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Measurement of aerosols above the Pierre Auger Observatory using the side-scattered light from the laser of the Aeolus satellite

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The Pierre Auger Observatory is a large-scale experiment for the investigation of ultra-high-energy cosmic rays. A combination of Surface Detector and Fluorescence Detector is used to measure the extensive air showers that are initiated by cosmic ray particles.

Aeolus is a satellite that is operated by the ESA with the purpose of making wind profile measurements on a global scale. To this end, beams of a UV-LIDAR are emitted towards the surface of Earth. As the satellite passes over the Pierre Auger Observatory, light that gets scattered off the laser beam in the atmosphere can be detected by the Observatory's Fluorescence Detector, allowing for the reconstruction of the beam from the Observatory data.

In this manner, the laser beam can be measured several hundred times for each satellite passage with a wide range of distances between the laser track and telescopes. This makes it possible to use the laser data for studies of the atmosphere above the Observatory and provides a unique opportunity for cross-checks with the atmospheric monitoring devices employed at the Pierre Auger Observatory.

In this contribution, we will explain the process of reconstructing laser shots from the Fluorescence Detector data, show the results of these reconstructions and introduce a method for extracting information about the aerosol content of the atmosphere from this data.

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