Executive summary - Evidence for inverse Compton emission from globular clusters

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In this contribution, we investigate the gamma-ray emission from 157 Milky Way globular clusters using 8-year Fermi-LAT data. At least 30 globular clusters have been detected by Fermi-LAT. The gamma-ray upper limits are placed for the other globular clusters. Those high-energy photons are most likely caused by the energy loss of relativistic $e^{\pm}$ from the millisecond pulsar population hosted by the globular clusters. However, the relative contributions between the curvature radiation in the magnetosphere and the inverse Compton emission inside the globular clusters have long been unclear.

To probe the origin of the gamma rays, we perform thorough correlation analysis using an EM algorithm. We find that the gamma-ray luminosities of the globular clusters are correlated with their stellar encounter rates and total radiation field energy density. We then fit the energy spectra of the globular cluster to a two-component model and find a strong preference for a soft inverse Compton component. This implies that the $e^{\pm}$ injection efficiency of the millisecond pulsars in the globular clusters is close to 10%.