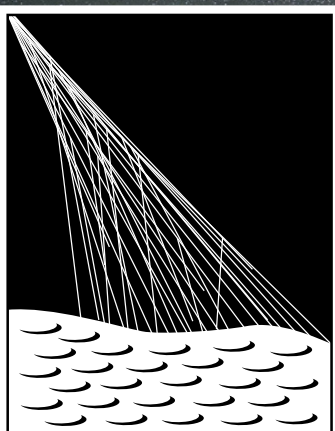


OPERATIONS of the PIERRE AUGER OBSERVATORY

Poster Contribution – Flash Talk on July, 16th 2021

Cosmic Ray Indirect (CRI) #822

PoS (ICRC2021) #238

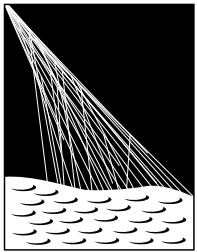


**PIERRE
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[ROSSELLA CARUSO¹](#) on behalf of the [Pierre Auger Collaboration²](#)

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Observatorio Pierre Auger, Av.San Martín Norte 304, 5613 Malargue, Argentina



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Operations of the Pierre Auger Observatory

Executive Summary

Rossella Caruso^a for the Pierre Auger Collaboration^b

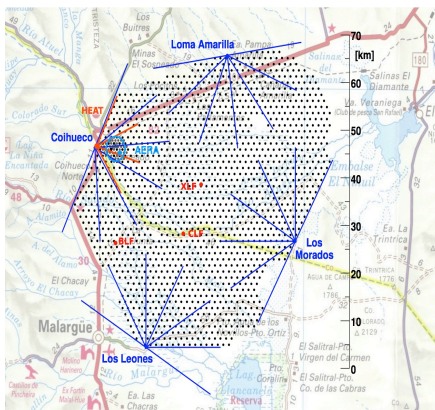
Dipartimento di Fisica e Astronomia “Ettore Majorana”, Università degli Studi di Catania & INFN, Sezione di Catania, Catania, Italy
Observatorio Pierre Auger, Av.San Martín Norte 304, 5613 Malargue, Argentina

What is this contribution about?

The Pierre Auger Observatory in Argentina, is currently the largest observatory in the world for the research of Ultra High Energy Cosmic Rays (from 10^{18} eV beyond 10^{20} eV). In this contribution, the general **operations** and **maintenance** of the Observatory are described as well as the **shift procedures** of its main detectors.

Why is it relevant/interesting?

The day-to-day operation and maintenance campaigns demand **34 people on site**. **Nightly FD shifts** are covered **locally** by ≈ 61 shifters/year and are **also remotely executable in Auger control rooms abroad**. Recently, **day-by-day SD shifts are remotely operated too**.



What has been done?

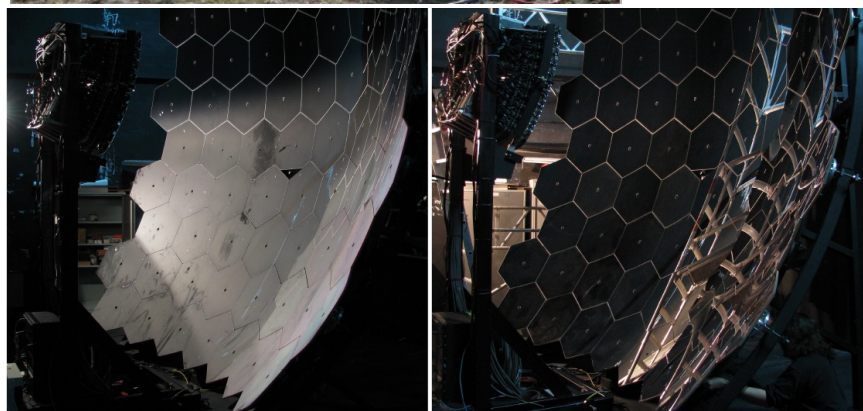
The construction of the Observatory began in 2001, it has been collecting data since early 2004 and was completed in 2008. **Beyond 15 years of successful operations, regular maintenance and stable data-taking and shifts have been achieved.**

What is the result?

At present, **the Observatory is operating in a stable and efficient manner and shifts regularly carried out** thanks to the the strong dedication from the engineering, technical and administrative local staff, the personnel in charge from other Auger institutions, as well as all the shifters.



- Each **water-Cherenkov detector** is a stand-alone unit, operating autonomously (duty-cycle $\approx 100\%$). The **Surface Detector Array (SD)** data-taking runs non-stop, not manually operated; the operation of the whole SD is monitored online. The detectors are exposed to very severe environmental conditions in situ: thermal variations, humidity, wind, salinity, dust, flooding, ground erosion, damages caused by local fauna and human vandalism or theft acts and so they undergo recurring maintenance. The overall long-term maintenance requires about 3 field trips per week, especially for batteries, PMTs and electronics.

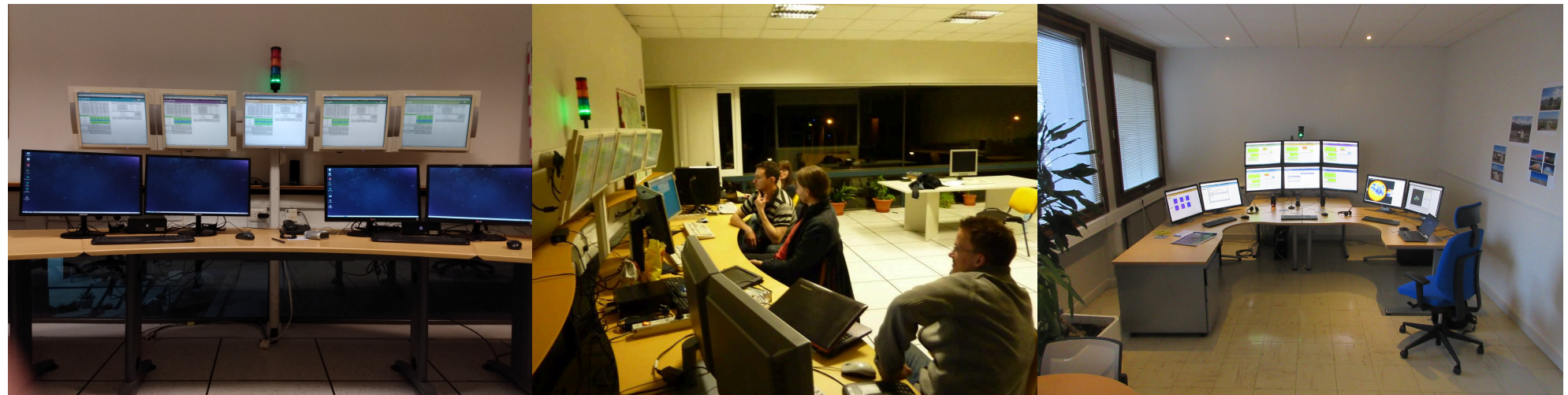


- Each **atmospheric fluorescence telescope** data-taking depends on various experimental conditions: weather situation, light levels, power failures, communications breakdowns, hardware malfunctions, software problems. It can only work at clear moonless nights (duty-cycle $\approx 15\%$). So the **Fluorescence Detector (FD)** has to be operated manually and the data-taking is organized in nightly runs. Even though the telescopes are protected in their buildings, cleaning and maintenance has been required during years of operation, especially for the filter and mirror cleaning and power supplies maintenance.

The SD day-to-day operation and FD maintenance demand 34 people, qualified engineers and technicians plus expert personnel from Auger institutions. Currently the SD Array and the FD telescopes are operating in a stable and efficient manner.

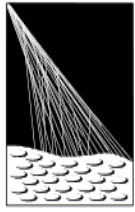
PoS#238 - Sections 4. and 5.: **FD and SD shifts**

- **The FD operation and data-taking** is controlled by a **shift-crew**, composed by shifters from outer Auger institutions, **operating locally** at the central campus of the Observatory, assisted when necessary by the local personnel . In recent years, regular FD shifts are also executed remotely **by Auger teams in control rooms abroad**, in sharing with the crew at the Observatory. **The FD shift operations** cover from 8 hours per night per 15-16 nights, during the austral summer, requiring 4 shifters up to to 14 hours per night per 18 nights, during the austral winter, requiring 6 shifters, per lunar cycle: **a total of about 61 shifters per year is needed.**



- Starting from 2019 also regular **SD shifts** are established to check the short and long term performances of the SD Array. Each SD shift can be carried out **remotely** from **at least one shifter from one Auger institution**. The SD shift requires a **daily work**, demanding less than one hour per day, **during a 2 weeks period.**

Currently the FD and SD shifts are regularly carried out. During the COVID pandemic, the remote shifts abroad allowed the FD data taking to be continued, except for one shift cancelled.



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OPERATIONS OF THE PIERRE AUGER OBSERVATORY

PoS(ICRC2021)238 Cosmic Ray Indirect (CRI) #822

Rossella Caruso¹ on behalf of the Pierre Auger Collaboration²

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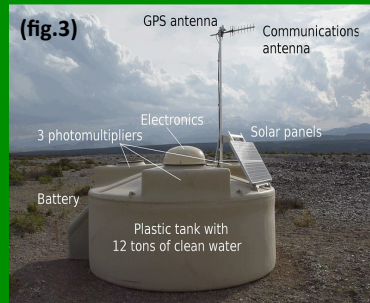
37th International
Cosmic Ray Conference
15-22 July 2021



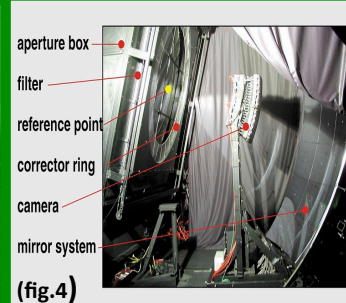
The PIERRE AUGER OBSERVATORY

The construction of the first stage of the Pierre Auger Observatory, designed for the research of ultra-high energy cosmic rays (UHECRs), began in 2001 with a prototype system. The Observatory has been collecting data since early 2004 and was completed in 2008. It is placed at 1400 m above sea level near Malargüe, (Mendoza province) in western Argentina, over a vast plain of 3000 km², known as *Pampa Amarilla*, where 1660 water-Cherenkov detectors (WCDs), forming the Surface Detector (SD) and 27 peripheral fluorescence telescopes, comprising the Fluorescence Detector (FD) are operating. (fig.1). The hybrid technique (fig.2) allows UHECRs flux, mass composition and arrival direction distribution to be measured with a very high statistics and precision.

SD and FD OPERATIONS and MAINTENANCE

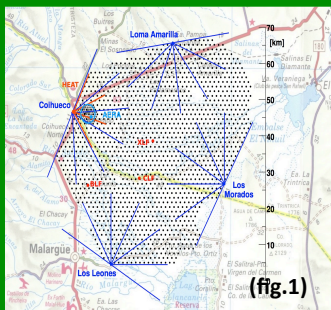


The SD was designed to be functioning for at least 20 years. Each WCD (fig.3) is a stand-alone unit, operating autonomously (duty-cycle $\approx 100\%$). The SD data-taking runs non-stop, not manually operated; the operation of the whole SD Array is monitored online. The overall long-term maintenance requires about 3 field trips per week, especially for batteries, PMTs and electronics. Operations and maintenance are under local supervision of the SD-Science Operation Coordinator. The FD data-taking depends on different experimental conditions: weather situation, light levels, power failures, communications breakdowns, hardware malfunctions, software problems (duty-cycle $\approx 15\%$). So the FD (fig.4) has to be operated manually and the data-taking is organized in nightly runs. Even though the telescopes are protected in their buildings, cleaning and maintenance has been required during years of operation, especially for the filter and mirror cleaning and power supplies maintenance. The day-to-day operation of the Observatory demands 34 people on site, mostly highly qualified engineers and technicians. Currently, the SD Array and the FD are operating in a stable and efficient manner.



FD & SD SHIFTS

The FD operation and data-taking is controlled by a shift-crew, composed by shifters from outer Auger institutions, operating locally at the central campus of the Observatory (fig.5) under the supervision of the FD-Science Operation Coordinator. In recent years, regular FD shifts are also executed remotely by Auger teams in control rooms abroad (fig.6), in sharing with the crew at the Observatory. The FD shift operations cover from 8 hours per night per 15-16 nights, during the austral summer, requiring 4 shifters up to to 14 hours per night per 18 nights, during the austral winter, requiring 6 shifters, per lunar cycle: a total of about 61 shifters per year is needed. Starting from 2019 also regular SD shifts are established to check the short and long term performances of the SD Array. Each SD shift can be carried out remotely from at least one shifter from one Auger institution. The SD shift requires a daily work, demanding less than one hour per day, during a 2 weeks period. Currently the FD and SD shifts are regularly carried out.



REFERENCES: see PoS(ICRC2021)238

