The formation of the high-mass star forming regions through colliding flows

- fabien louvet

High-mass star form in hyper-massive clouds. Previous studies suggested that these dense structures form through colliding flows, but patent evidence of this process are difficult to gather. In the W43-MM1 hyper-massive cloud we detected, with the IRAM-30m telescope, a bight, large-scale (> 5 pc) emission of SiO(2-1). This is particularly surprising since SiO emission lines are known to mainly trace high-velocity shocks associated with protostellar outflows. We use high angular resolution images of the SiO(2-1), obtained with the NOEMA interferometer, to disentangle the emission arising from high-velocity shocks, and we show that a low-velocity ($\sim$7 km/s) shock was responsible for most (70%) of large-scale SiO emission. This shock study is the first irrefutable proof that hyper-massive clouds form at the interaction of cloud-cloud collision. To better constrain the ability of SiO to become a universal shock tracer (i.e. regardless of its speed), we conducted a survey of the SiO transitions in W43-MM1 (from J 2->1 to J 10->9) with IRAM-30m, APEX, JCMT, and ALMA-TP. We compare these emissions to a dedicated grid of one-dimensional (1D) radiative shock models. We show that i) low-velocity shocks can generate observable levels of SiO emission and ii) that a fraction of the silicium must be placed either in the gas phase or locked on the mantle of dust grains, instead of being locked into the core of the dust grains.

Galactic Scale