARBON CHAIN CHEMISTRY IN TMC-1: THE FIRST INTERSTELLAR DETECTION OF METHYL-CYANOTRIACETYLENE (CH_3C_7N)

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Cold carbon chemistry in the interstellar medium is well-known for its efficient production of linear carbon chain molecules. Among the many variations on these species are the symmetric top methylpolyynes and methylcyanopolyynes ($CH_3C_{2n}H$ and $CH_3C_{2n-1}N$, where $n = 1, 2, 3...$). Despite their widespread presence in environments with rich carbon chemistry, the main formation mechanisms of these molecules are still not well understood. With the high sensitivity and broad frequency coverage obtained by the ongoing GOTHAM (Green Bank Telescope Observations of TMC-1: Hunting for Aromatic Molecules) survey of TMC-1, we have the opportunity to study the spectral signatures of these carbon chains in great detail. In this talk, we will present a rigorous study of the methyl carbon chains in TMC-1, in addition to the discovery of the largest interstellar symmetric top, methylcyanotriacetylene (CH_3C_7N). Making use of the second data release of GOTHAM in combination with Markov-Chain Monte Carlo simulation and spectral line stacking techniques, we detect statistically significant emission from the $K = 0$ and $K = 1$ components of this molecule, and derive its abundance and excitation conditions in TMC-1. Furthermore, by carrying out the same analysis for the many other methylpolyynes and methylcyanopolyynes that show emission lines in our data, and comparing our results with predictions of chemical models, we assess the chemistry governing the production of this class of molecules in this source and compare it with that of other carbon chain species.