Structure of the molecular cloud surrounding HII regions

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High-mass stars and their impact on the interstellar medium are the candles used to study the energy budget and galactic evolution of external galaxies. However the physical process allowing the formation of high-mass stars and its impact on the star formation efficiency around them is not yet fully understood. The formation of a high-mass star seems to require the global collapse of its parental cloud/clump (e.g. Schneider et al. 2010; Peretto et al. 2013). Among forced-fall signatures are spread-out infall velocities and steeper density gradients than the $\rho(\mathrm{r}) \propto r^{-2}$ radial density profiles classically found for protostellar envelopes. The latter are sometimes probed, especially with the spatial resolution of extragalactic studies, through the shape of the column density Probability Distribution Function (PDF), which thus has a flatter power-law tail (Federrath et al. 2008, Schneider et al. 2013, Tremblin et al. 2014).

Mon R2 is a nearby molecular cloud hosting an association of four HII regions. Herschel observations have been used to analyze the development of its four HII regions and characterize the cloud envelope inside which they developed (Didelon et al. 2014). They have also allowed to make a census of protostars forming within Mon R2 envelope and to estimate star formation rates (Rayner et al. 2014). The central UCHII region however shows a steeper profile that could be interpreted as material compressed by an external agent (Didelon et al. 2014). This result is in complete agreement with the flat power-law tail observed for the PDF and coincides with a clear enhancement of star formation (Rayner et al. 2014). These studies suggest that high-mass star formation requires specific cloud overdensities to have formed and that it is consequently associated with a local increase of the star formation efficiency.

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