Results of the CALYPSO survey of young solar-prototars: chemistry, dynamics and disk formation

Sébastien Maret[1,2], Anaëlle Maury[3], Sibylle Anderl[1,2], Philippe André[3], Sylvie Cabrit[4,1,2] and the CALYPSO team

[1] *Univ. Grenoble Alpes, IPAG, F-38000 Grenoble, France*

[2] *CNRS, IPAG, F-38000 Grenoble, France*

[3] *Laboratoire AIM-Paris-Saclay, CEA/DSM/Irfu - CNRS - Université Paris Diderot, CE-Saclay, F-91191 Gif-sur-Yvette, France*

[4] *LERMA, Observatoire de Paris, CNRS, ENS, UPMC, UCP, 61 Av de l'Observatoire, F-75014 Paris, France*

Class 0 protostars represent the earliest stage of the formation of a Sun-like star. This phase is crucial, as it determines the final mass of the star and the initial composition of the protoplanetary disk, that may eventually form planets. Yet, the chemistry and dynamics of these objects on a few hundred AUs scales - where disks are expected to form - is still poorly known, due to a paucity of millimeter observations at sub-arcsecond resolution. In fact, we still don't know how the progenitors of protoplanetary disks are formed during the youngest phases of protostellar formation. In this contribution, we present the results of a high-angular-resolution survey of 17 Class 0 protostars, obtained with the IRAM Plateau de Bure interferometer and the 30m telescope, as part of the CALYPSO Large Program (Continuum and Line Observations in Young Proto-stellar Objects; P.I. Philippe André). We discuss in detail three representative sources of our survey, NGC1333-IRAS2, NGC1333-IRAS4B and L1527. We find that IRAS2A and IRAS4B are associated with compact, yet resolved, emission from complex organic molecules (COMs). The size and the morphology of the emission suggest that they originate in a hot inner region heated by the protostar, in which the icy grain mantles evaporate (the so called hot corino). We also find an anticorrelation between the CO and N_2H^+ emissions in IRAS4B, which is likely caused by the destruction of N_2H^+ in the region of the protostar where CO ices evaporate. Our line observations also allow us to constrain the velocity field inside the protostellar envelopes. In IRAS4B, we detect an inverse P-Cygni line profile that indicates infall motions. In IRAS2, we detect some rotation on small scales, but no disk. Finally, in L1527 - where a protoplanetary disk has been recently detected - we detect rotation in several transitions, and we discuss the nature of the velocity profile as a function of the radius. A preliminary comparison of the properties of our Class 0 sample (chemical composition, presence of a disk) is also presented.