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HOW STARS INTERACT WITH THEIR LOCAL ENVIRONMENT IN CYGNUS-X

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We present some results on our investigations on the young stellar populations in the regions DR15 and DR21 in the Cygnus-X massive star formation complex. We provide some insight on processes associated with the presence or absence of massive stars, and the consequences this has on gas removal and early evolution of young clusters. Our use of multi-wavelength data permits to define a clear picture of the recent history of the complexes and the interaction of the young stars with their local environment.

Cygnus-X is one of the most prominent star formation factories of the Milky Way, with over twenty known embedded star clusters formed around the massive association Cygnus OB2 (Reipurth & Schneider 2008). This is an ideal laboratory to study the formation and early evolution of intermediate mass star clusters and more importantly, how they interact with their local formation environment, which varies significantly from one part of the cloud to another. We centered our current efforts in two, very prominent embedded cluster groups:

The DR15 region, located in the south part of the complex presents an interesting layout in which a giant molecular pillar has formed near a dark infrared molecular filament interacting in turn with a LBV star Palau et al. (2014). Both molecular structures have formed several young stellar groups, which we identify in basis of the spatial distribution of young stellar sources, classified from multi-wavelength photometry (IR, X-rays). The cluster located atop the molecular pilar contains a relatively low number of protostars, indicating that it is slightly more evolved than expected, despite the fact that it is still embedded in a prominent, bright nebulous envelope. By studying the kinematics of the gaseous envelope, we found that it has a low mass loss rate, indicative of parental gas removal in timescales longer than the expected circumstellar disk ages of the population (Rivera-Gálvez et al. 2015). This is in direct contrast with the scenario in the massive star forming cluster W3, where we found that the presence of several embedded O type stars generate a massive outflow of gas capable of removing 10^3 $M_\odot$ in about 1.5 Myr, which explains the presence of abundant Class II sources in the W3 complex, including the gas-free association IC 1795 (Román-Zúñiga et al. 2015).

At the opposite, North-East side of the complex, the DR21/W75S region is one very well studied event, in which a young cluster containing several intermediate to massive protostars is emerging from its parental dark filamentary cloud, but the event has produced a large bipolar outflow resulting from expulsion of material from the center of formation in what appears to be a violent molecular explosion (Zapata et al. 2013). Previous millimeter observations near the center of the event, have shown the presence of gas plowing and maser emission. We identify and classify young embedded stars using multi-wavelength photometry (IR, X-rays), We report on the detection of several X-Ray emission events which, do not appear to be related to a young embedded source, but instead, appear to trace the acceleration of electrons from the molecular shock. We discussed possible scenarios for this event (Román-Zúñiga et al., in prep).

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