
Cosmic rays from young star clusters: clues from multi-wavelength observations

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Abstract

High energy observations show the presence of cosmic rays (CRs) in OB associations, and it is also theoretically expected, since massive stars are usually born in such associations. We have studied various aspects of CRs acceleration in these star clusters, using analytic methods and 1-D/3-D two-fluid cosmic ray (CR) hydrodynamic simulations. We investigated two different CR injection scenarios, namely, (a) injection in the central wind-driving region and (b) injection at the resolved shocks. We find that, in model (a), the thermal profile gets significantly affected by CRs when (i) the Mach number of the shock exceeds $M_{\text{th}} \gtrsim 12$ and (ii) the dynamical time is longer than the CR acceleration timescale $\tau_{\text{acc}} \sim \kappa_{\text{cr}} / v^2$ (κ_{cr} is the CR diffusion coefficient).

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