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Young Stellar Clusters: a new player in the field of Cosmic Ray origin

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The origin of Galactic cosmic rays (CR) is still a matter of debate. Supernova remnants (SNR) remains the best candidates thanks to their kinetic luminosity and a well studied acceleration mechanism, the diffusive shock acceleration, which has been shown to efficiently work at the SNR forward shocks. However, recently their ability to accelerate particles up to PeV energies, as required from direct detection of local CRs, have been questioned both from an observational point of view as well as from a theoretical perspective. Only very rare and powerful SNRs seem to be able to reach PeV energies, posing a serious challenge to the entire SNR paradigm. The last decade has also seen the rise of a new class of potential CR sources, namely Young Stellar Clusters (YSC), supported by observations showing high energy gamma-ray emission in coincidence with several YSCs. Indeed, powerful winds from massive stars embedded in YSC produce large wind blown bubble where the conditions to accelerate PeV particles may be reached. In this talk I will critical discuss this hypothesis presenting the status of theoretical models and future perspectives for gamma-ray observation of YSCs with upcoming facilities.

Collaboration name

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