

Searching for ultra-high-energy cosmic rays and events related to atmospheric electricity at the Pierre Auger Observatory

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The Pierre Auger Observatory is the largest facility in the world for studying ultra-high-energy cosmic rays. The Observatory is located in Argentina and consists of more than 1600 water Cherenkov detectors spread over an area of 3000 km² overlooked by Fluorescence detectors. The first phase of the Observatory's data-taking began in 2004 and continued until the end of 2021. Now a new phase is starting with the upgraded AugerPrime detector. The Auger Observatory was designed to investigate the composition, energy and arrival directions of ultra-high-energy cosmic rays studying the extensive air showers produced in the Earth atmosphere, but has proven to be also a unique instrument to detect in unprecedented detail phenomena related to atmospheric electricity, as ELVES and downward TGFs. I will describe the work I carried out as a member of the Auger Collaboration starting from composition studies, passing through the optimization of AugerPrime, up to atmospheric electricity studies.

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