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Overview of muography in geoscientific research

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Muography is a novel imaging method, using muon particles present in cosmic rays at Earth surface level. These naturally occurring high energy muons are able to penetrate even kilometers of rock. The count rate (flux) depends on the zenith angle of the incoming muon, as well as on the density-length of the rock (density integrated along the muon path up to the detector) thus providing a powerful tool to image the average densities of 10-1000 m rock layers. In some cases with multiple detector locations, even 3D density reconstruction is possible. The geometric constraint of muography is that the altitude of the particle tracking detector must be lower than the examined object level.

Applications arise in multiple disciplinaries, including volcanology, mining, archeology, civil engineering, speleology. In this presentation the technology of muography will be reviewed, the muon detectors developed in Wigner RCP Budapest will be introduced, and experiences learned from ongoing projects will be presented.