

Muography: imaging with cosmic particles

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Naturally occurring cosmic particles, mostly muons, reach the Earth surface continuously and nearly uniformly, and due to their high energy can cross as much as 10-1000m of rock. Since muons propagate along straight lines, one can use these particles for imaging the internal density structure of large objects. More than five decades ago, this method has been used to search for hidden chambers in a pyramid, and subsequently to study various challenging structures: mines, caves, volcanoes, nuclear reactors. Since the turn of the last century, there has been a rapid increase of interest towards muon imaging –with a new research field, called “Muography” emerging –and the application possibilities broadened along with drastic reduction of instrumentation cost, at improved detection efficiency, portability and imaging resolution. The most relevant application possibilities include mining, archeology, volcanology, nuclear industry and border control. Measurements related to volcanology span three continents, and revealed magma movement and erosion effects. Mining applications allow cost reduction (less drilling) and improved operational safety, thus contributing to a sustainable future.

Muography is not only becoming a consistent research field, but there is an international community which facilitates information exchange, critical assessment of the quality of new results, and promotes technology transfer towards an increasing number of industrial partners.

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