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Elves, Forbush decreases and solar activity studies at the Pierre Auger Observatory

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The Pierre Auger Observatory, designed to observe cosmic rays at the highest energies, can be also a valid ground based instrument for the observation of transient luminous events and for studying modulation of galactic cosmic rays due to solar activity. In more detail, the Fluorescence Detector can observe elves. They are transient luminous emissions from altitudes between 80 and 95 km above sea level, with timescales of tens of microseconds, which are triggered by lightning activity. A dedicated trigger and an extended readout scheme were introduced to enhance detection efficiency on these events and to improve the knowledge of some peculiar characteristics. The low energy mode of the Surface Detector, instead, records variations in the flux of low energy secondary particles with extreme detail. With the Scaler mode, it is possible to register the rate of signals for energies between 15 MeV - 100 MeV; the Histogram mode, using the calibration charge histograms of the individual pulses detected by each water-Cherenkov stations, covers different energy ranges up to 1 GeV. The variations in the flux of galactic cosmic rays has been studied on short and intermediate time scales (Forbush decreases), but also a long-term analysis, which shows the sensitivity of the Observatory to the solar cycle variation, is in progress.

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