

Different structures formed at HII boundaries

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Abstract. Hydrodynamic simulations on the evolution of molecular clouds (MCs) at HII boundaries are used to show that radiation driven implosion (RDI) model can create almost all of the different morphological structures, such as a single bright-rimmed cloud (BRC), fragment structure and multiple elephant trunk (ET) structures.

Keywords. ISM: molecular cloud, HII regions, ISM: structure

The interaction of UV radiation with MCs creates a diversity of morphological structures at HII boundaries which prompted several theoretical models, such as the RDI model (Lefloch & Lazareff 1994) for the formation of a single BRC (Sugitani & Ogura 1994), collect & collapse (C&C) model (Elmegreen & Lada 1977) for HII bubbles or fragments (Deharveng, Zavagno, & Caplan 2005) and hydrodynamic instability model (HD) for a forest of ETs (White *et al.* 1999). A mixture of the above mentioned structures are often found in one HII region (Chauhan *et al.* 2011), so it is desirable to use one model to consistently interpret the overall structure.

Using an existing numerical (Miao *et al.* 2009) code based on RDI mechanism and smoothed particle hydrodynamic (SPH) method, and considering the clumpiness and non-spherical nature of a MC, we found that a prolate uniform MC could evolve into a bar-like structure with condensed cores embedded along the fragment when its major axis is perpendicular to the UV radiation field. An asymmetrical BRC with one side compressed more strongly than the other side will form, if its major axis is initially inclined to an UV radiation flux by an angle. Triggered single or multi star(s) are found embedded at the centre of the head of the BRCs. These simulation results well interpret the physical features of some of the BRCs observed. Further investigation shows that a clumpy MC with proper initial conditions could form various ET structures.

Our simulation results, combined with that of Walch *et al.* (2011) on the formation of HII bubble structure state that RDI mechanism is a versatile model to deal with almost all of the morphological structure formation at HII boundaries.

References

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