

# Studying PG1553+113 with the LST-1 Telescope (and other interests)

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**Arshia Ruina**

# My Background

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- Masters in high-energy particle physics (2018)
  - Thesis with ATLAS (LHC) collaboration, University of Bonn (DE)
- PhD in cosmic-ray (CR) physics (2023)
  - DAMPE collaboration, University of Geneva (CH)
  - Thesis on the CR helium flux measurement
- Post-doc in gamma-ray astrophysics (present)
  - INFN Padova
  - Data analysis with LST-1, LST1+MAGIC
  - Studies with SWGO
  - ...

# Research Interests with the LST\*

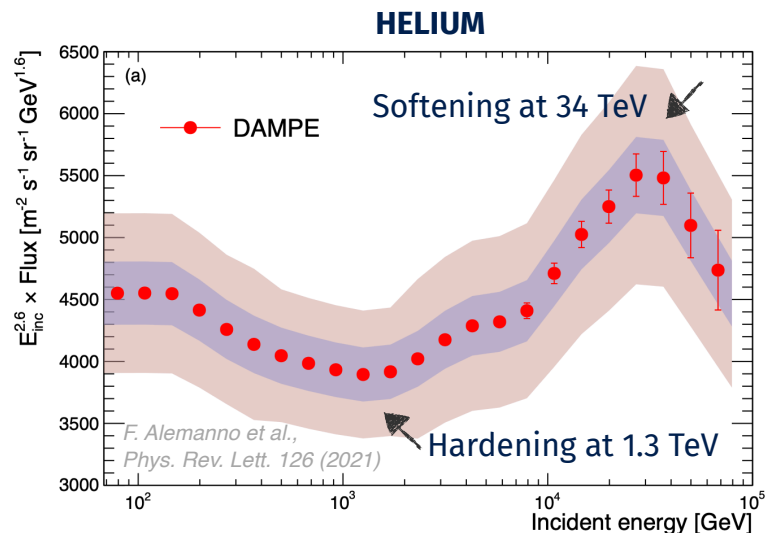
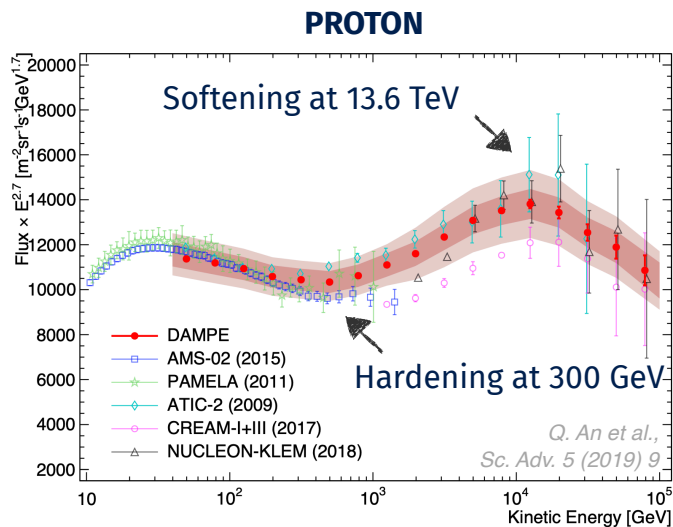
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- Long-term goal: Exploit Direct Cherenkov light detection in IACTs
  - Measure the CR Fe spectrum in the  $\geq$ TeV range
- Short-term goals:
  - Familiarise myself with
    - analysis workflow in IACTs (LST, LST1+MAGIC)
    - gamma-ray astronomy, in general
  - Cross-check of the PG1553+113 analysis with the LST-1 telescope in the Padova group

\*Neither exhaustive nor etched in stone ;)

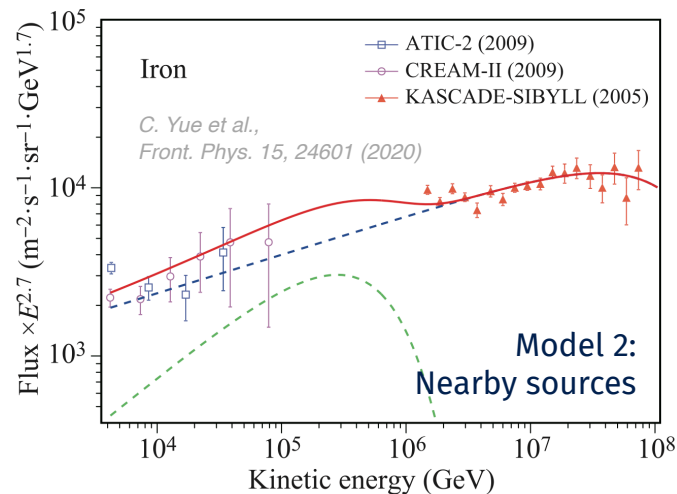
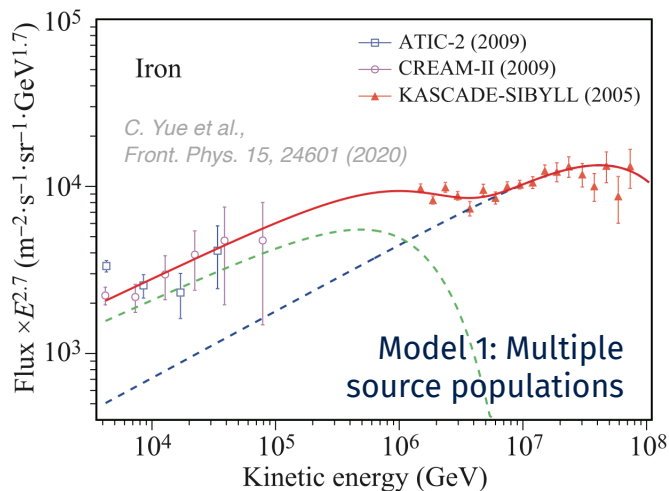
# CR spectrum: Below the “knee” energy

- Galactic CRs
- Spectral features are present at lower energies
  - Most likely dependent on the particle charge,  $Z$



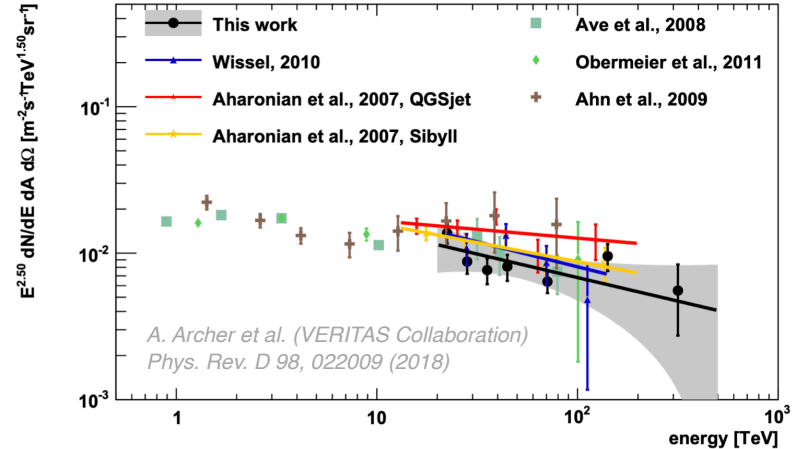
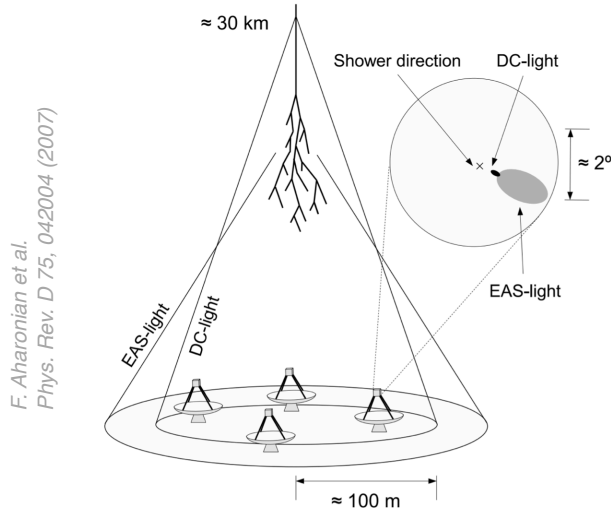
# The Iron Spectrum

- Data is scarce near the start of the PeV region
  - Direct measurements: low statistics
  - Indirect measurements: low Z resolution



# Direct Cherenkov Light

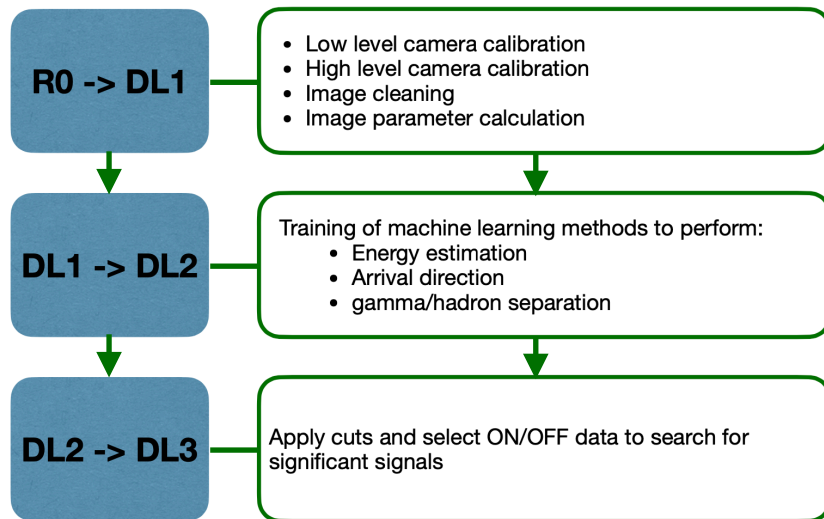
- Cherenkov radiation emitted by a highly energetic CR particle before producing EAS
- Flux proportional to  $Z^2$



# Data Analysis Workflow with the LST

López-Coto et al. (CTA-LST Project), ASP Conference Series, Vol. 532 (2021)

R0: Raw data directly from the camera server  
DLX: Data Level X



DL3 data can be further processed with the existing high-level gamma-ray analysis tools

- Data selections refined
- Data selection notebook updated
  - Thanks to A. Moralejo
- DL3 data analysis is ongoing
  - Thanks to Padova colleagues for their patience!

# Motivation for PG 1553+113

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*S. Adhikari et al. (and references therein)  
arXiv:2307.11696*

- Studies are already underway in the Padova group
- High-frequency peaked BL Lac object (HBL) at  $z \sim 0.4$ 
  - AGN characterized by high variability and weak emission lines
  - Relativistic jet is pointing towards the observer direction => SED dominated by the jet emission
- Exhibits a quasi-periodicity of  $\sim 2$  years
  - Possible scenarios? SBBH system? Jet instabilities?
- Shorter timescale periodicities
  - Intra-day variations
  - Provide constraints on jet structures? Acceleration mechanisms?



# Next Steps

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- Cross-check of a previous analysis of PG1553+113 (by H. Luciani)
  - Discussion + circulation in internal WGs
- Upcoming LST Analysis School (February 2024)
  - LST and LST1+MAGIC analysis pipelines