The ANITA anomalous events and expected events in Auger

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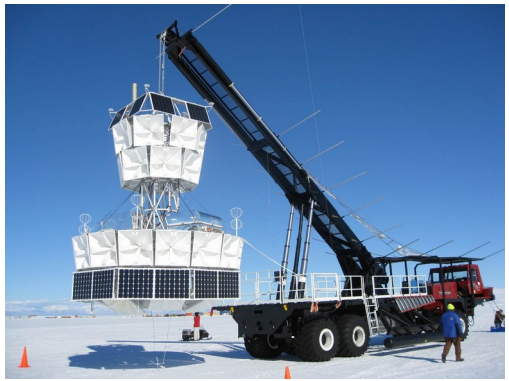
4th LIP/IGFAE workshop

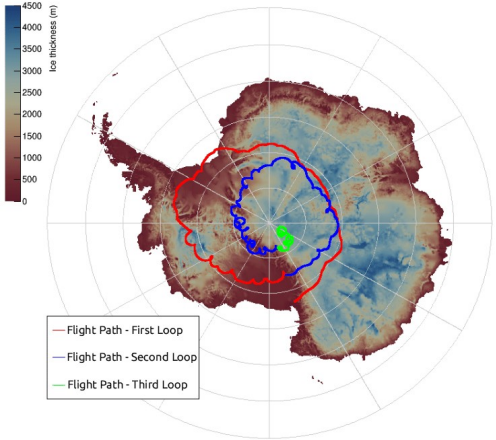
Outline

- What is ANITA?
- Why were some of their events called “anomalous”?
- Some of the possible explanations.
- What can we do with Auger?

The ANtarctic Impulsive Transient Antenna

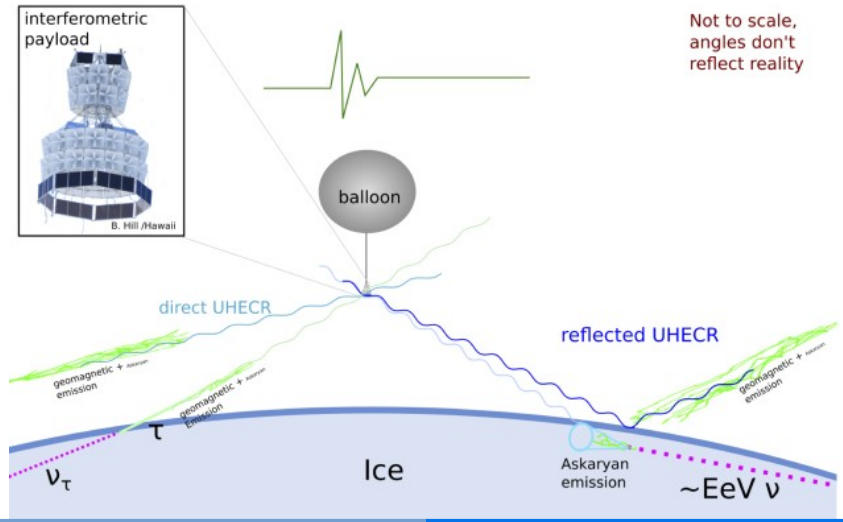
- ANITA is an array of antennas hanging from a stratospheric baloon.

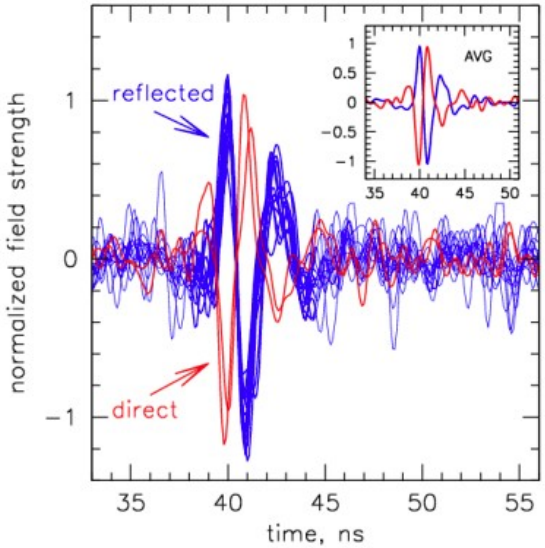




The ANtarctic Impulsive Transient Antenna

- ANITA is an array of antennas hanging from a stratospheric baloon.
- Detects radio pulses of showers developing in ice and air.

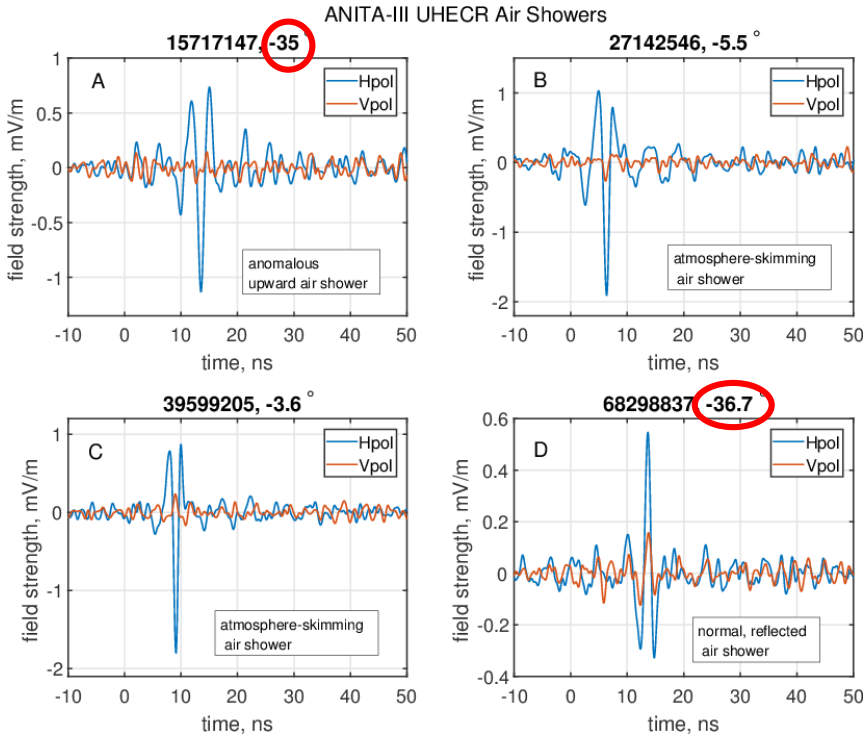




- We distinguish between direct and reflected events by their polarity.

The anomalous events

- Events from below the horizon that have no polarity inversion.



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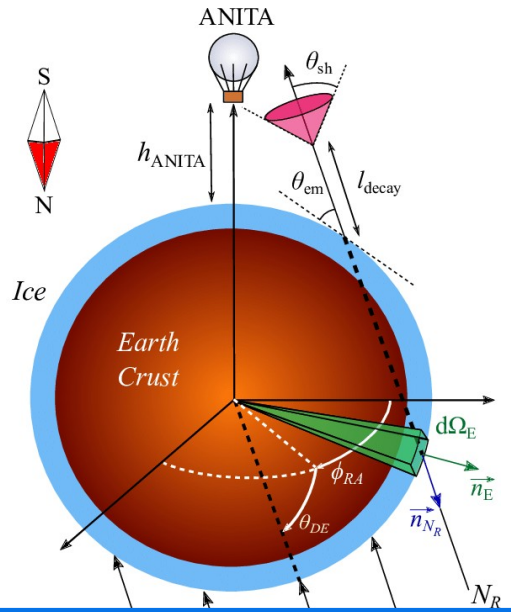
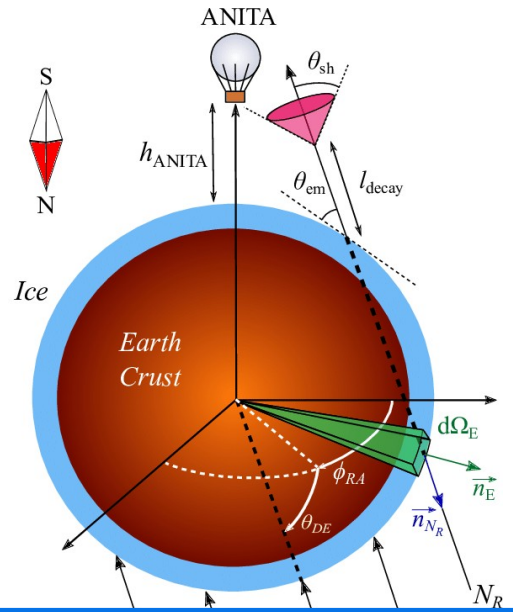


The anomalous events

- Events from below the horizon that have no polarity inversion.
- They are anomalous because, at a primary energy of 0.56 EeV, there is no SM particle that can go through that much matter.



The anomalous events: some explanations

- BSM model particle.
- Transition radiation of a shower from ice to air.
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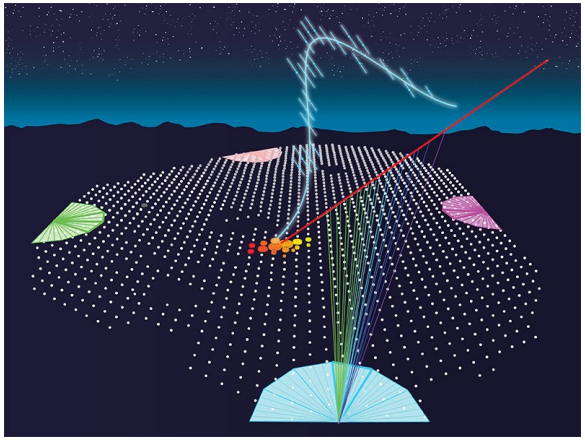
- Sub-surface reflectors.
- ...
- Astrophysical origin in tension with IceCube observations.

What can we do with Auger?

- Auger is a hybrid detector:



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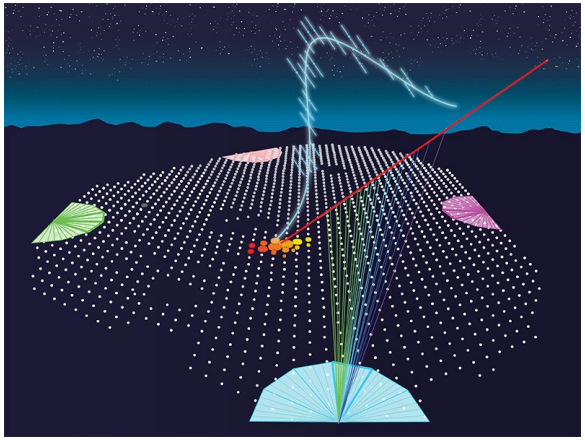

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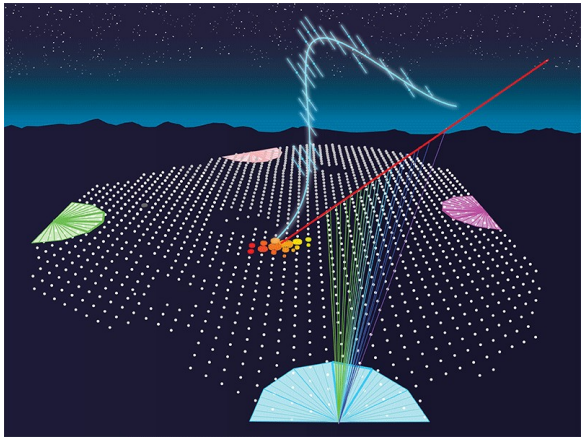

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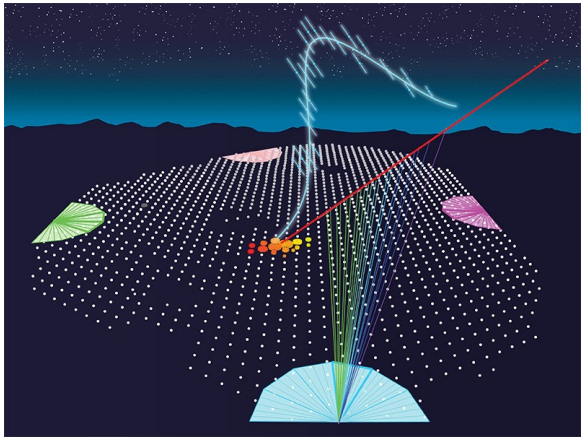

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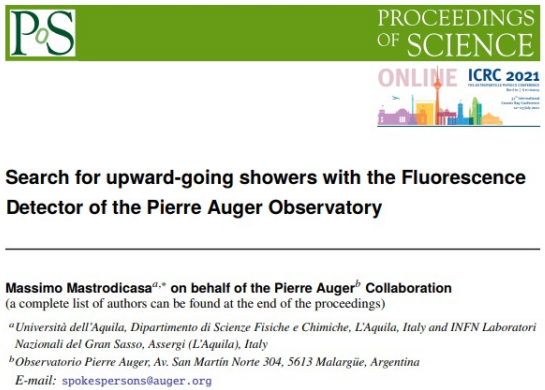

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ONLINE ICRC 2021

Search for upward-going showers with the Fluorescence Detector of the Pierre Auger Observatory

Massimo Mastrodicasa[a,*] **on behalf of the Pierre Auger**[b] **Collaboration**
(a complete list of authors can be found at the end of the proceedings)

[a] *Università dell'Aquila, Dipartimento di Scienze Fisiche e Chimiche, L'Aquila, Italy and INFN Laboratori Nazionali del Gran Sasso, Assergi (L'Aquila), Italy*
[b] *Observatorio Pierre Auger, Av. San Martín Norte 304, 5613 Malargüe, Argentina*
E-mail: spokespersons@auger.org

- In 14 years of data, 1 possible candidate was found.

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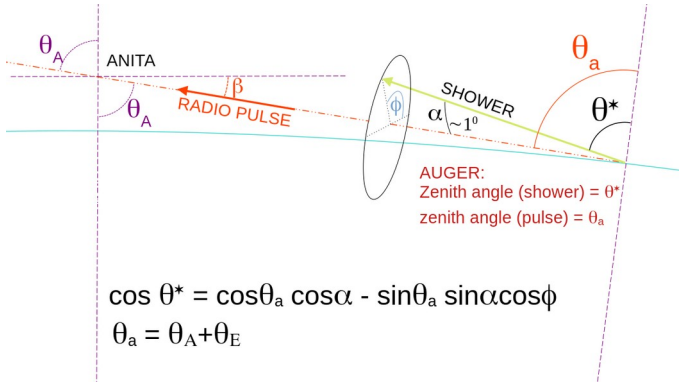

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  4. Apply the ANITA derived flux to Auger's aperture and get the expected events.
  5. Compare with the events seen at Auger.

First findings

- ANITA is more sensible to lower energies, so steep fluxes favor these anomalous events.

- Even for the more conservative fluxes the tension seems to be considerable.