Auger Master Class with the Auger Open Data

use the many href's, like most screen-shots

Auger Master Class

- Previous Auger Master Class based on old open data-set and excel-type analysis
- ICRC 2015 contribution
- Leading developer of Auger Master Class: Raul Sarmento from Lisbon Auger Group
- ICRC contribution submitted
- Based on the Open Data Release of Auger

PROCEEDINGS OF SCIENCE

High energy astroparticle physics for high school students

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The questions about the origin and type of cosmic particles are not only fascinating for scientists in astrophysics, but also for young enthusiastic high school students. To familiarize them with research in astroparticle physics, the Pierre Auger Collaboration agreed to make 1% of its data publicly available. The Pierre Auger Observatory investigates cosmic rays at the highest energies and consists of more than 1600 water Cherenkov detectors, located near Malargüe, Argentina. With publicly available data from the experiment, students can perform their own hands-on analysis. In the framework of a so-called *Astroparticle Masterclass* organized alongside the context of the German outreach network *Netzwerk Teilchenwelt*, students get a valuable insight into cosmic ray physics and scientific research concepts. We present the project and experiences with students.

Pierre Auger Observatory Open Data

December 2022 release

The Pierre Auger Open Data is the public release of 10% of the Pierre Auger Observatory cosmic-ray data published in recent scientific papers and at International conferences , following the Auger Collaboration Open Data Policy. The release also includes 100% of weather and space-weather data collected until 31 December 2020. This website hosts the datasets for download. Brief overviews of the Pierre Auger Observatory and of the Auger Open Data are set out below. An online event display to explore the released cosmic-ray events, and example analysis codes are provided. An outreach section dedicated to the general public is also available.

Datasets

the released datasets and their complementary data

Visualize

an online look at the released pseudo raw cosmic-ray data

Analyze

example analysis codes in online python notebooks to run on the datasets

Catalog

of the highest-energy cosmic rays

Outreach

a page dedicated to the general public

Auger Master Class: Idea and Purpose

- to 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 by integrating the activity in the framework of the IPPOG Masterclasses on Particle Physics (IMC program)

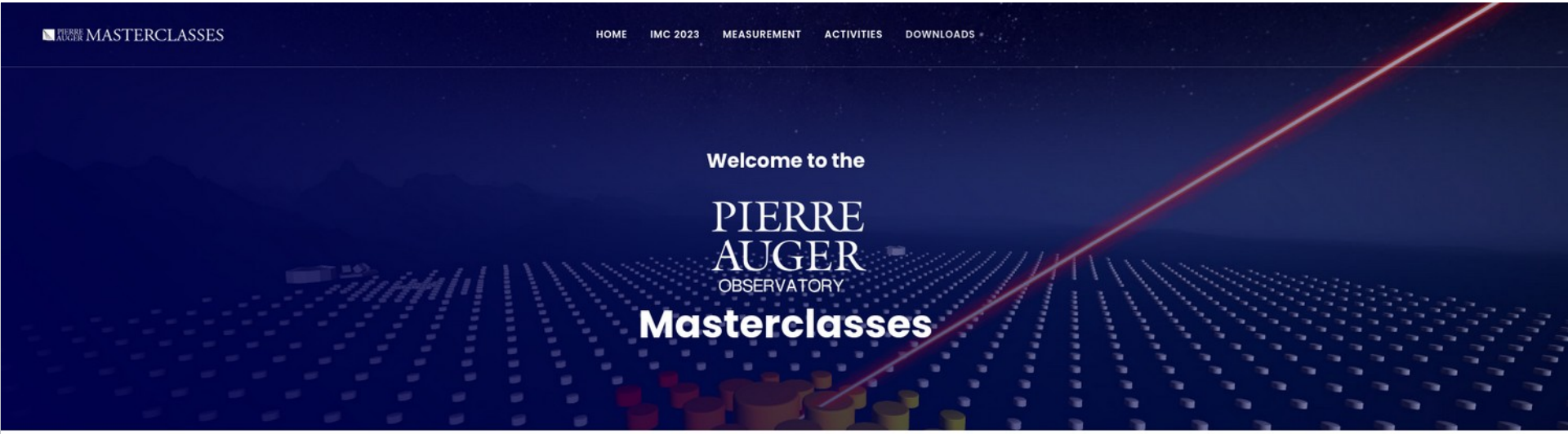
Auger Master Class: Concept

- Basic question: What is the origin of ultra-high energy cosmic rays?
- 3D display interface
  - event reconstruction: arrival direction + energy
  - event selection
- Python notebooks
  - smoothed, exposure-corrected sky map
    with reconstructed arrival directions of selected events

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

http://physicsmasterclasses.org



INTERNATIONAL MASTERCLASSES 2023

The masterclasses with the Pierre Auger Observatory in the IMC2023 will be held on three different days:

Europe - **18.03.2023**

Europe - **24.03.2023**

Europe - **04.04.2023**

Follow and tag us on:
#AugerMasterclass2023
#physicsIMC

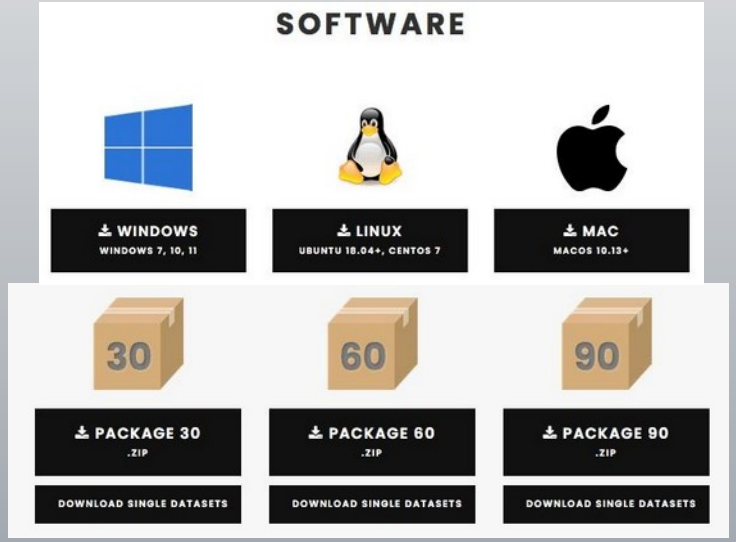
Auger Master Class: Day Schedule

https://augermasterclasses.lip.pt/

10:00 – 10:15	Registration and welcome
10:15 – 10:30	Introduction
10:30 – 11:45	Particle and astroparticle physics
11:45 – 12:15	Coffee break
12:15 – 13:00	Experiments in astroparticle physics
13:00 – 14:00	Lunch
14:00 – 16:00	Data analysis
16:00 – 17:00	Video conference with the Pierre Auger Observatory*
17:00 – 17:15	Farewell

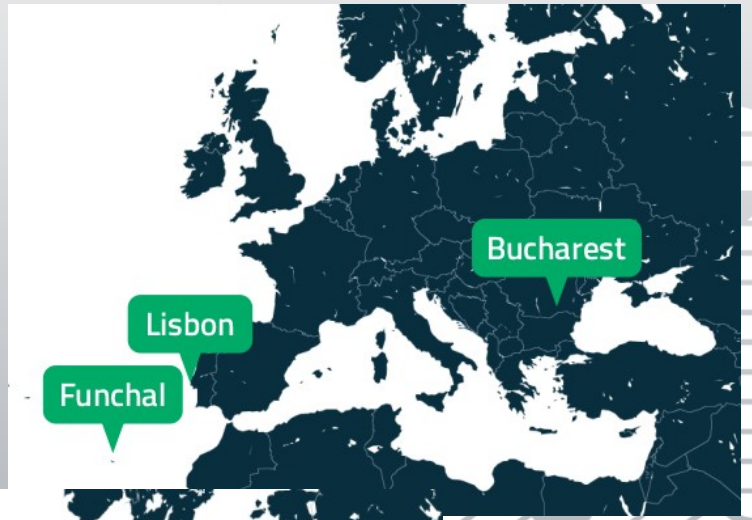
Auger Master Class: Documentation

- preparatory meetings with participating institutions
- complete list of resources available for the preparation of the activity



Auger Master Class: events at the IMC 2023

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



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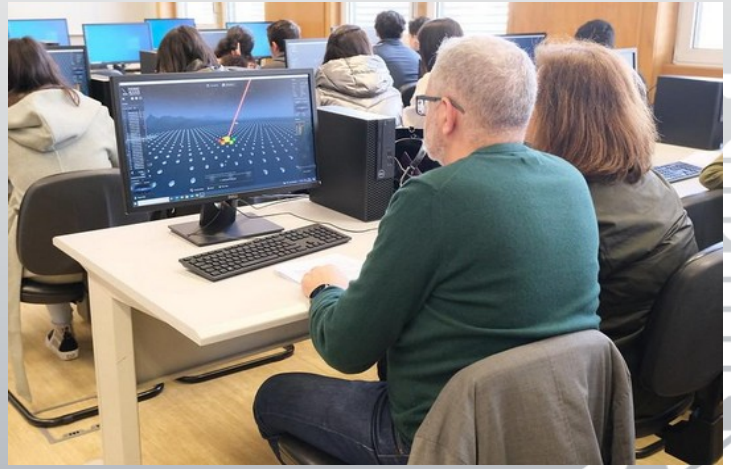
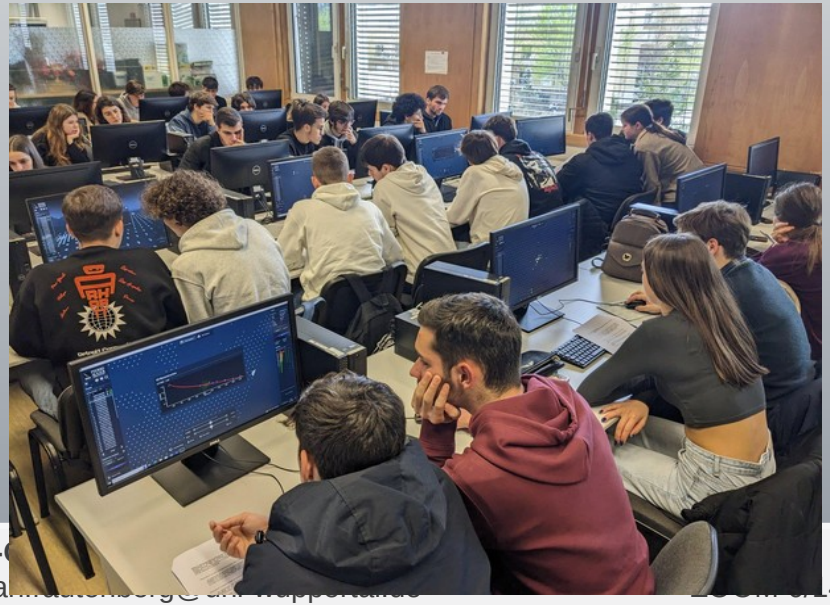
ZOOM

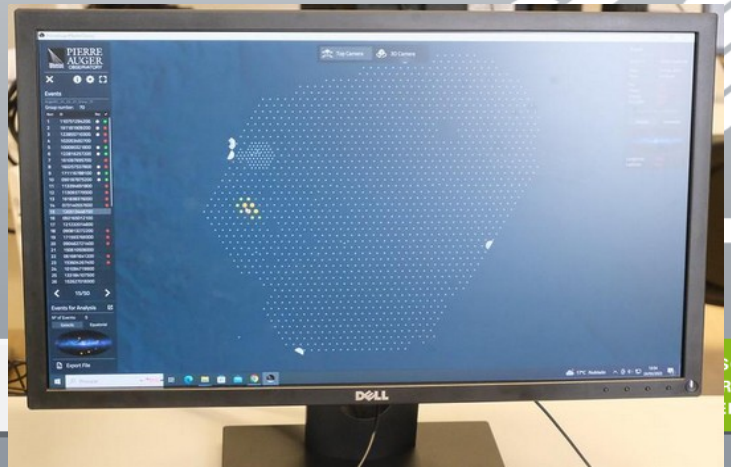
BERGISCHE UNIVERSITÄT WUPPERTAL

Auger Master Class: Morning Talks

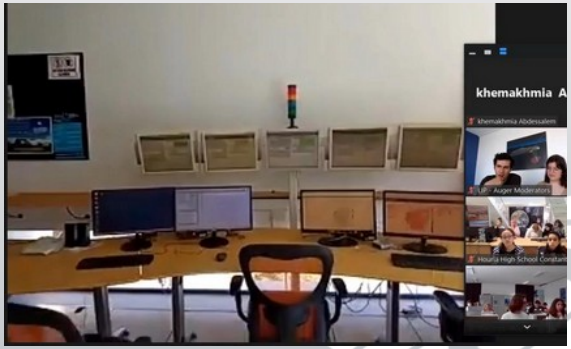
Auger Master Class: Hands-On

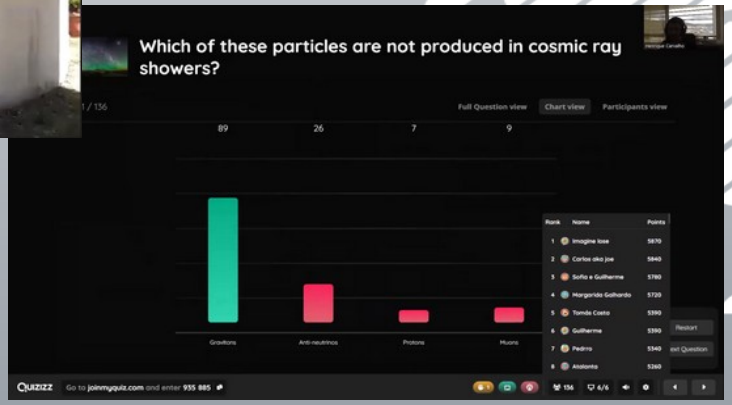






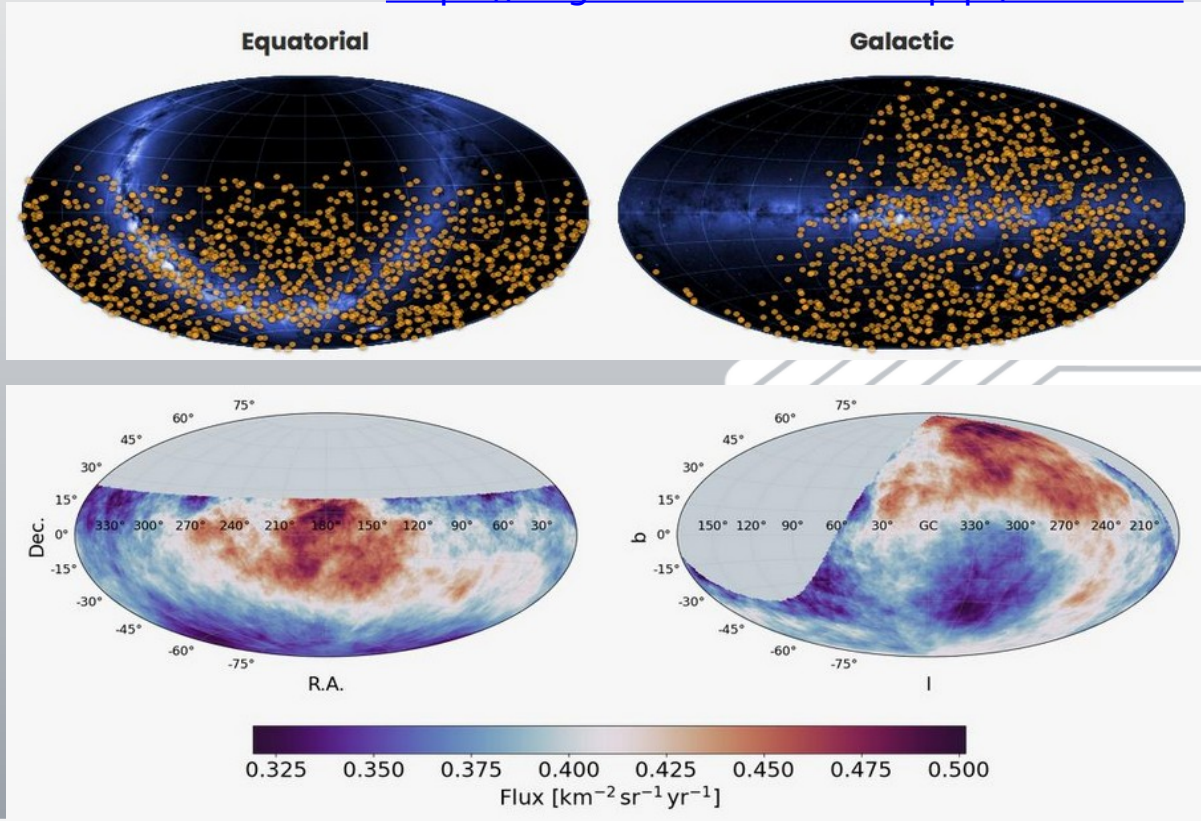
Auger Master Class: Video Conferece





https://augermasterclasses.lip.pt/activities

- Students results from the first Masterclass day
- 1130 reconstructed and selected events
- Dipole pattern starts appearing (still low statistical significance)



- Continue with going through the documentation for the app: