

Outreach in the era of big data with the Pierre Auger Observatory

Karen S. Caballero-Mora¹  for the Pierre Auger Collaboration²

¹Universidad Autónoma de Chiapas,
Boulevard Belisario Domínguez, Km. 1081, Sin Número, Terán, Tuxtla Gutiérrez, Chiapas,
México, 29050. Tel:52 (961) 617-8000, Mexico
email: karen.mora@unach.mx

²Observatorio Pierre Auger,
Av. San Martín Norte 304 Malargüe, Mendoza, Argentina
Full author list: http://www.auger.org/archive/authors_2020_12.html
email: auger_spokespersons@fnal.gov

Abstract. The Pierre Auger Observatory, built to study the physics of astroparticles, has expanded its endeavours in outreach and education. Since its inception, the collaboration has been informing the general public about its discoveries. From creating a visitor center in Malargüe, Argentina, to providing talks for different audiences, science fairs for students, international measurement workshops, and making compilations of the scientific contributions of women in different countries throughout history, we share the passion for science with the population. The collaboration processes a huge amount of data and requires a large storage capacity. However, 10% of this data is made available to the general public in a useable format. The collaboration developed special masterclasses aimed at high school students, providing the software that can be used to analyse the public data set. In addition, a summary of the different outreach activities performed by the members of the Pierre Auger Collaboration will be presented.

Keywords. Outreach, Education, Astro-particles, Pierre Auger Observatory

1. Introduction

Astroparticles are particles from the universe arriving on Earth. The Pierre Auger Observatory studies those particles having ultra-high energies. Their study can give information on their origin, of acceleration and propagation mechanisms, and also clues on the laws governing interactions between particles at the highest energies. This study area has helped to develop the physics and also the technology applied in the detectors used. Outreach and education has been a very important component of the work of the Pierre Auger Collaboration, informing several kinds of audiences about our discoveries. The Collaboration is formed by researchers from 17 countries and 81 institutions, who prepare different outreach and educational activities to share the science discoveries with high-school and university students, as well as other members of their communities. In the following sections, some of them are described.

2. Outreach and education at the Auger Observatory

The Pierre Auger Observatory has an instrumented area of 3000 km² with different kinds of detectors: water-Cherenkov detectors, fluorescence telescopes, scintillators and radio antennas. The technology used for these detectors is explained to visitors



Figure 1. Visitor Center, Permanent exhibition, Auditorium and some visitors.



Figure 2. Science Fair in Malargüe and the Collaboration in the Parade.

so that they can understand the physics used to measure astroparticles (Castellina A 2019). As early as 2001, a visitor center has been created (see Figure 1), which welcomes around 9000 visitors a year. Nowadays, a visitor tour is also available, which can be found in the outreach web page of the Collaboration at: <https://www.auger.org/index.php/edu-outreach>. In addition, the bond between the city of Malargüe and the Collaboration is expressed by our participation in the annual parade of the city. Every year during the Collaboration meeting in November, a Science Fair is organised at which high-school students, mostly from the Mendoza province, present projects to the researchers of the Collaboration (Figure 2). Students show what they have learned and they discuss with scientists who may enrich and inspire them. The Collaboration promotes diversity in science. An example thereof is a virtual exhibition, created by members of the Collaboration, called “Women hold up half the sky”, which can be found in English at <https://izi.travel/en/c824-women-hold-up-half-the-sky/en> and in Spanish at <https://izi.travel/en/c824-las-mujeres-sostienen-la-mitad-del-cielo/es>.

3. Masterclasses, Data and Software release

Ten percent of the data collected by the Observatory is made available to the general public in a useable format for educational purposes. A Public Event Browser is available at <https://labdpr.cab.cnea.gov.ar/ED/index.php?lang=en>. Students and teachers are aided through the masterclasses developed by members of the Collaboration, consisting of lectures, notes and hands-on data analyses through online tools or tools installed on a local PC. More information can be found at: <https://www.lip.pt/> <https://www.lip.pt/experiments/auger/?p=public-data>. These master class tools are used for instance when members of the collaboration participate in the International Cosmic Day, organized annually by DESY (<https://icd.desy.de/>).

Reference

Castellina, A., for the Pierre Auger Collaboration 2019, *EPJ Web Conf.*, Volume 210, *Ultra High Energy Cosmic Rays 2018*, Article Number 06002, 2019