

Q01a The molecular gas faced to HII regions show no sign of acceleration

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It is believed that HII regions accelerate the molecular gas and triggers star formation in the compressed layer (Elmegreen and Lada 1977). This process seems reasonable and is widely accepted in the literature. In order to quantify this process we examined the molecular gas immediately surrounding HII regions both for single and multiple O stars in young and old HII regions. They include N159E, RCW38, RCW32, M20, Oph North and M42 (Fukui et al. 2018a; 2016; Enokiya et al. 2018; Torii et al. 2017; Tachihara et al. 2000; Fukui et al. 2018b). The results, unexpectedly, show that no molecular gas has signatures of acceleration as a velocity shift greater than  $1 \text{ km s}^{-1}$  at a sub-pc scale. The apparent very small acceleration does not support the significant compression of molecular gas by HII regions. We present an interpretation that ionization by O stars is more rapid than acceleration. We discuss the implications of the interpretation on the theoretical studies, and suggest that gas compression leading to star formation is made not by HII regions but by the other mechanism(s) including cloud–cloud collision.