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A Monte Carlo simulation study of the excitation of molecules in high mass star forming regions

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Astronomical maser emission occurs in various astrophysical environments and can be used to infer the physical properties of the regions where they are excited. An important part of interpreting the presence of maser emission associated with a specific astrophysical environment is knowing what the pumping mechanism (radiative or collisional) for a particular maser is. Based on calculations using the online RADEX facility, Baan et al (2017) recently concluded that the extragalactic 4.8GHz formaldehyde megamasers are radiatively pumped. This is contrary to the conclusion of van der Walt (2014) that formaldehyde masers associated with high mass star forming regions are collisionally pumped. Since much of the interpretation of the maser emission depends on pumping mechanism, we revisited the pumping of the formaldehyde masers (1) to try to understand the results obtained by Baan et al (2017) using the RADEX facility and (2) to extend the calculations of van der Walt (2014) to also include parts of parameter space considered by Baan et al (2017) but not by van der Walt (2014). Some preliminary results, which suggest that the formaldehyde masers are indeed collisionally pumped, are presented.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

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