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The population of Galactic young massive star clusters in the TeV range

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Young massive star clusters (YMSCs) can produce gamma rays in the very-high-energy (VHE, $E > 100$ GeV) range and have been proposed as sources that can accelerate cosmic rays up to PeV energies. Observations with current instruments have led to the detection of only a few YMSCs but future instruments should significantly increase this number. However, the details of the production of the VHE emission are not well understood: What is the spectrum of accelerated particles? What is the efficiency of cosmic-ray production? What fraction of the wind luminosity is converted into the turbulent magnetic field?

To address these questions, we simulate the population of YMSCs in the gamma-ray domain, by means of Monte Carlo methods, and apply the constraints based on the subsample of YMSCs currently detected at TeV energies. We confront our simulated populations with the catalogue of the H.E.S.S. Galactic Plane Survey, the third HAWC catalogue, and the first LHAASO catalogue, allowing us to investigate crucial aspects of particle acceleration at YMSCs.

Collaboration(s)

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