

The latest results
from the
Pierre Auger Observatory
(the *Southern Observatory* that is)

Miguel Mostafá for the Pierre Auger Collaboration

Department of Physics

Colorado State University

Cosmo 08



Outline

1 Introduction

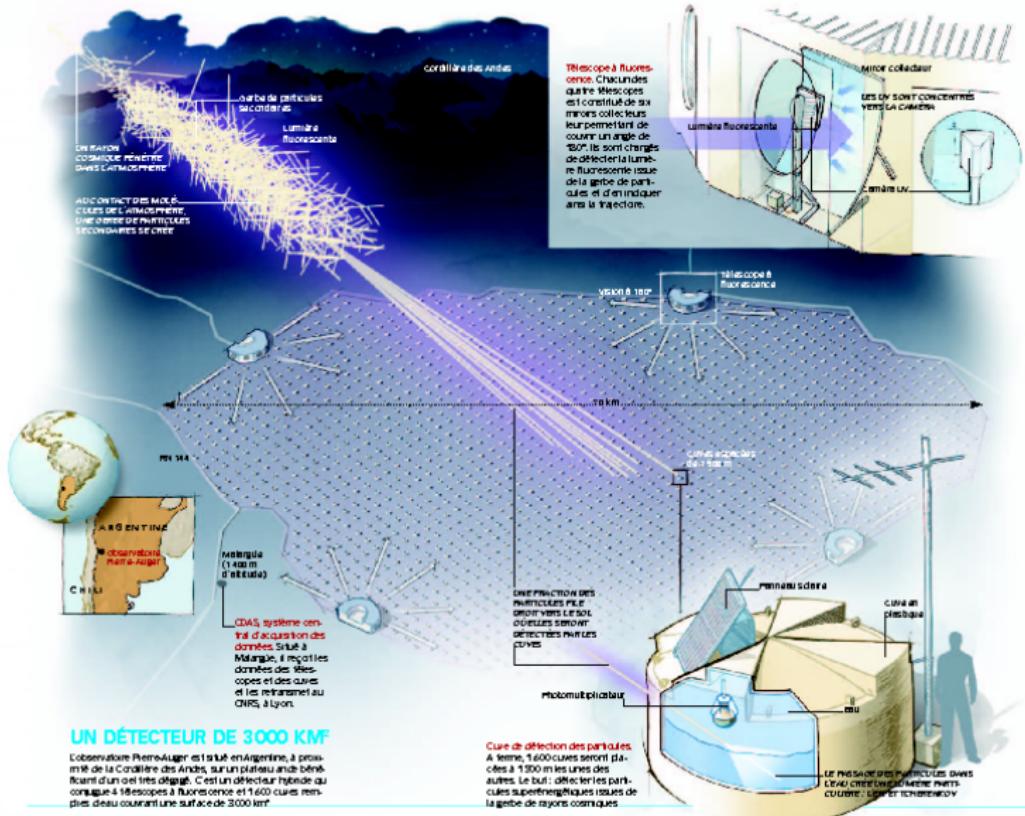
2 Our Results

- Correlation with AGNs
- Photon flux
- Neutrino flux
- Energy spectrum

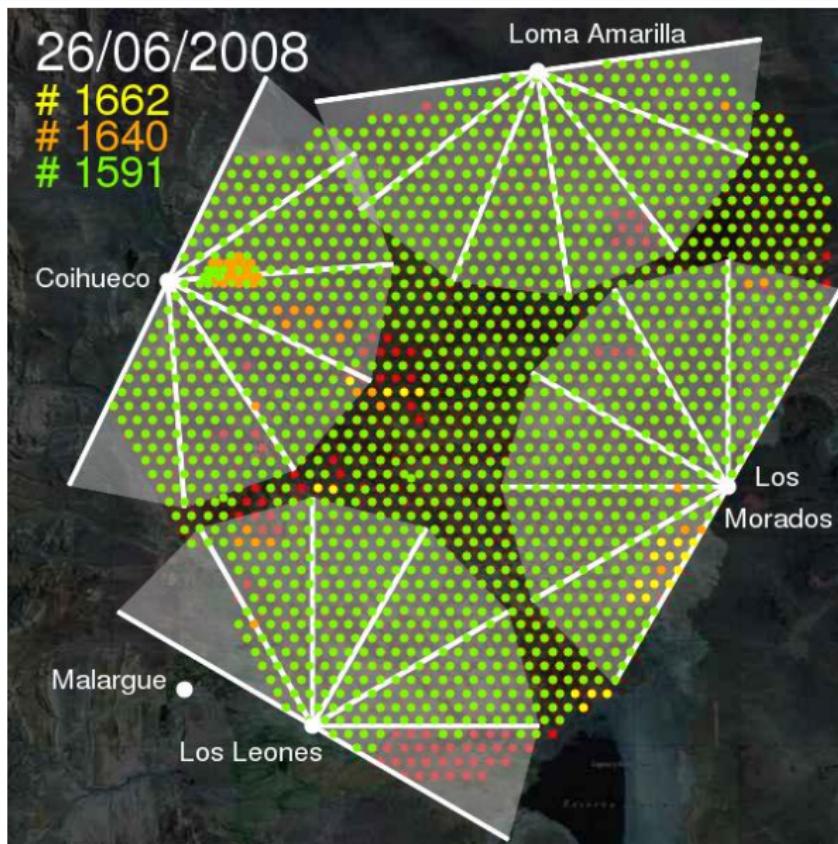
3 Future Attractions



The Pierre Auger Southern Observatory



Status of the Southern Observatory



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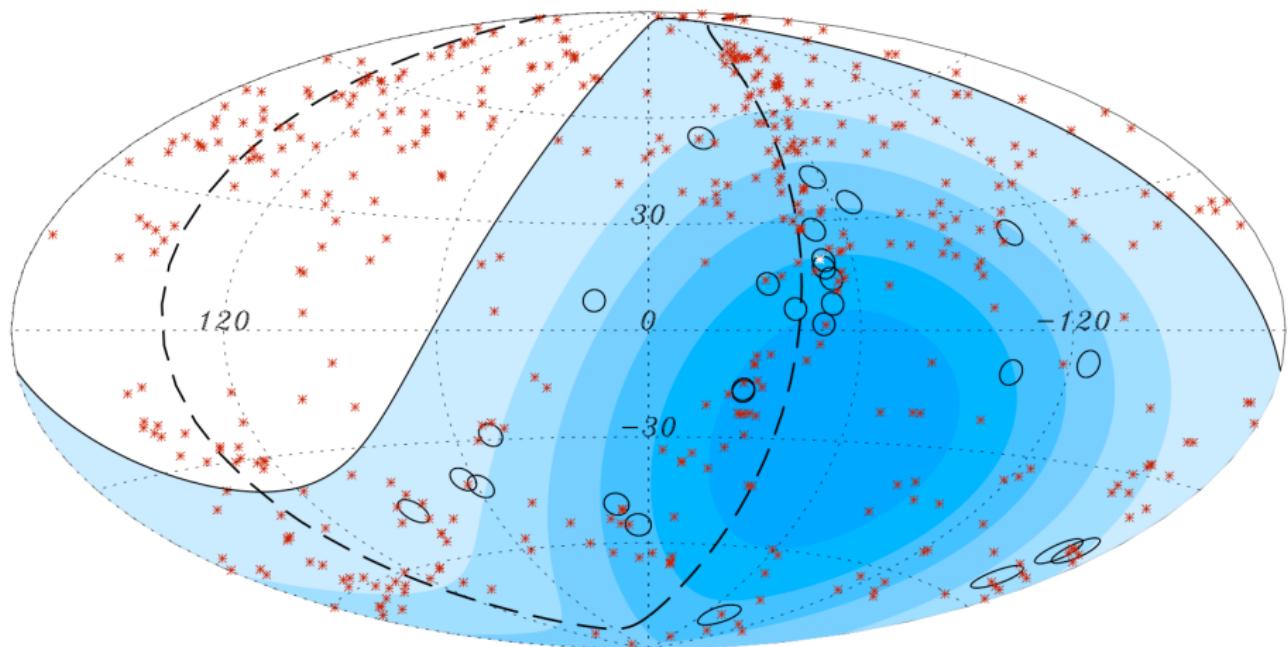
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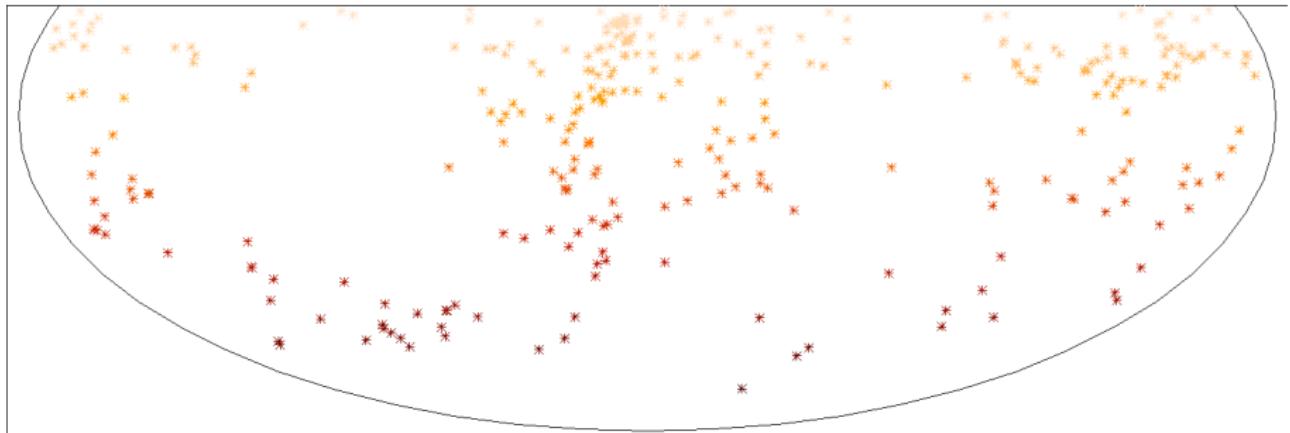
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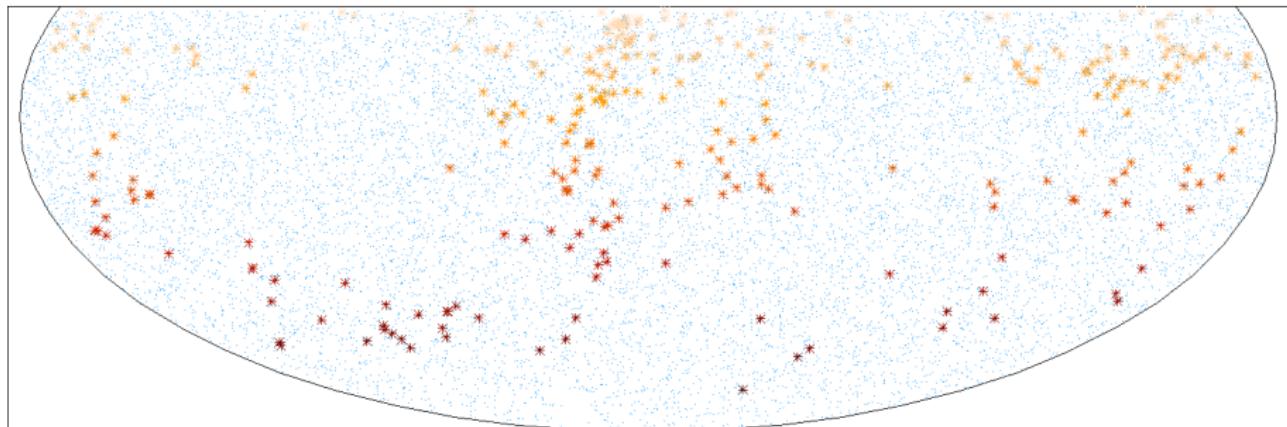
the *Science* result



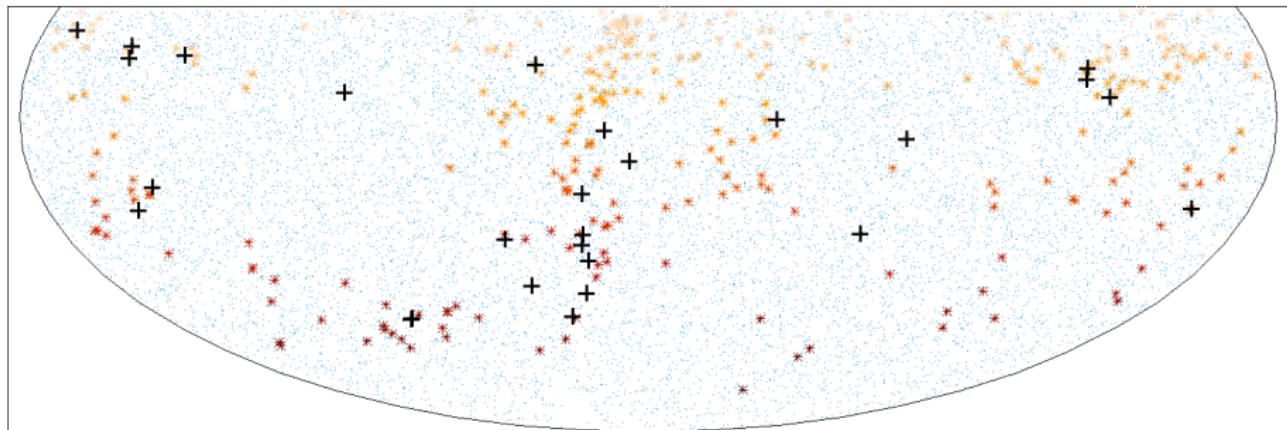
An iso-exposure Mollweide map



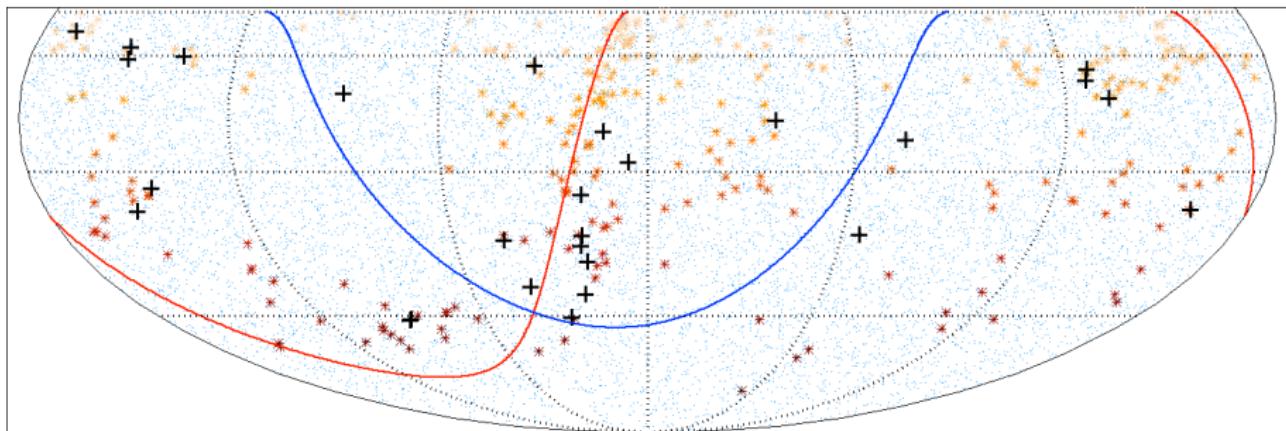
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An iso-exposure Mollweide map



An iso-exposure Mollweide map



AGN correlation

Acceleration sites

- Can we say anything about the sources?
 - They are **not Galactic**
 - Likely **astrophysics**
 - AGNs are **plausible** acceleration sites
- More data are needed to identify and characterize the sources
- *Subliminal message: Auger North = EXCELLENT*



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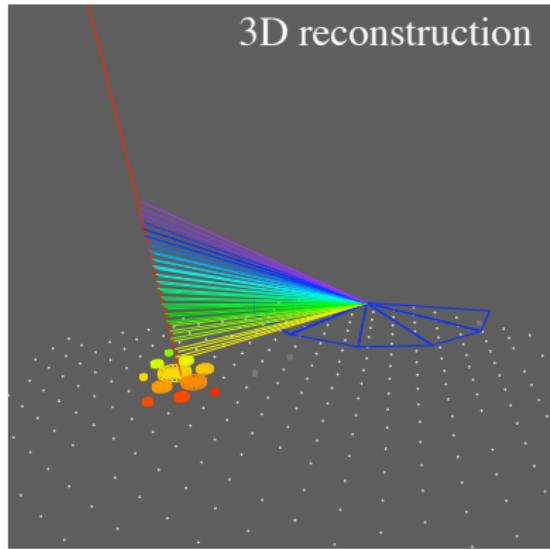
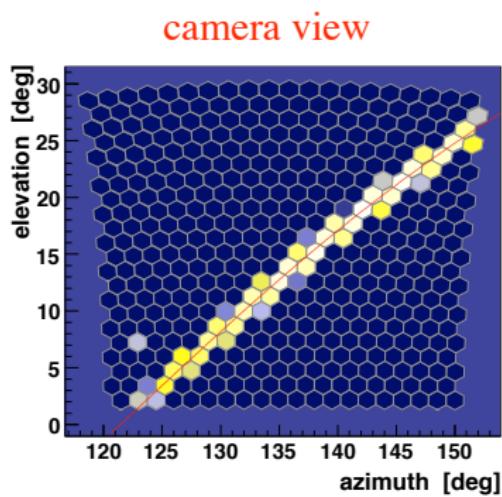
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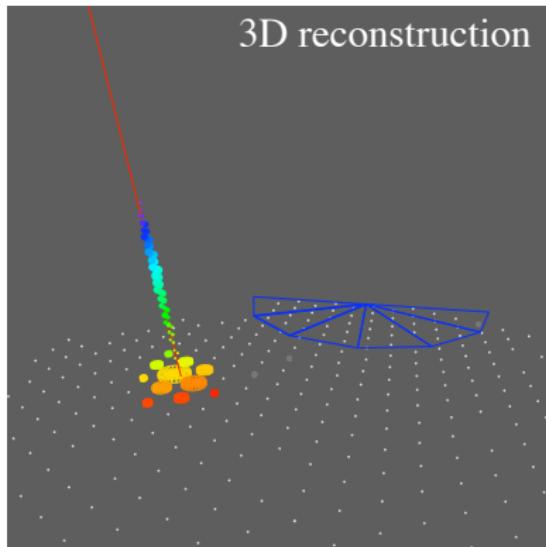
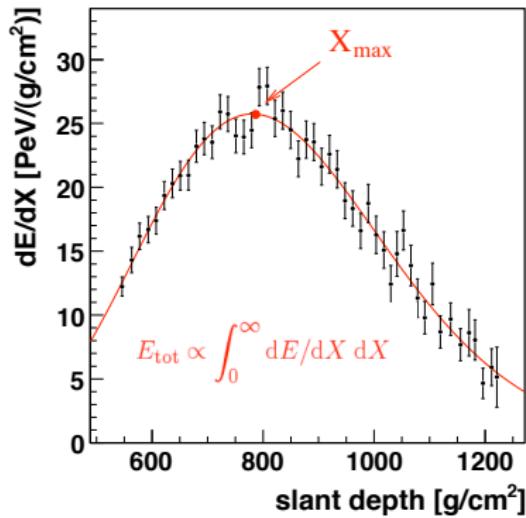
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Longitudinal Profile Info from FD

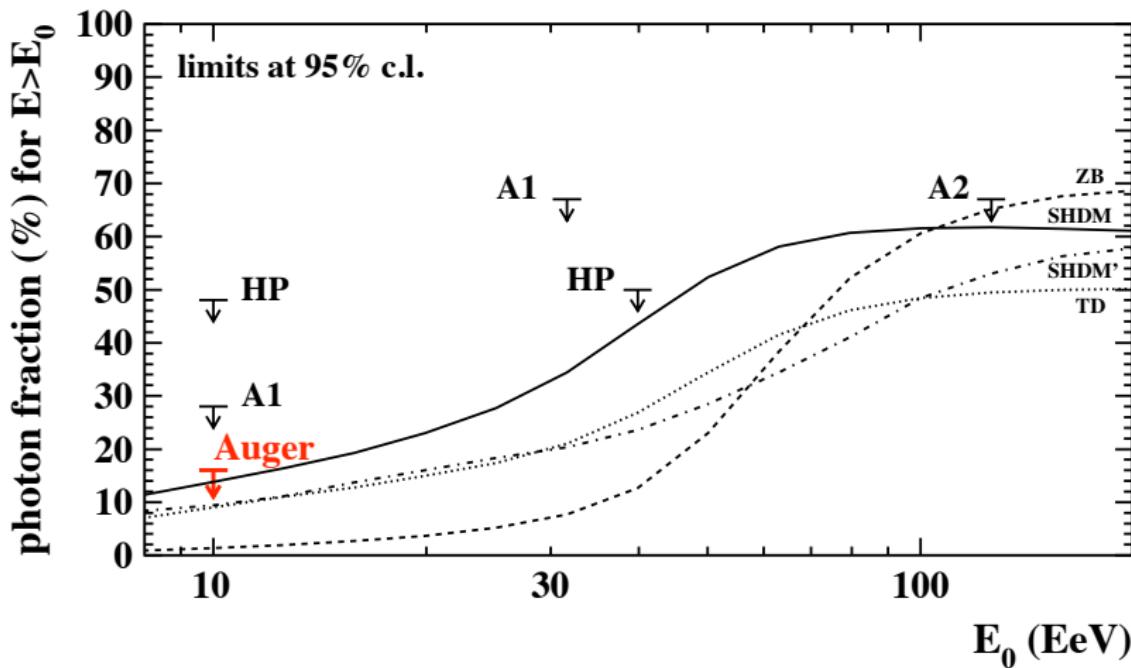


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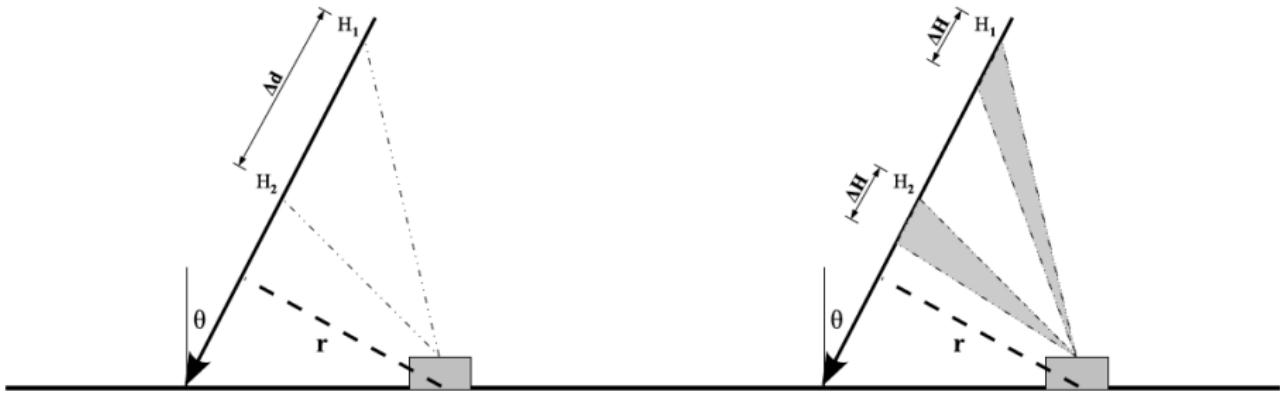


old Auger Results

- Upper limit on *photon fraction* from FD

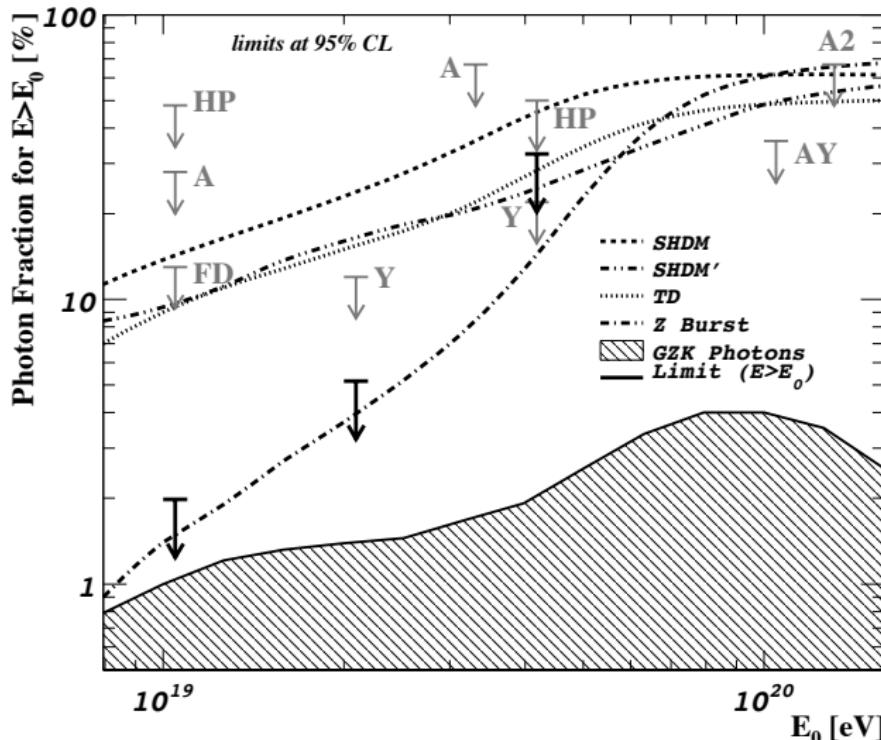


Shower Front Info from SD



New Auger Results

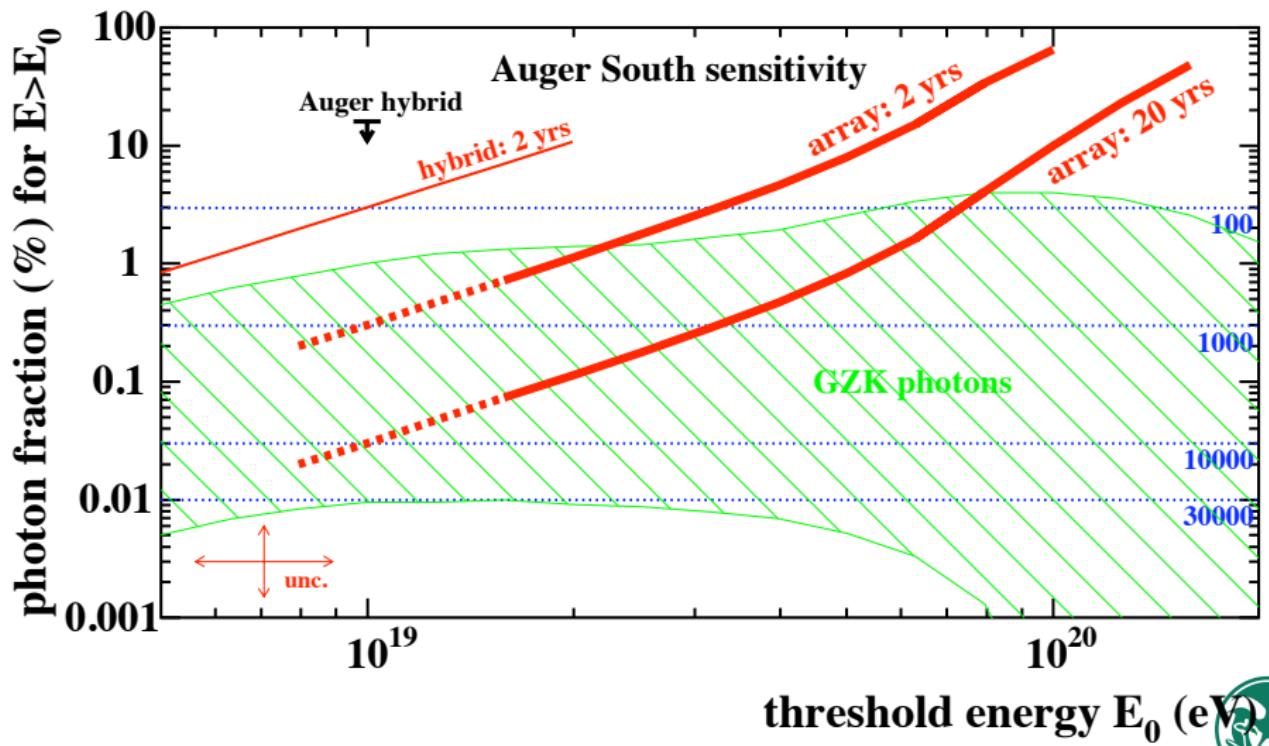
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Astroparticle Physics 29 (2008) 243



Photon's Northern Outlook



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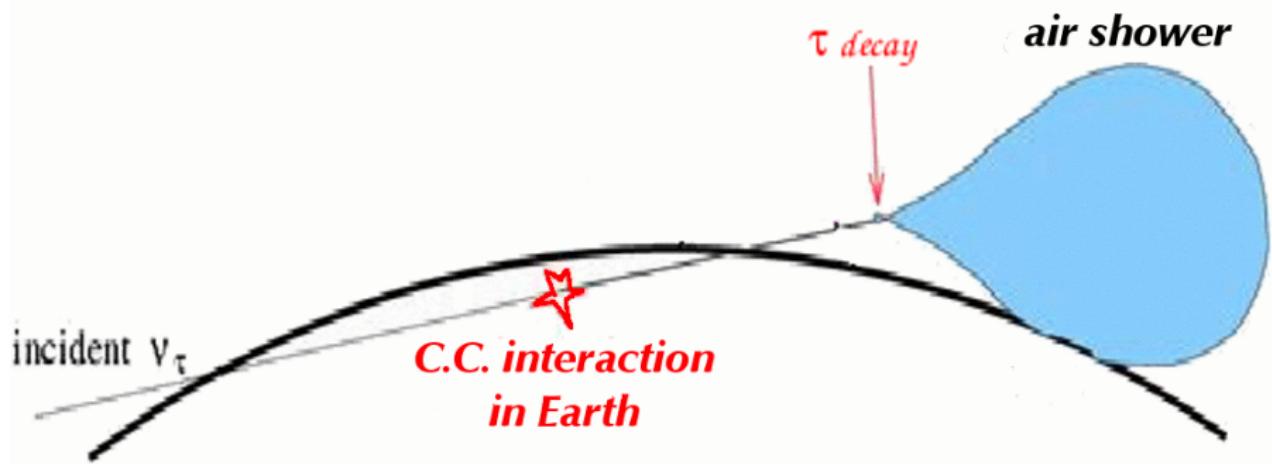
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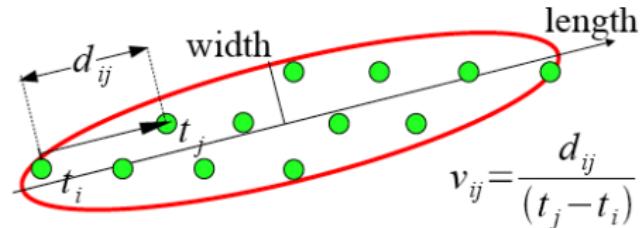
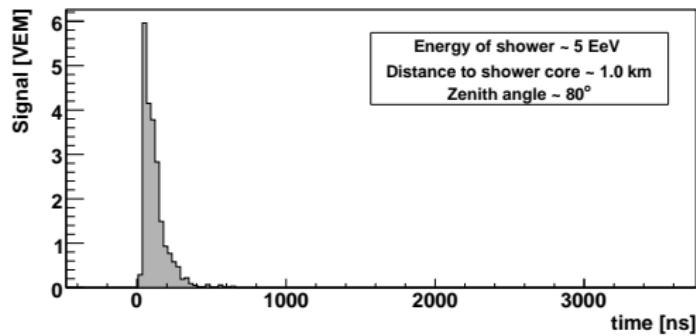
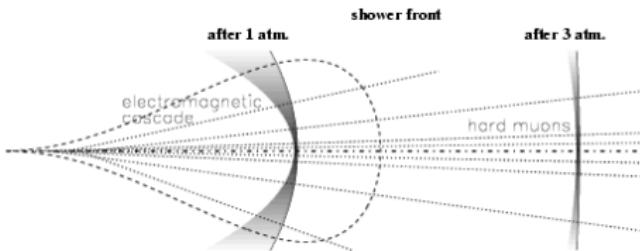
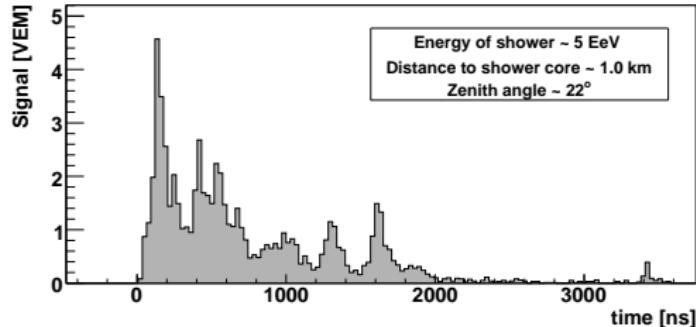
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Skimming Neutrinos



Neutrino Identification



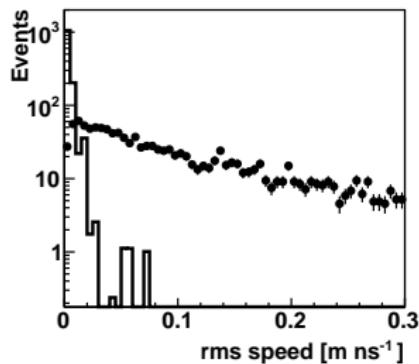
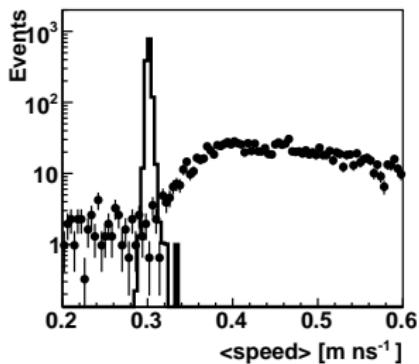
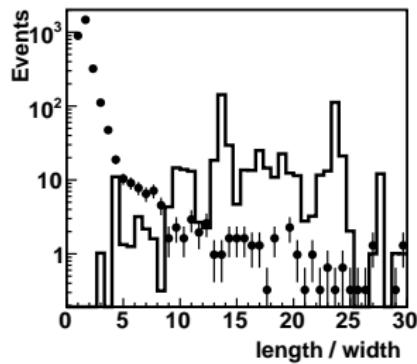
Event Selection

Data

- **young showers**
- Jan '04 – Aug '07

Selection

- length/width > 5
- $V \approx c$



Results

- No candidates
- 80% efficiency



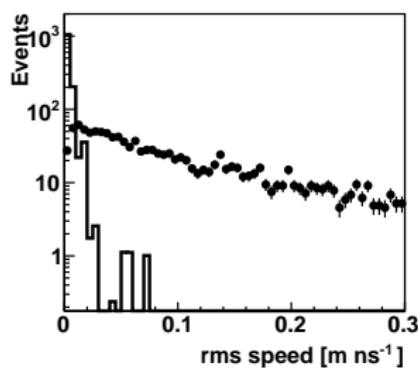
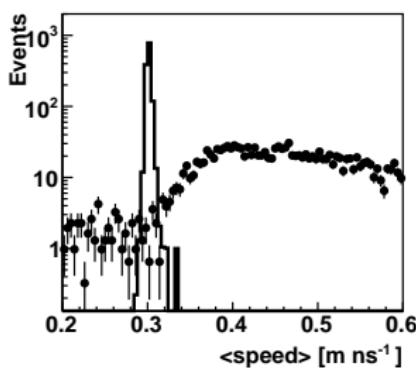
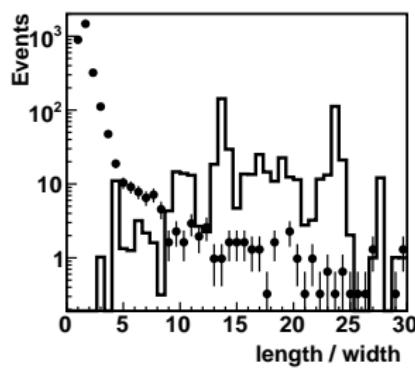
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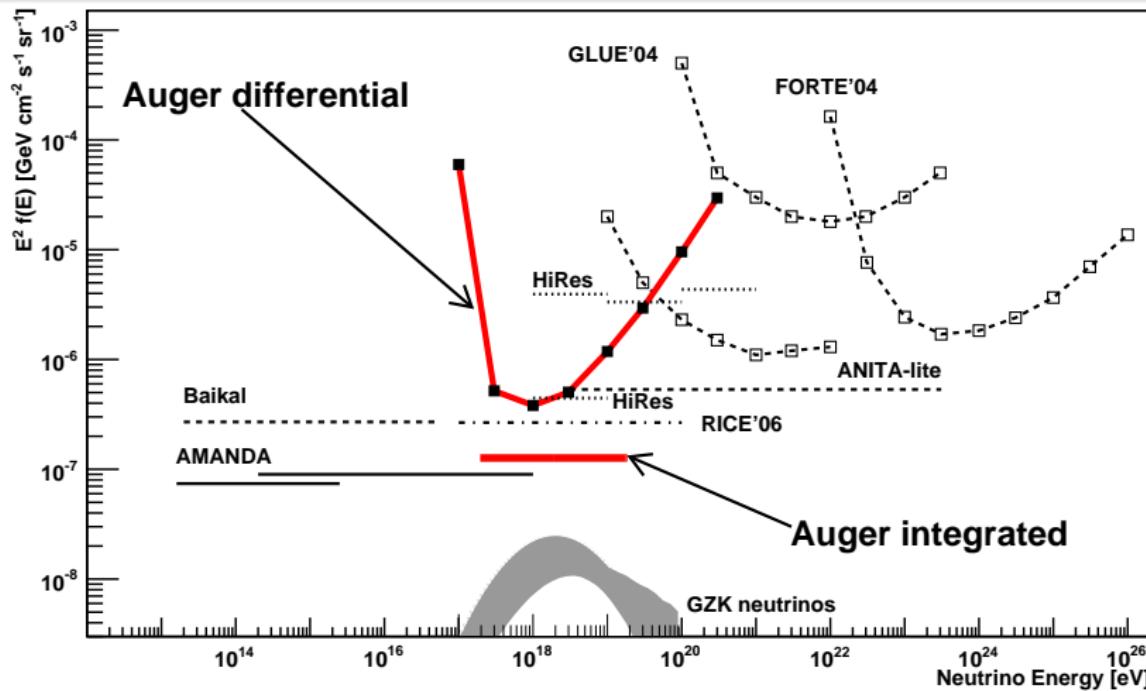
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Neutrino Flux Limit @ 90% C.L.

$$E_\nu^2 f(E_\nu) < 1.0^{+0.3}_{-0.5} \times 10^{-7} \text{ GeV cm}^{-2} \text{ s}^{-1} \text{ sr}^{-1}$$



Physical Review Letters 100 (2008) 211101

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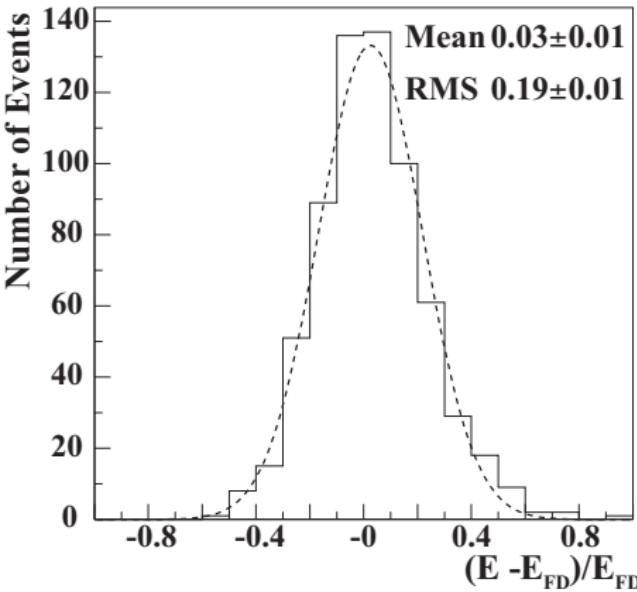
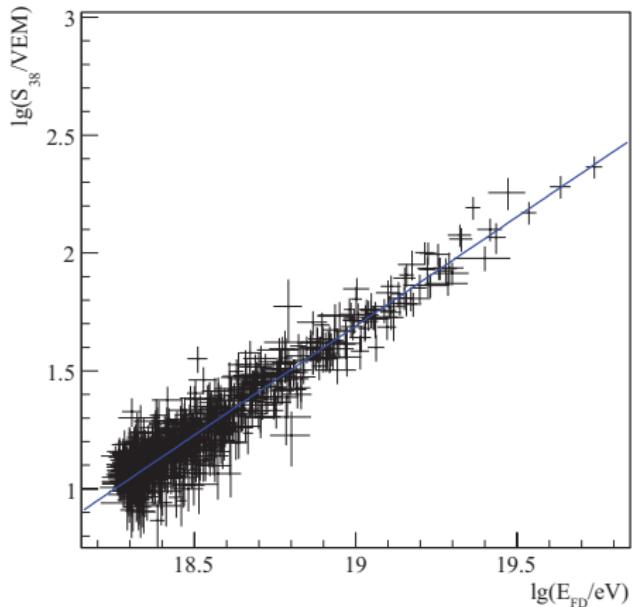
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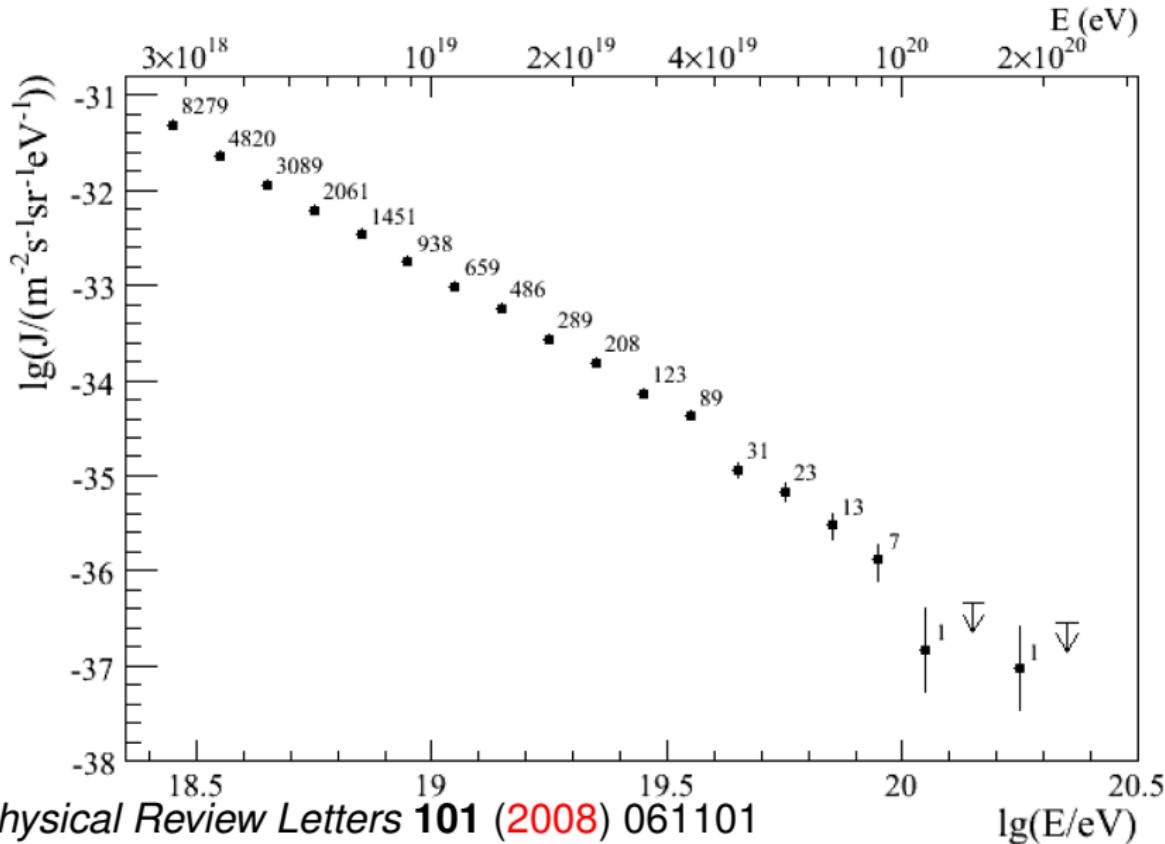
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the energy calibration



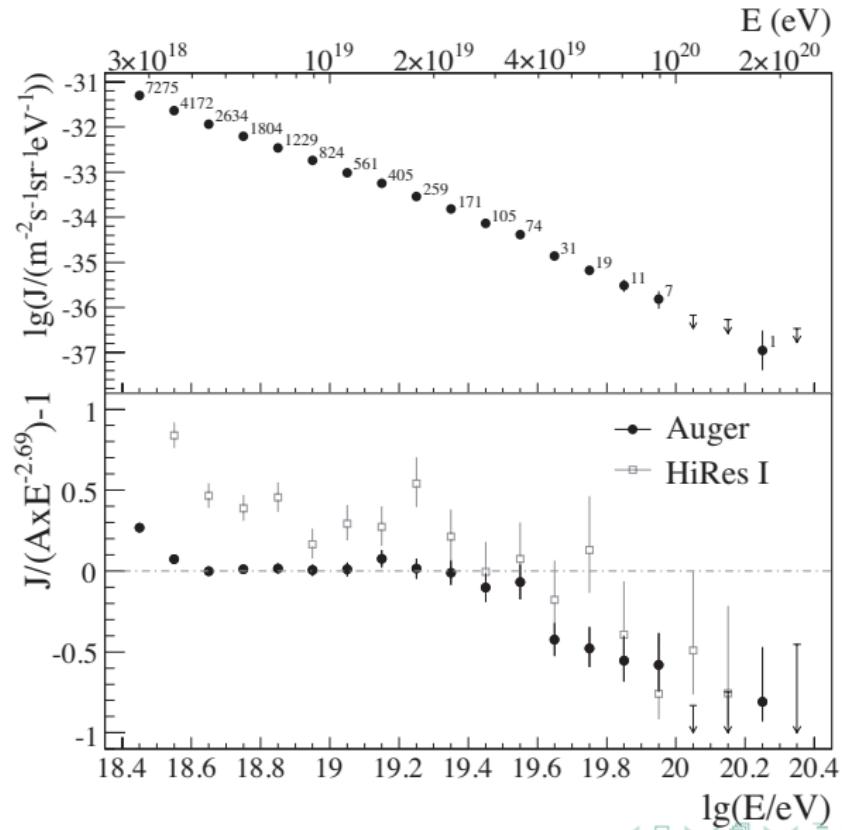
the SD spectrum



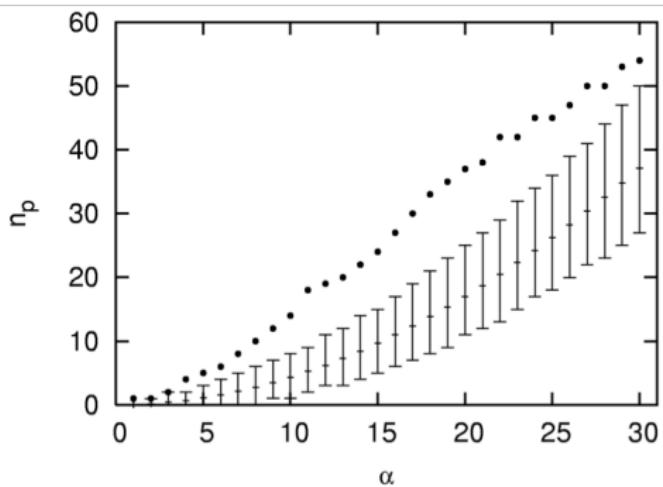
Physical Review Letters **101** (2008) 061101



the spectrum comparison



Coming soon to a Conference near you!



1

More Anisotropy

- 2-point correlation
- discrimination among different scenarios

2

More Composition

- elongation rate
- photon limits down to 1 EeV
- down-going neutrinos

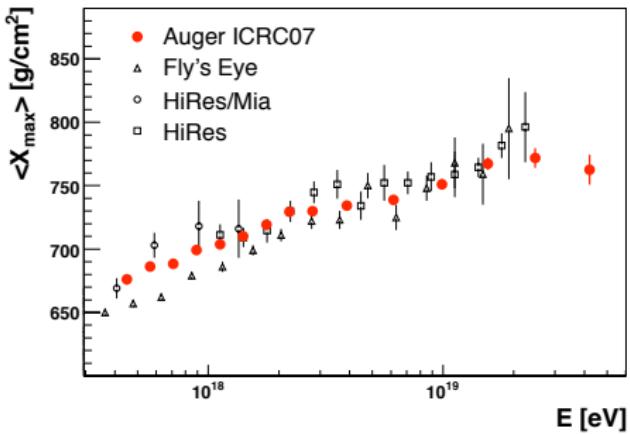
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More Energy

- hybrid spectrum
- combined spectrum and implications



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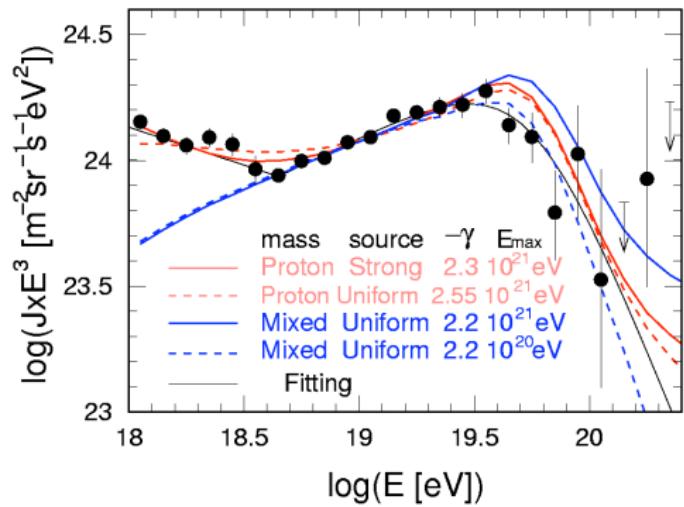
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Summary

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- First **anisotropy** result above GZK energies
- First **photon** and **neutrino** limits from a CR detector
- Most precise measurement of the **GZK suppression**

Outlook

- Combined (**hybrid**) measurements
- Lower energy detectors coming online
- Auger North = **EXCELLENT**



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Thank you very much!

Appendix I



Science 318 (2007) 939

Correlation of the highest energy cosmic rays with nearby extragalactic objects



Astroparticle Physics 29 (2008) 243

Upper Limit on the Cosmic-Ray Photon Flux Above 10^{19} eV Using the Surface Detector of the Pierre Auger Observatory



Physical Review Letters 100 (2008) 211101

Upper Limit on the Diffuse Flux of Ultrahigh Energy Tau Neutrinos from the Pierre Auger Observatory



Physical Review Letters 101 (2008) 061101

Observation of the Suppression of the Flux of Cosmic Rays above 4×10^{19} eV

