Carbon chain molecules towards massive clumps: the cold envelope still has surprises.

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The recent detections of several heavy carbon bearing molecules towards TMC-1 (McGuire et al. 2020, Cernicharo et al. 2021) reveal a new window on the chemical complexity of the interstellar medium with several of the newly discovered species forming under unknown conditions. The most prominent stages associated with massive star formation are characterised by a large amount of heated gas rich in saturated COMs (hot cores), however a distinct chemical laboratory hosting large carbon chain molecules towards high-mass star forming regions has not yet been recognised. Recent results report high detection rates of unsaturated carbon bearing molecules. We targeted three massive clumps with various evolutionary stages selected from the ATLASGAL survey (Csengeri et al. 2014) and performed sensitive unbiased spectral surveys with the Yebes and IRAM-30m telescopes to study the chemistry of the carbon chain molecules to reconcile our view of complex chemistry. Towards the targeted sources, we identified a rich molecular emission originating from carbon chain molecules. We performed a detailed analysis of the physical conditions using non-LTE modeling and located the cyanopolyynes in the cold, extended gas. The comparison of the molecular composition of our objects to that of a sample of hot corinos, warm carbon chain chemistry (WCCC) objects, and dark clouds, reveals a similarity with the WCCC chemistry (Bouscasse et al. subm).

Références

[1] McGuire 2020, ApJ 900, L10
[2] Cernicharo et al. 2021, A&A 647, L3
[3] Csengeri et al. 2014, A&A, 565, A75