Emerging molecular complexity in the warm gas of young protostars.

L. Bouscasse[1], T. Csengeri[2], A. Belloche[3], K.M. Menten[3], F.Wyrowski[3], S.Bontemps[2], R. Güsten[3]

[1] Institut de Radioastronomie Millimétrique, 300 rue de la Piscine, 38400 Saint-Martin-d'Hères, France
[2] Laboratoire d'astrophysique de Bordeaux, Univ. Bordeaux, CNRS, B18N, allée Geoffroy Saint-Hilaire, 33615 Pessac, France
[3] Max-Planck-Institut für Radiastronomie, Auf dem Hügel 69 53121 Bonn, Germany

The physical processes at the origin of high-mass stars are still poorly constrained. ALMA has been extremely successful to identify a large sample of Class 0 high-mass protostars in the frame of the SPARKS survey (Csengeri et al. 2018, 2019). From these, six sources have been found to be isolated down to 400au, making them easy targets for single-dish observations to study the early warm-up phase chemistry leading to the appearance of hot cores. These sources have been studied using an unbiased spectral survey between 159-374GHz with the APEX telescope and revealed a large molecular emission even towards the youngest sources (Bouscasse et al. 2022). In all the sources, an average of 40 species were found which denotes a high molecular richness. We located these species within the envelope by combining a detailed analysis of the line profiles with local thermodynamic equilibrium modeling. While some objects exhibit a clear structure with a well-defined warm gas phase, some remain mostly cold with warm gas traced only by methanol and methyl cyanide. Although the sources have a common molecular content composed of the simplest molecules, we detect complex organic molecules (COMs) in the cold component of envelope for all our objects. We observe that one of the main differences in the molecular emission of our sources is in the COMs. We will show here a gradual emergence of the warm component and an increasing molecular complexity along the evolutionary sequence of our objects. The comparison of the molecular composition of our objects to that of a sample of hot corinos suggests strong similarities for O-bearing COMs.

Références

[1] Csengeri et al. 2019, A&A, 632, A57
[2] Csengeri et al. 2018, A&A, 617, A89
[3] Bouscasse et al. 2022, accepted by A&A, arXiV:2202.08621