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Modelling uncertainties in GeV - TeV flux predictions of Galactic globular clusters

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Globular clusters are multi-band emitters, with their gamma-ray emission having been variously attributed as due to dark matter annihilation, a resident gamma-ray burst, white-dwarf population, or a millisecond-pulsar population hosted by the cluster. Terzan 5 has plausibly been detected in the gamma-ray band by H.E.S.S., which produced constraining stacking upper limits on the integral gamma-ray flux of a population of other globular clusters. Using a leptonic model that invokes host millisecond pulsars in globular clusters as sources of relativistic particles, we demonstrate that uncertainty in model parameters leads to a large spread in the predicted high-energy flux, yet there are regions in parameter space for which the stringent H.E.S.S. stacking upper limits are satisfied. Two additional case studies on M15 and Omega Cen (from which five pulsars have recently been detected at radio frequencies) indicate that it is important to increase measurement accuracy on key model parameters in order to improve precision in predictions of cluster fluxes. This has important implications for the observational strategy of the Cherenkov Telescope Array.

Keywords

Globular clusters, pulsars, gamma rays

Collaboration

other Collaboration

Subcategory

Theoretical Results

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