

ALMA2019: Science Results and Cross-Facility Synergies



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Dissecting high-mass protostars with SPARKS

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Contributed talk

Abstract:

“The origin of the highest mass stars is still an enigma in modern astrophysics. The SPARKS project (Search for high-mass protostars with ALMA up to 5 kpc) is a high angular resolution follow-up of the complete sample of infrared quiet massive clumps selected from the ATLASGAL survey at 870 micron. ALMA confirms that deeply embedded high-mass protostars are already formed at the onset of collapse of the youngest massive clumps revealing the initial conditions of high-mass star formation. SPARKS reveals the so far largest sample of individual collapsing envelopes at 2000 au scales, with 135 protostars revealed, ~30 of them being high-mass. A case study of one of our targets revealed the so far known highest mass protostar with a stellar mass estimated between 11 and 16 Msol and an envelope mass of 130 Msol. With SPARKS we could study the physical and molecular structure of the inner envelope at size scales < 1500 au in great detail reaching a 400 au resolution. High sensitivity mapping of the same region with the ALMA-IMF large programme confirms that this object is a single collapsing envelope down to our resolution of 400 au. We discovered shocks at the centrifugal barrier implying an accretion disk. The chemical properties of the envelope show a striking dichotomy between O-bearing complex organic molecules (COMs) and COMs with a CN group. Altogether this reveals a qualitatively similar picture for a high-mass protostar in its main accretion phase, as for low-mass protostars.”

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