Formation of the massive pre-hot core CygX-N63

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Csengeri et al. (2010) suggested that small scale (0.1 pc) converging flows could be the dominating process to form massive stars, in line with recent MHD simulations by Commerçon et al. (2010). These flows form shocks which can warm the pristine gas that will form the massive star, changing its chemical composition.

CygX-N63 is the most massive monolithically collapsing core of Cygnus-X (~50 $M_\odot$). It is young (less than 400 $L_\odot$) and cold (~17K) but is already chemically rich, suggesting that this source is in a pre-hot core phase.

I will present new high resolution observations (0,4'') of this unique source with the Plateau de Bure Interferometer, which show that the object does not fragment down to 500 AU. I will also discuss the systemic velocity gradient observed perpendicular to the outflow axis in several molecular lines, which we proposed to be an evidence for magnetic braking.

I will also show the results of a large unbiased spectral survey made with the IRAM 30m telescope (180 GHz in the 3, 2, 1 and 0.8 mm bands). Rotational transitions from 52 molecules were identified. Some rare molecules were found, such as the fluoromethyliumylidene CF^+, which could be a key tracer of the early steps of the massive star formation (see Fechtenbaum *et al. in prep.*). We are able to separate different components of the molecular emission : the cold envelope, the forming hot core and the outflow.

The first results of the numerical simulations obtained with the chemical code Nautilus will be presented. We will compare the observed and the calculated abundances and discuss several possible evolutions of the physical conditions.

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