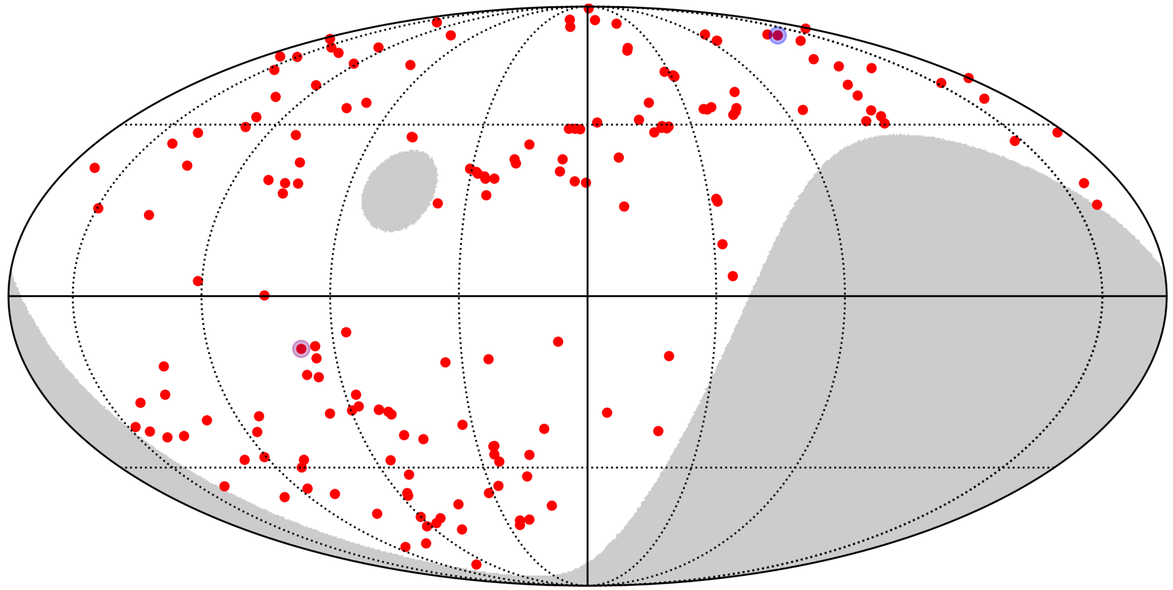
Diffuse Gamma-ray emission in galaxy clusters using LHAASO-WCDA

First LHAASO Collaboration meeting of 2026
NJU, Suzhou

Sergio Hernández Cadena and Hao Zhou
Shanghai Jiaotong University; Tsung-Dao Lee Institute

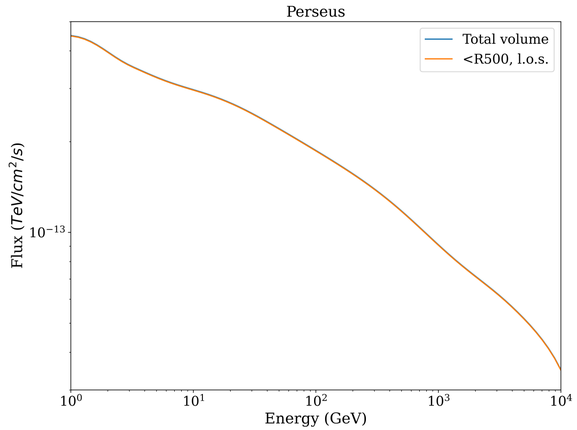
CR-induced Gamma-rays in ICM

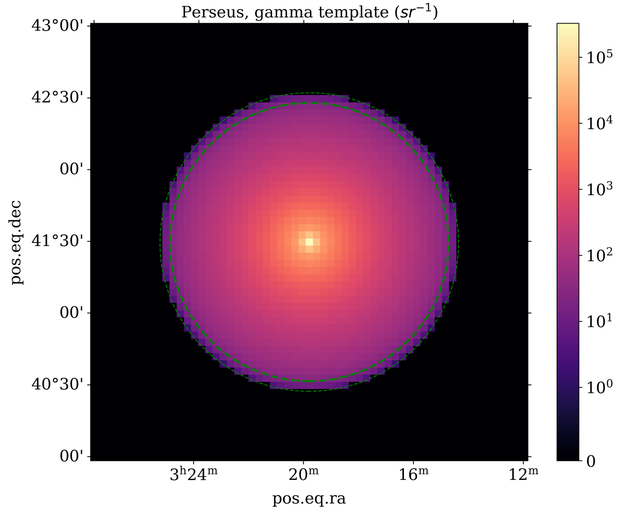
- Cosmic rays accumulated through the history of galaxy clusters
- Interaction with the ambient gas should produce gamma-rays (E ~ 10 TeV)
- LHAASO-WCDA data to search for this diffuse emission
- Sample from the MCXC-II catalog, z < 0.05



Example with the Perseus Cluster

- $n_e(r)$: double beta-model (X-ray)
- Gas Pressure: Universal Pressure Profile (Ghirardini+; 2019)
- $B(r) \propto (n_e)^{\eta}$
- Diffuse emission: MINOT (Remi+; 2019)
- EBL: Dominguez
- NGC 1275
- IC 310

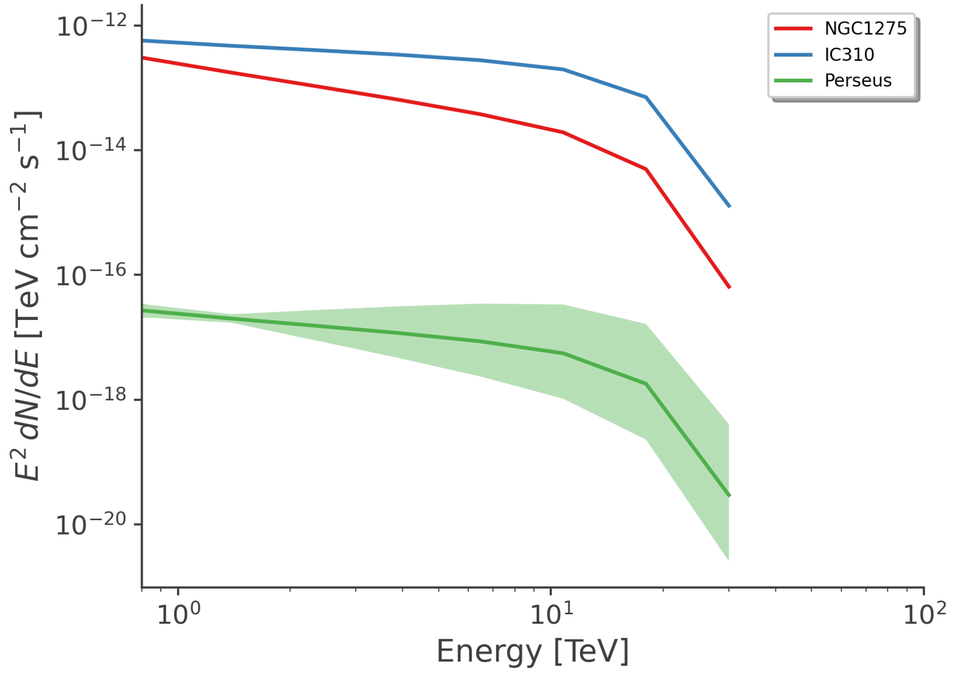




Results for Perseus

Work in progress

- Detection of IC 310 (TS = 183)
- Non detection of NGC 1275 (TS ~ 10)
- Fixing the spectral indices to the best models, result in a TS (~1e-4) for the diffuse emission
- Convert to upper-limits on the CR-to-thermal pressure ratio ⚙ ⚙ ⚙



To Do

- Reduce number of galaxy clusters in the sample according to the expected gamma-ray luminosity
- Finish the estimation of spatial templates
- Combined analysis