

# Advances on the Pierre Auger Outreach and Education program

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on behalf of the Pierre Auger Collaboration



# The Pierre Auger Observatory



(UMD)



Underground muon detectors  
(24+)

Pierre Auger Observatory

More than 400 members, 98 institutes  
17 countries

Southern hemisphere:  
Malargue, Province Mendoza, Argentina

Radio antenna array  
(153 antennas, 17 km<sup>2</sup>)



Loma Amarilla



Coihueco

HEAT

AERA  
AMIGA

Sub-array of 750 m  
(63 stations, 23.4 km<sup>2</sup>)

Los Morados

LIDARs and lasers  
facilities



4 Fluorescence detectors  
(24 telescopes up to 30°)

High elevation telescopes  
(3)



Central Campus

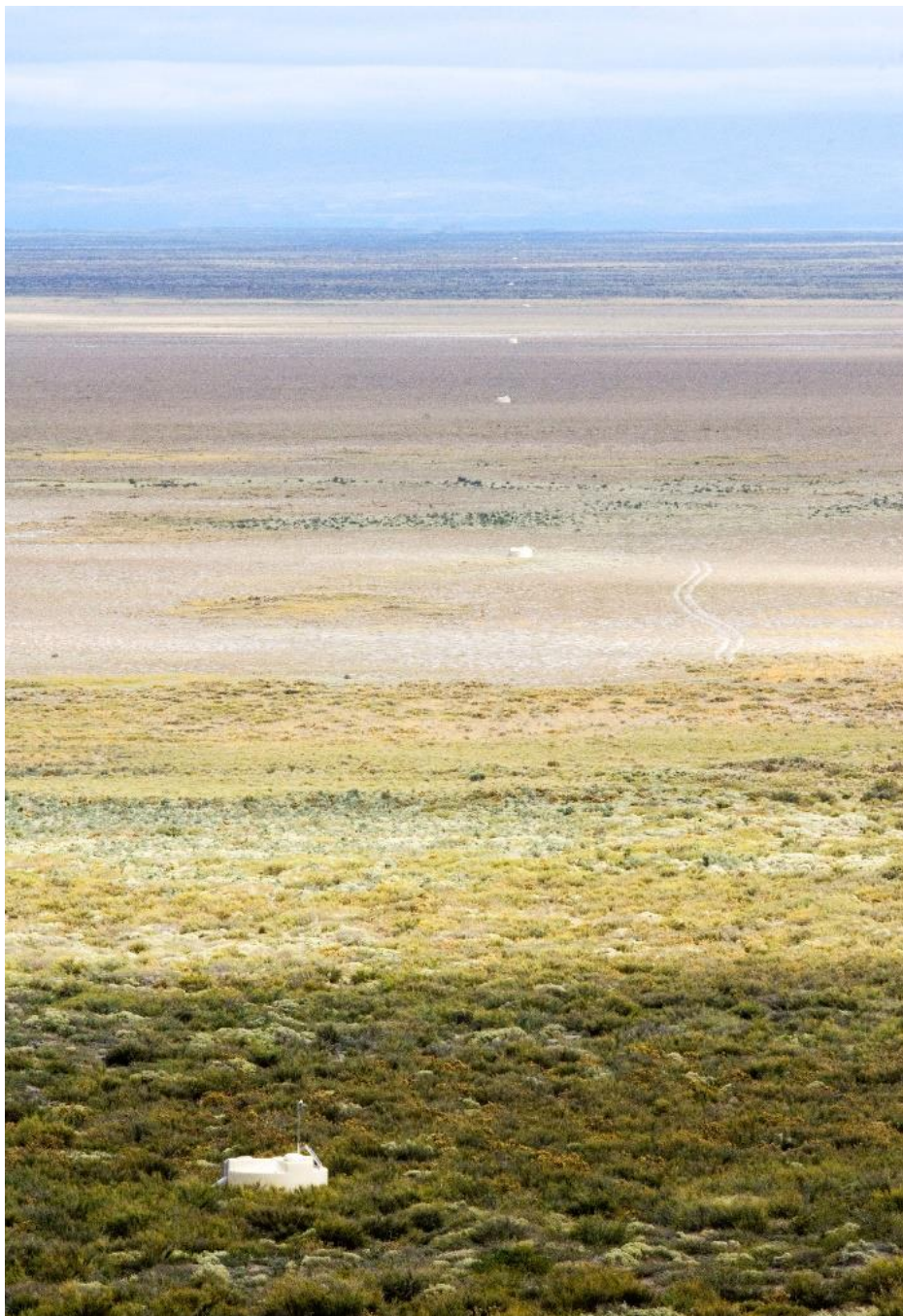
Los Leones



1665 surface detectors: water-Cherenkov  
tanks (grid of 1.5 km, 3000 km<sup>2</sup>)



Traveling through the roads and highways inside the Observatory region, it is possible to distinguish the water tanks following straight lines which disappear in the distance



The growth of the observatory is bound to the interaction with the community of the place where it is located, Malargüe, Argentina.



<https://visitantes.auger.gov.ar>





# The Visitor Center



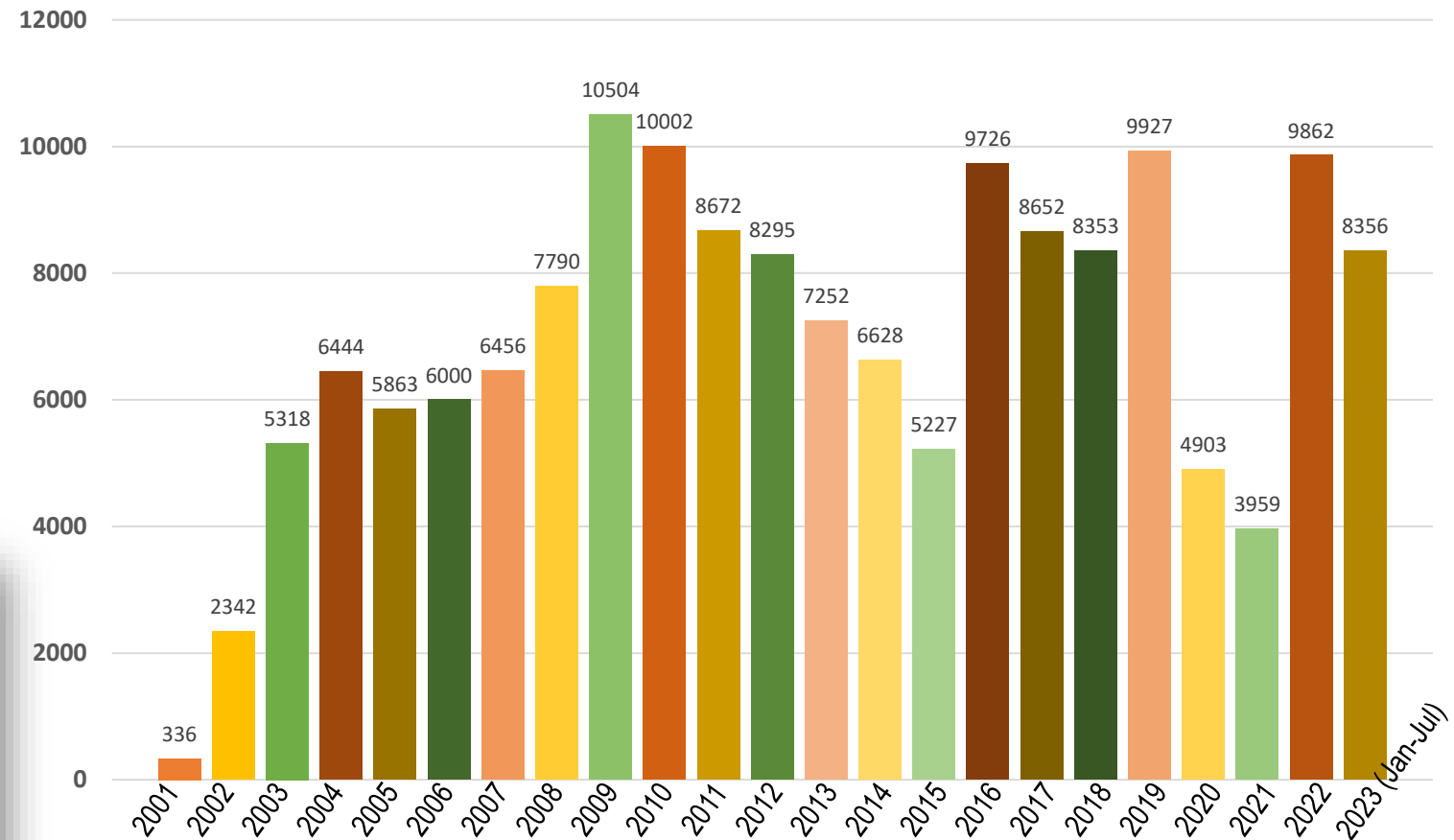
Office building




**Observatorio Pierre Auger Malargüe**  
 26 aprile · 🌐  
 Novedades en las visitas en el Observatorio Pierre Auger: 40 estudiantes de 6to y 7mo grado y sus docentes de la Escuela Comodoro Luis Py de San Rafael, Mendoza, experimentaron con centelladores y fibras ópticas, parte del desarrollo del proyecto AMIGA (Más info en <https://visitantes.auger.org.ar/index.php/amiga>)



**Permanent exhibition:**  
 exposition of instruments, interactive exhibits and immersive element.  
 Hands on Activities



- PAO data taking start 2004, in 2008 full array operational
- At the end of 2015, a more interactive visit
- 2020 2021- pandemic years

# The new Visitor Center

After almost a year of preparation, the new VC was inaugurated in March 2023.



Detectors prototype



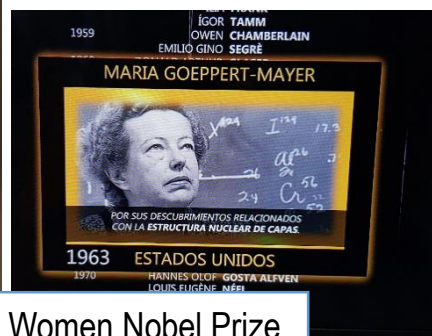
Virtual Reality



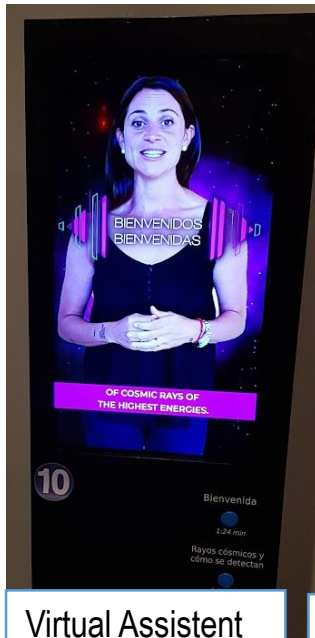
Focus on discoveries



IN 2017 THE AUGER COLLABORATION PUBLISHED IN THE PRESTIGIOUS MAGAZINE "SCIENCE"



Women Nobel Prize



Virtual Assistant

**FRONTIERS winter school**  
**VIRTUAL VISIT TO PIERRE AUGER OBSERVATORY**  
 Friday 5 February 2021 - 17.30-18.30 CET  
 BROADCASTING LIVE  
 facebook.com/frontierseu  







**Development during pandemic**

Observatorio Pierre Auger Margutíe  
 5 gennaio -  
 Las visitas en Observatorio Pierre Auger son auto guiadas a lo largo de todo el año y también es posible realizarlas de manera virtual, a través de nuestra audioguía, en izi.TRAVEL

**Online AudioTour in spanish and english**

izi.TRAVEL  
**Pierre Auger Observatory**  
 El Observatorio Pierre Auger está destinado al estudio de los Rayos Cósmicos de ultra elevada...



# Science Fair and Going to Schools

## Feria de Ciencias Auger



The Pierre Auger Observatory Science Fair provides a space where students can show their research skills and understanding for new scientific insights. The students exhibit their work developed together with their peers under the guidance of their teachers. They share and present the ideas to the international researcher of the Observatory.



**¡PRESENTÁ TU PROYECTO y VIVÍ una gran experiencia científica junto al equipo investigador del Observatorio Pierre Auger!**

**16 y 17 de noviembre de 2022**

**Ejes temáticos**  
Los objetivos de desarrollo sustentable establecidos por las Naciones Unidas.

Los grupos cuyos trabajos sean preseleccionados recibirán apoyo económico para su estadia en Malargüe.

**8ª Feria de Ciencias**  
OBSERVATORIO PIERRE AUGER

**Escuelas de nivel primario y secundario**  
INSCRIPCIONES HASTA EL 21/10/2022

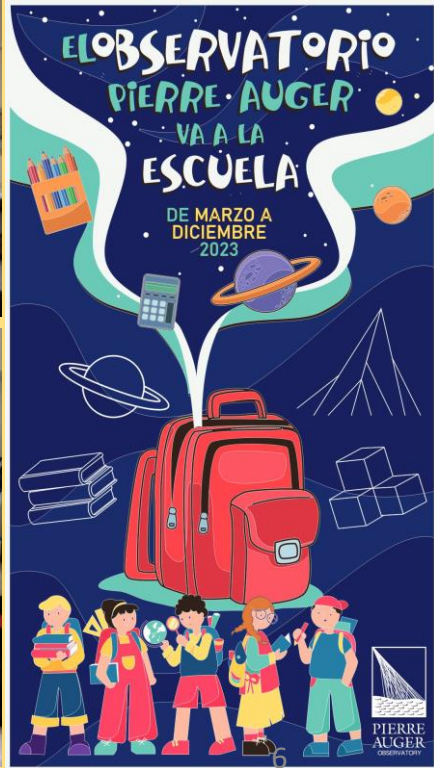
**CONTACTO** feria@auger.org.ar  
**+ INFO** https://visitantes.auger.org.ar

Observatorio Pierre Auger Malargüe  
@observatoriopierreauger

Malargüe  
PIERRE AUGER OBSERVATORY



The Pierre Auger staff visits the school of the Malargue area

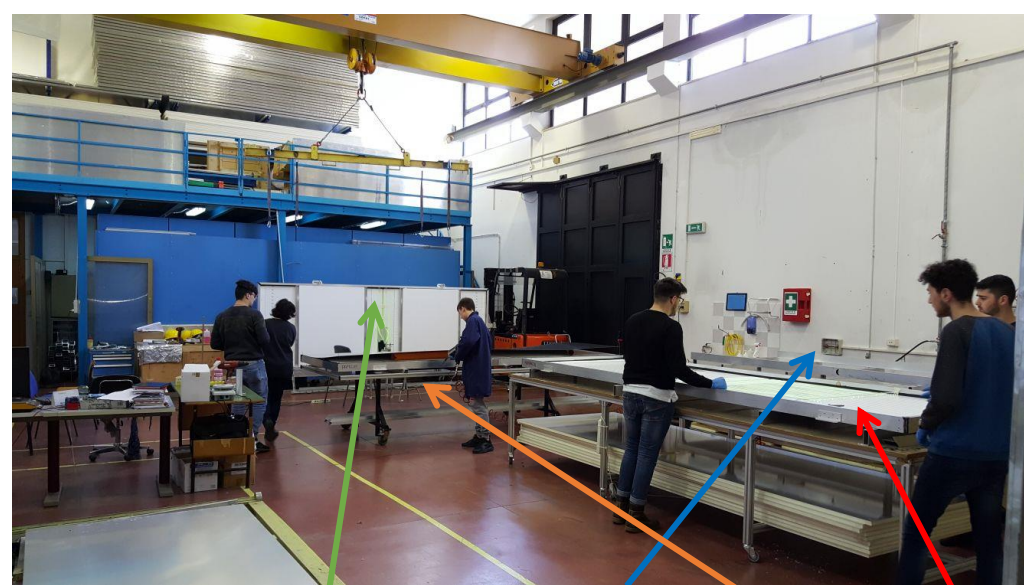




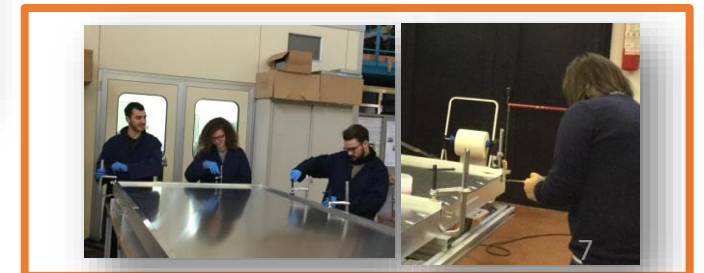
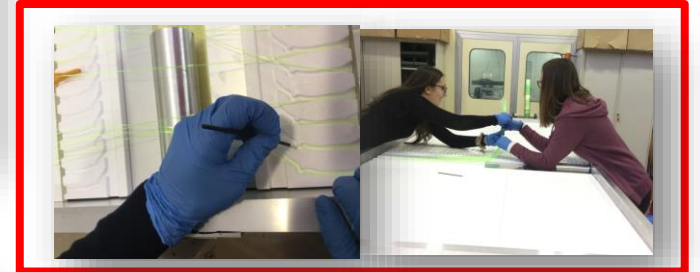
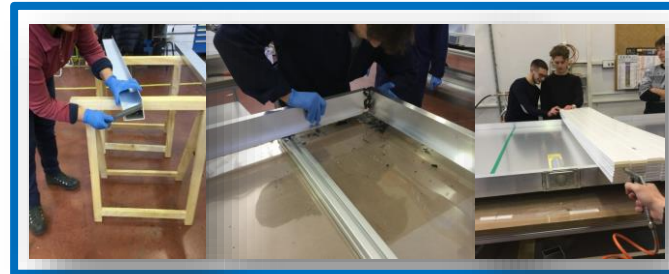
# The Upgrade of the Observatory – cooperation with students

The upgrade of the Observatory includes, among others the production of around 1500 scintillator detectors modules. In Italy a specific project involving students has been introduced (UniSalento and INFN Lecce) – (pre-covid activity)

- Security training
- Introduction on Cosmic Rays and Auger (usually a small group 4/5 people interacting with a researcher-tutor 30 min)
- The students follow all the phases of production («DOING PHYSICS BY HANDS») while talking about detection methods, and physics related issues



4 main production steps (frame assembling – fiber insertion – cookie alignment/cement – top closing).

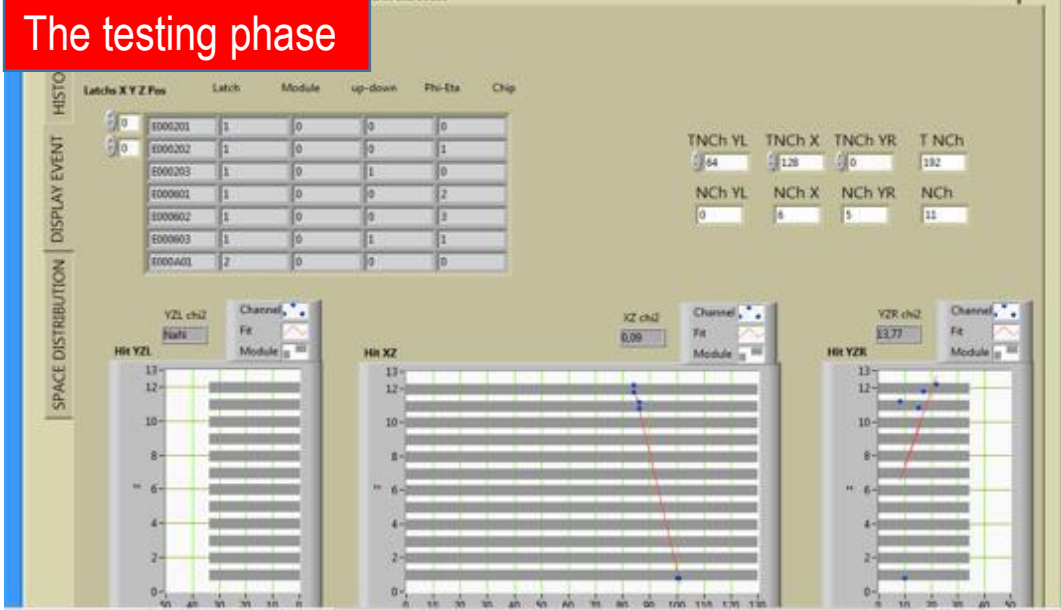


Interaction with collaborators from different institute/countries was often possible

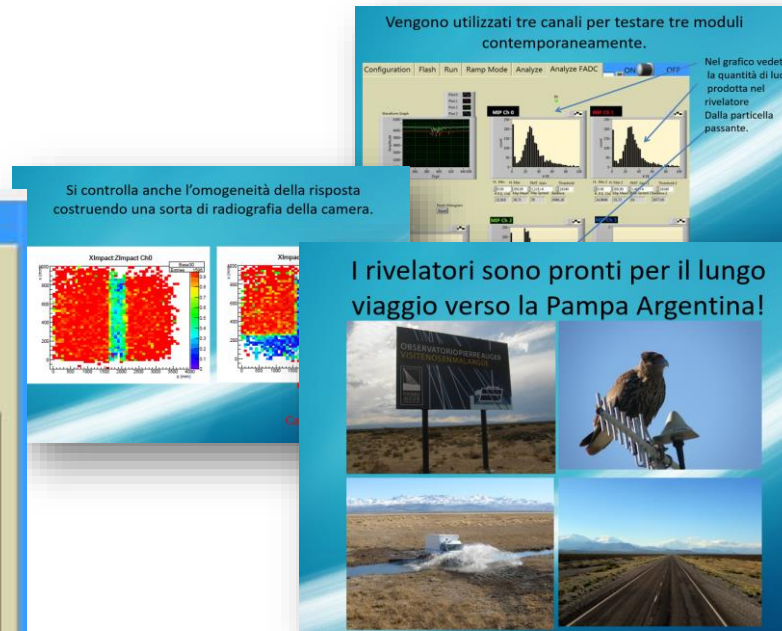
# The Upgrade of the Observatory – cooperation with students



The testing phase



1 or 2 weeks activity

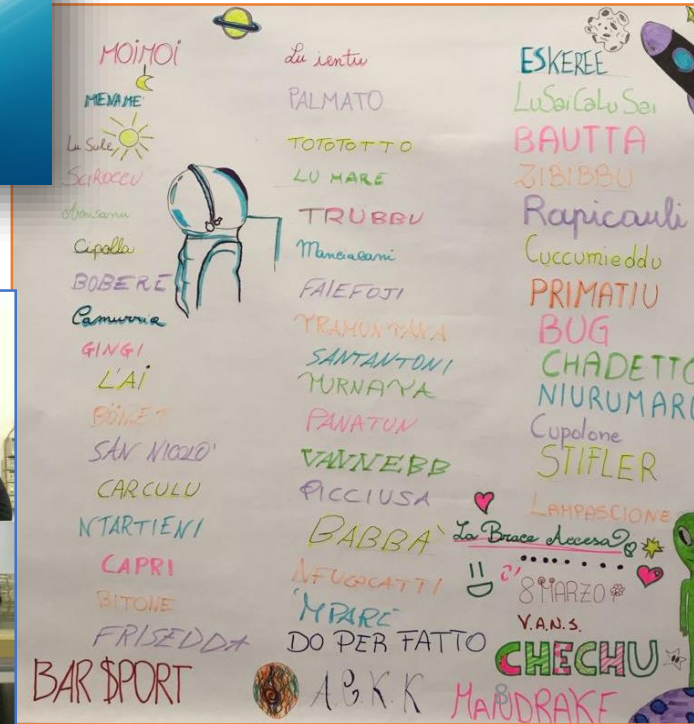


Celebrating special DAY



The REPORT: Presenting the results and their work to the researcher.

#SSD Nicknames

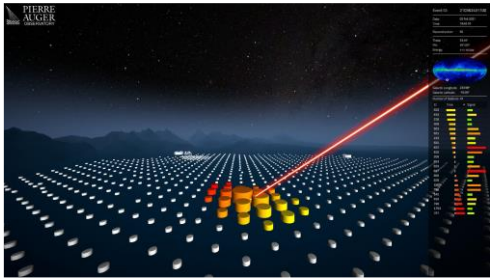




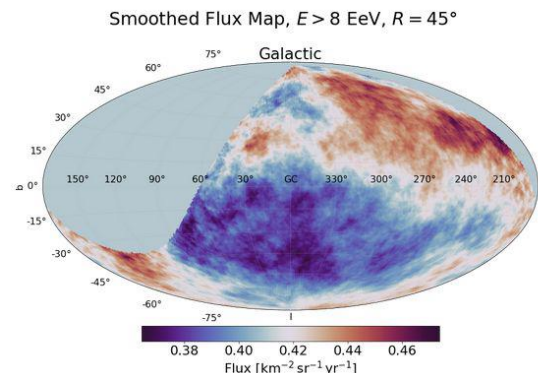
# From Open Data to Auger Masterclasses

A fraction of the data processed from the collaboration is made available to the public in a usable format.

<https://opendata.auger.org/>



- 3D display tool



- Analysis notebooks based on *python*

Masterclasses develop an experimental activity for **high-school students** to learn about astroparticle physics

- to analyse the **Auger public data** using a friendly interface based on the open data tools
- to reach **students worldwide** the activity has been integrated in the framework of the IPPOG Masterclasses on Particle Physics (IMC program)



Home  
Information for High School Students  
Information for Teachers and Educators  
Information for Institutes and Physicists  
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<http://physicsmasterclasses.org>



International Masterclasses  
19<sup>th</sup> International Masterclasses 2023



Each year more than 13.000 high school students in 60 countries come to one of about 225 nearby universities or research centres for one day in order to unravel the mysteries of particle physics. Lectures from active scientists give insight in topics and methods of basic research at the fundaments of matter and forces, enabling the students to perform measurements on real data from particle physics experiments themselves. At the end of each day, like in an international research collaboration, the participants join in a video conference for discussion and combination of their results. See [here](#) for media coverage. **International Masterclasses 2023** will take place from 13.2. - 31.3.2023.



# Auger Data Masterclasses in 2023



3 Masterclass events!  
~550 students  
12 institutions

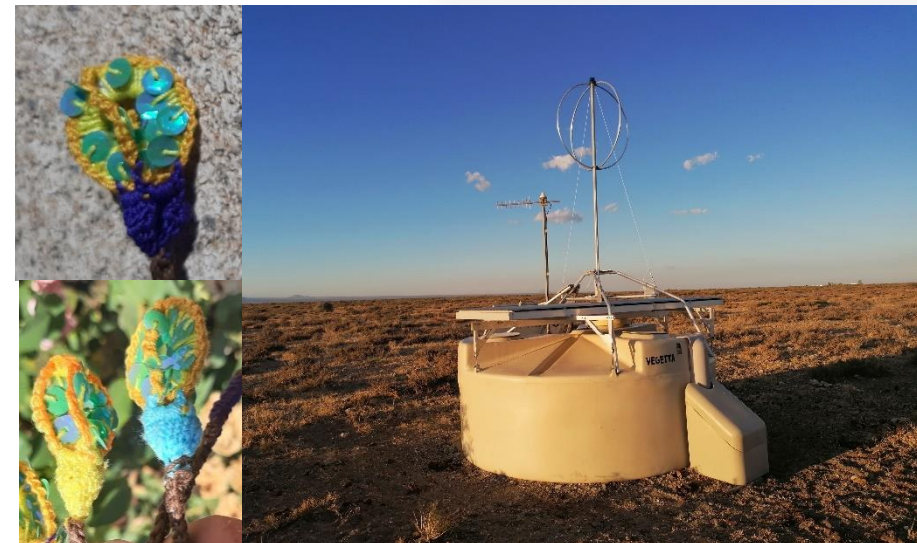
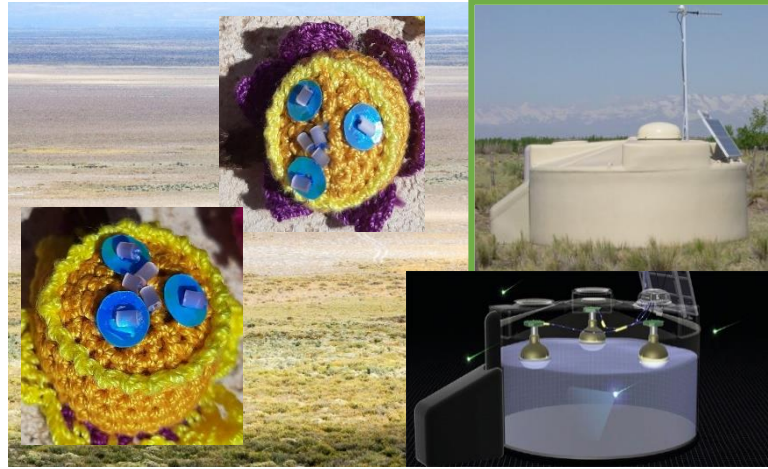
- Learning about astroparticle physics and detection
- Hands-on activity
- virtual visit and quiz





# Multidisciplinarity

In the contest of Art&Science across Italy: a mask to talk about the Pierre Auger Observatory, to improve observation and pattern recognition and enhance visual thinking.





# Summary and Outlook

- The Pierre Auger Observatory Outreach and Education program includes among others:
  - ✓ the visitor center conceived as a public engagement hub to involve people with the main discoveries and the latest developments in technology and research fields
  - ✓ a tight interaction with the school in Argentina and in the countries participating in the collaboration (open labs and visits to school)
  - ✓ various citizen science programs
  - ✓ the open data policy of the collaboration seed the development of masterclass available under IPPOG Master Classes Programs
  - ✓ the participation to programs targeting the “talk about science” to the population has driven the development of some “curiosity-tool” focused on the “emotional appeal” of the experiment