Effects of magnetic fields on photoionised pillars of dense gas

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Abstract

I will first introduce the photoionisation-magnetohydrodynamics code I have developed, and will discuss the efficiency and parallel scaling of implicit and explicit raytracing-photoionisation integration algorithms. I will then describe 3D simulations we performed to investigate the effects of initially-uniform magnetic fields on the formation and evolution of dense pillars and cometary globules at the boundaries of HII regions. For weak and medium field strengths an initially perpendicular field is swept into alignment with the pillar during its dynamical evolution, matching magnetic field observations of the "Pillars of Creation" in the Eagle Nebula (M16) and also some cometary globules. A strong perpendicular magnetic field remains in its initial configuration and also confines the photoevaporation flow into a bar-shaped dense ionised region which partially shields the ionisation front and would be readily observable in recombination lines. The results show that ISM magnetic field strengths can in principle be constrained by the morphology of ionised and neutral gas structures in HII regions.