Study of the supersonically contracting dense core ahead of HH 80N

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Project outline

The main topic of my thesis focuses on the study of the dense core found ahead of HH 80N, the north counterpart of the highly collimated and powerful HH 80/81/80N jet system. This core harbors a very young stellar object and appears to be contracting at supersonic infall velocities. Our recent results (submitted to the Astrophysical Journal) using BIMA observations confirms not only these striking kinematic signatures, but also that the UV radiation field probably coming from HH 80N is capable to alter the chemistry in most of the parts of the core resulting in a high abundances for some species.

The next goal is to understand the peculiar dynamical evolution of the HH 80N core and its relationship with the HH 80/81/80N flow. Did this outflow trigger or speed up the star formation process? One of the requirements to answer this question is to derive the physical structure of the HH 80N core and see if it departs from the typical structure found in other star forming cores. To do so, we plan to combine molecular line observations and continuum data, specially at mm wavelengths, where the emission is associated with dust and molecules found typically in the cool protostellar envelope of the very young embedded objects. For this purpose, the good performance of the CARMA array observing at mm wavelength will provide the chance of studying this region with an angular resolution of 3-6" at D configuration, significantly better than that of our previous BIMA observations ($\sim$ 7-15"). Clearly, given the CARMA capabilities, this instrument will play an important role in the forthcoming thesis work (as was the BIMA case in the first part of the thesis). Therefore, as a potential CARMA user in the future I am strongly interested in attending the CARMA school.

In particular, in the present project (c0268 proposal) we plan to carry out N_2H^+ (1–0) observations towards the HH 80N region in order to probe the structure and kinematics at the inner and densest regions of the core, where the other molecules previously studied are found to be depleted. As a complement, we request time to observe the 3 mm dust emission that, combined with continuum observations at other wavelengths (e.g. recently acquired 1.2 mm data using MAMBO bolometer at the IRAM 30m telescope or Spitzer archive), will allow us to characterize the spectral energy distribution of the core. This is needed for a complete physical modeling of the protostellar envelope of the HH 80N core.