

## **From the Geosphere to the Cosmos: ASPERA Workshop**

### **Abstract**

#### **Atmospheric Physics at the Pierre Auger Observatory**

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The Pierre Auger Observatory detects high-energy cosmic rays with energies above some  $10^{17}$  eV. It is designed as a hybrid detector measuring charged particles of initiated extensive air showers at ground in combination with observations of fluorescence emissions induced by extensive air showers on its development through the atmosphere.

For the reconstruction of extensive air showers, the atmospheric conditions at the site of the observatory have to be known quite well. This is particularly true for reconstructions based on data obtained by the fluorescence technique. For these data not only the weather conditions near ground are relevant, most important are altitude-dependent atmospheric profiles.

Thus, the Pierre Auger Observatory has set up a dedicated atmospheric monitoring programme at the site of the observatory in the province Mendoza, Argentina. For measuring state variables like pressure, temperature and humidity, a set of ground-based weather stations is installed in addition to a facility for launching meteorological radio soundings. For determining the optical properties of the atmosphere, several instruments are located at the site. The Observatory operates a Central Laser Facility, lidar stations, cloud monitors, Aerosol Phase Function monitors, and a Horizontal Attenuation Monitor and a Photometric Robotic Atmospheric Monitor telescopes. A subset of these instruments is running a rapid atmospheric monitoring programme in addition to the characterisation of the atmospheric properties on fixed timescales. The programme serves for increasing the accuracy of air shower reconstruction of very high-energy showers or further showers of particular interest. Recently, activities about applying satellite data about cloud coverage to derive local cloud information have started as well as applying Global Data Assimilation System data for state variables to the air shower reconstruction algorithm.

All these activities aim primarily for a high-quality reconstruction of air showers. Further interests are beyond the scope of cosmic ray investigations, in the field of atmospheric science. Local measurements can be used for determining the accuracy of global model data at the site of the Observatory or can serve for dedicated studies of local conditions in the Pampa Amarilla, Argentina.

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