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# The Rapid Atmospheric Monitoring Program for the Pierre Auger Observatory

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The Pierre Auger Observatory measures extensive air showers from interactions of cosmic rays with Earth's atmosphere. More than 1600 Surface Detectors (SD) sample the secondary shower particles that reach the ground while 27 Fluorescence Detectors (FD) constantly scan the night sky for faint fluorescence emissions from nitrogen molecules, excited by the secondary particles. For the reconstruction of air showers from FD data, information about the current atmospheric conditions is needed. For this purpose, several monitoring systems have been implemented. Five ground-based weather stations and atmospheric soundings provide ground values and altitude-dependent profiles of the molecular atmosphere, four elastic lidars measure the attenuation of light due to aerosols and scan for clouds, four cloud cameras at each of the FDs, and one photometric robotic telescope (FRAM) also measures the aerosol attenuation. Two aerosol phase function monitors, a horizontal attenuation monitor and a Raman lidar provide additional information about aerosol scattering. The atmospheric monitoring program has been upgraded to allow for triggering the monitoring instruments shortly after the detection of high-energy events and other showers of interest. During FD shifts, incoming shower data are reconstructed by an automated online analysis. Interesting showers then trigger dedicated measurements by the various subsystems if they meet certain individualized criteria to obtain detailed information of the atmosphere, for some subsystems even in the vicinity of the shower track. The data are used to supplement the regular observations of the atmosphere. In the cases of sparse regular measurements or rapidly changing atmospheric conditions the rapid monitoring data can significantly improve the accuracy of the reconstruction of showers. We will present an overview of the implementation, performance and first results of the rapid monitoring system.

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