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Applied muography : from volcanology to archaelogy with a mobile muon detector

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Since a decade the DIAPHANE collaboration has developed many detection methods in the context of volcanology to end up with the most complete existing muon detection complex on the dome of La Soufrière of Guadeloupe. Up-to-now 6 detectors are operating around this dome allowing both structural 3D imaging and functional continuous monitoring of the hydrothermal system. Although the volcanic dome has ideal proportions for muography studies in terms of opacity and timescales, it has recently emerged that applications in different fields may be worth a dedicated measurement campaign.
Non invasive and non destructive measurements are a natural applications of muography in the industrial context as long as the relative opacity is large enough to be detected in a reasonable timescale. We present here the details of an upgraded mobile muon detector aimed at performing measurements on different points around an ancient tumulus near Thessaloniki in the North of Greece. The aim is to perform a 3D map of the tumulus and to correlate it with the results obtained in electrical tomography.
We also show the results of a Monte-Carlo study of the low-energy muons scattering on the target, just upstream the detector, mimicing a through-going particle. Indeed, muons detected after a previous forward scattering on the object surface represent an irreducible background noise, leading to a bias on the measurement and consequently on the reconstruction of the object density. Therefore, a prior characterization of this effect represents valuable information to conveniently correct the obtained results.