

## Cosmic rays



**Malargüe, Argentina**  
altitude: 1 400 m

# AUGER PIERRE AUGER OBSERVATORY

Capturing the most energetic and rarest particles in the Universe

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- **Scientific leader:** Olivier Délicny (IJCLab) \*
- **Laboratories involved:** CC-IN2P3 (Lyon), IJCLab (Orsay), LPNHE (Paris), LPSC (Grenoble)
- **Nature :** research infrastructure
- **Status:** project mainly funded in 2020 by Germany, Argentina, France, Italy and the Netherlands
- **Website:** <https://www.auger.org/>

**3 000** km<sup>2</sup> of surface instrumented

**72** research institutions

**25** years of operation

**18** participating countries

**450** PhDs

### SCIENTIFIC OBJECTIVES

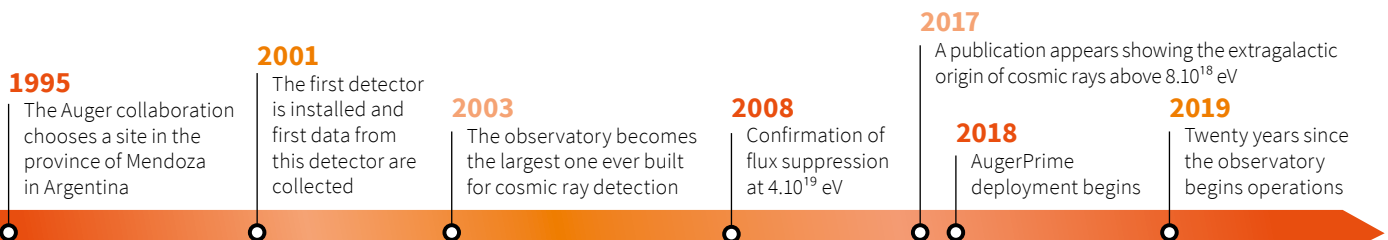
The Earth is continuously bombarded by particles from the cosmos, the so-called "cosmic rays". The Pierre Auger Observatory studies the most energetic and mysterious of these particles: their energy exceeds  $10^{18}$  electronvolts and can even exceed  $10^{20}$  electronvolts. This is a phenomenal energy that far exceeds that involved in the LHC collisions. For the past 20 years, the observatory has been observing these cosmic rays through the immense cascades of particles that they form when they collide with the atmosphere. It has tackled the enigmas of their origin and nature, and its results have led to remarkable advances. To go even further, the Pierre Auger collaboration is currently reinforcing the performance of its detectors with the AugerPrime improvement programme.

### RESOURCES DEPLOYED

- The world's largest atmospheric cosmic ray detector. It covers an area of 3 000 km<sup>2</sup> on the Pampa Amarilla plateau at an altitude of 1 400 m, in Argentina.
- It comprises an array of 1 660 stand-alone particle detectors, overlooked by twenty-seven fluorescence telescopes.
- Complementary detection systems were deployed: a 17 km<sup>2</sup> antenna array and buried muon detectors.
- Remote control rooms have been developed in some fifteen laboratories around the world.

### IN2P3 CONTRIBUTIONS

- Development of the majority of the Cherenkov detector electronics, and of the essential computer programs: processing of the detector data including the central triggering system of the network, and the central data acquisition system.
- Participation in the first on-site radio detection network and the AugerPrime project.
- CCIN2P3 stores the Auger data, IN2P3 researchers analyse and interpret them. They play a major role in studies of the distribution of cosmic ray arrival directions and their energy spectrum.



\* Since 2022