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The Geometry Package for the Pierre Auger Observatory

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The Pierre Auger Observatory consists of two sites with several semi-autonomous detection systems. Each component, and in some cases each event, provides a preferred coordinate system for simulation and analysis. To avoid a proliferation of coordinate systems in the offline software of the Pierre Auger Observatory, we have developed a geometry package that allows the treatment of fundamental geometrical objects in a coordinate-independent way. This package makes transformations between coordinate systems transparent to the user, without taking the control about the internal representation completely from the user.

The geometry package allows easy combination of the results from different sub-detectors, at the same time as ensuring that effects like the earth curvature, which is non-negligible on the scale of a single Auger site, are dealt with properly.

The internal representations used are Cartesian. For interfacing, including I/O, the package includes support for Cartesian coordinates, geodetic (latitude/longitude and UTM), and astrophysical coordinate systems.

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