The hunt for hot corinos and WCCC objects in the OMC-2/3 filament

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The Solar System formed from a clump in a molecular cloud and was, very likely, surrounded by numerous high- and low- mass forming stars. Central questions in Astronomy are 1) what happened to the first phases of the Solar System formation and 2) how they might have influenced the early development of organic chemistry and perhaps the appearance of life on Earth. Chemistry is a powerful tool to answer these questions. For example, the protostellar stage is chemically rich and diverse. Hot corinos, dense (>10^7 cm^{-3}), hot (>100K), and compact (<100 au) regions [1], enriched in interstellar Complex Organic Molecules (iCOMs; e.g. CH_3OH, CH_3OCH_3) [2][3], and Warm Carbon Chain Chemistry (WCCC) objects, deficient in iCOMs but showing a larger zone (a few thousands of au) enriched in hydrocarbons (e.g. CCH, c-C_3H_2) [4], key pieces of evidence of this chemical diversity.

Our Sun being a former protostar, an obvious question is whether it experienced a hot corino phase, a WCCC phase or neither during its youth. In this context, we carried out a systematic study to search for hot corinos and WCCC objects in the OMC-2/3 filament, the nearest and best-known analogue of our Sun's birth environment [5],[6]. We first performed a large scale study (<10^4 au) using single-dish observations (IRAM-30m, Nobeyama-45m) of CH_3OH and CCH, the most abundant species in hot corinos and WCCC sources, respectively. Unfortunately, we could not find any hot corinos or WCCC sources in OMC-2/3 due to the contamination of the line emission by the photo-dissociation region or the molecular cloud [7]. Following our quest to determine the chemical nature of the OMC-2/3 protostars, and ultimately to understand the Sun's chemical past, we then explored their chemical nature at small-scale (<100 au) with the ORion ALMA New GEneration Survey (ORANGES) [8]. I will present both studies and what we could learn from them.

References

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