Outreach and Open Data with the Pierre Auger Observatory

The Pierre Auger Collaboration

JENA Computing Workshop

Bologna, 12-14 June 2023

Summary of Outreach and Open Data at the Pierre Auger Observatory

Disclaimer:
This presentation contains (probably a personally biased) summary of several of our activities done for Outreach and Open Data.
Not all activities done by the Outreach and Open Data tasks are represented here.

The slides presented in this talk are a collection of slides from several colleagues
- I hope to convey the right message to you
  - All errors and omissions are mine

Pierre Auger Observatory

One SD station and one FD site
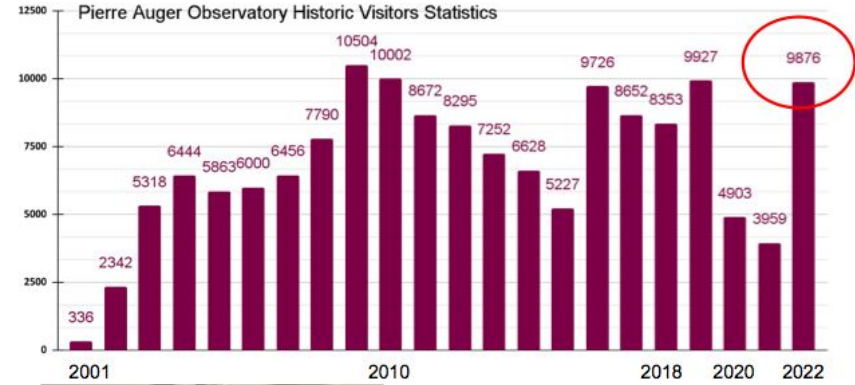

Malargüe main avenue

Visitor's Center and CDAS

Pierre Auger Southern Observatory

Pierre Auger Observatory
renewed Visitor Center

Pierre Auger Observatory Historic Visitors Statistics

336 2342 5318 6444 5863 6000 6456 7790 10504 10002 8672 8295 7252 6628 5227 9726 8652 8353 9927 4903 3959 9876

2001   2010   2018 2020 2022

Thanks to R. Sarmento

Pierre Auger Observatory
annual Science Fair

Thanks to R. Sarmento

@Pierre Auger Observatory goes to the School

El Chacay

La Junta

Selected schools on Malargue Map: red: just visited!

Thanks to B. Garcia and K. Caballero Mora

@Pierre Auger Observatory goes to the School

El Chacay school: students from 11 to 13 years, their teachers and Pedro Barraza!!

Women and Girls in Science
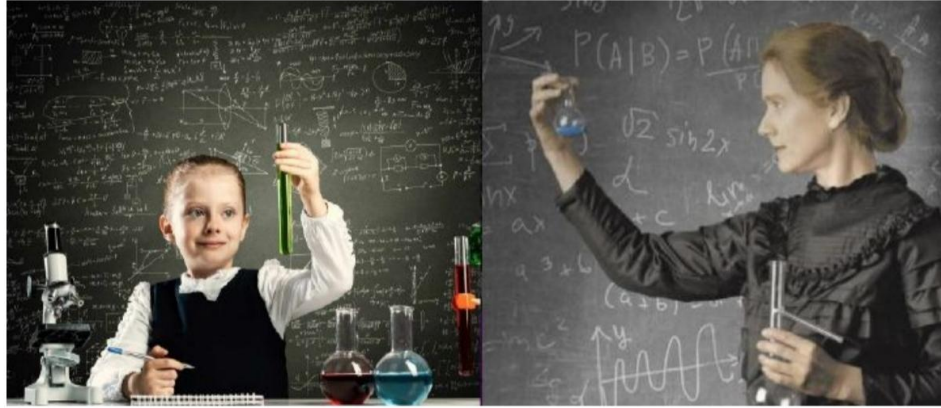
Art and Science contest deadline Oct 1st, 2023

Drawing and painting contest "Women and Girls in Science 2023", select 13 works to identify the months of the year 2024 (plus one, which will be on the cover), in a special edition of the Pierre Auger Observatory Calendar.

https://visitantes.auger.org.ar/index.php/dia-internacional-de-las-mujeres-y-las-ninas-en-ciencias/

Thanks to B. Garcia and K. Caballero Mora

International Masterclasses
on particle physics
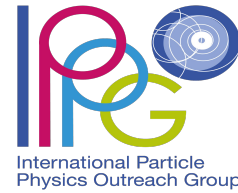
- Every year ~13000 high-school students from 60 countries
- "Scientists for one day with the hands on particles"
- Typically between February and April

International Masterclasses
19th International Masterclasses 2023

Thanks to R. Sarmento

Auger Masterclasses
events at IMC 2023

- 3 Masterclass events!
- ~550 students at 12 institutions

Thanks to R. Sarmento

Open Science @ the Pierre Auger Observatory

- **An open history:** following the FAIR principle
  - Since 2007 1% data available in simplified format for outreach purposes

- **An open present:** since Feb 2021 release of 10% cosmic-ray data
  - Auger Open Data portal https://opendata.auger.org/
  (Description of the Observatory and how data are collected and reconstructed)
  - Diverse outreach and public engagement activities
  (International Cosmic day, International Master Classes, …)

- **An open future:**
  - In 2024 increase fraction of open access data to 30%
  - participate in inter experiment consortiums for data sharing
  - combined analyses and multi-messenger studies (AMON, GCN alerts, …)

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https://opendata.auger.org

DOI:10.5281/zenodo.4487612
```

The Auger Open Data Portal

- 10% of Cosmic Ray data in portable format

~ 30000 events above 2.5 x 10^{18} eV

- 100% low energy data for space-weather studies
- Software & Visualization tools
- Outreach section dedicated to the general public

Open Data portal
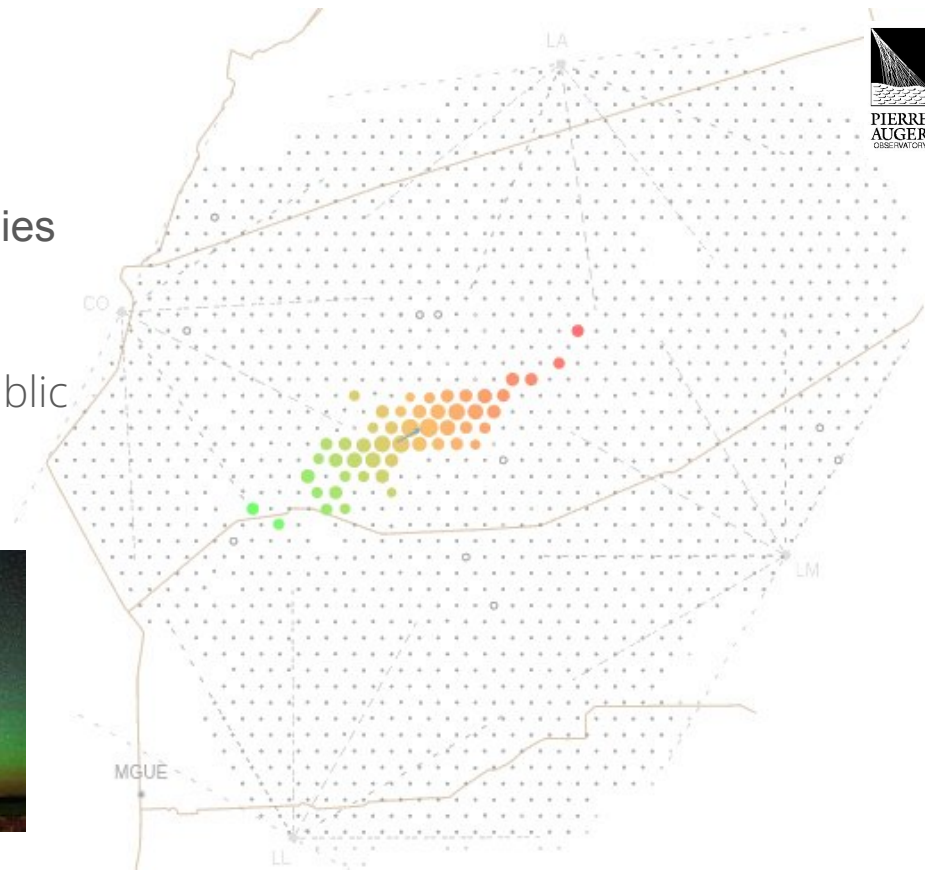
Thanks to V. Scherini and M. Buscemi

Open Data: file format

- Standard format for open data
  - Adaptable & portable

- close to raw data in JSON format
  - headers metadata
  - detectors sections
  - reconstructed and close to raw data

- High level info in CSV summary file

- Detailed description of data content

JSON   Raw Data   Headers

Save   Copy   Pretty Print

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Thanks to V. Scherini and M. Buscemi

Data handling tools

Exemplary-code based on Python Notebooks available on Kaggle
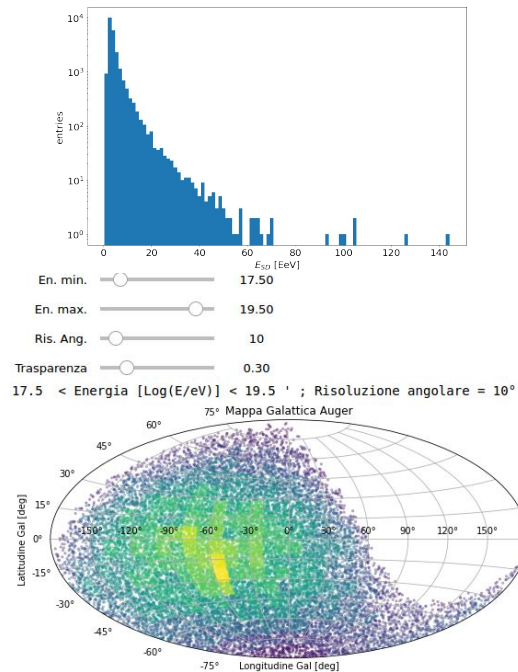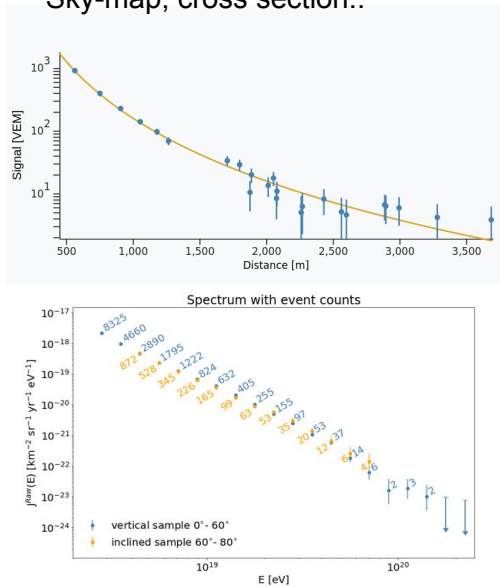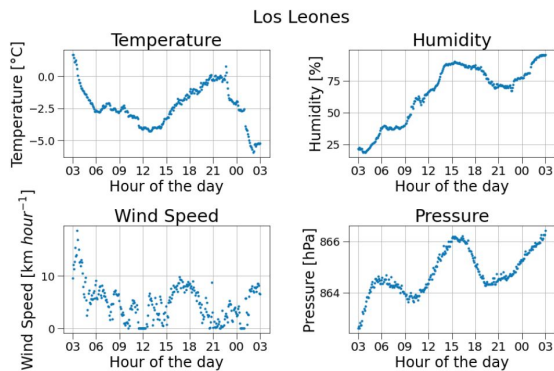
Thanks to V. Scherini and M. Buscemi

Open data: visualization
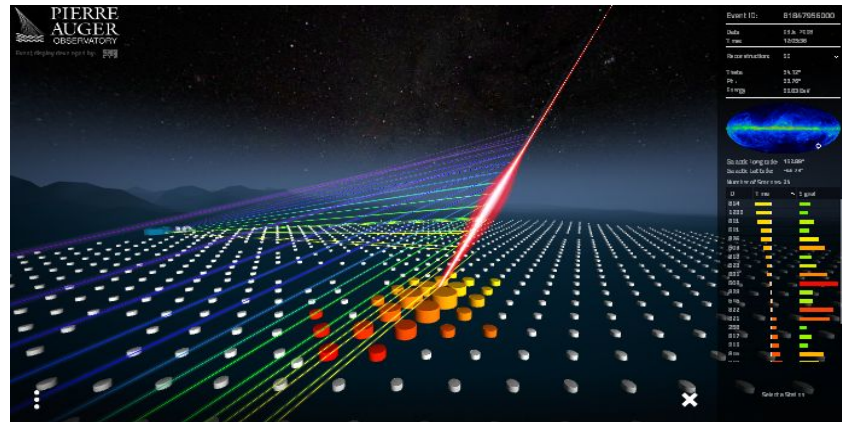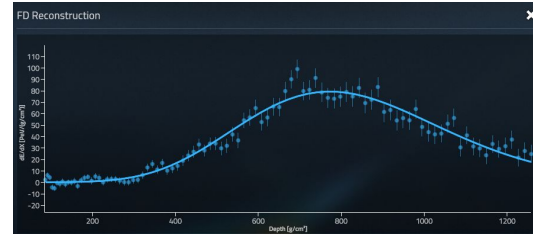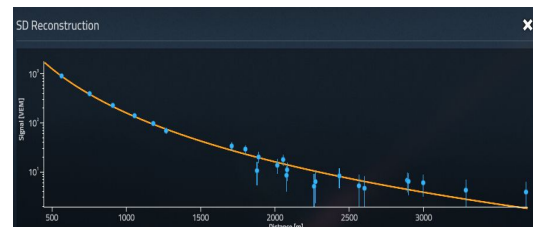
- Immersive 3-dimensional viewer for each event

  - Interactive Observatory map

  - Event reconstruction

  - Sky-map

Built with

Sky map in galactic and equatorial coordinates

Lateral and longitudinal profiles

Thanks to V. Scherini and M. Buscemi