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Muon tomography in the Mont Terri underground rock laboratory

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The Mont Terri underground rock laboratory (Switzerland) was excavated in a Mesozoic shale formation constituted by Opalinus clay. This impermeable formation presents suitable properties for hosting repository sites of radioactive waste.
A muon telescope has been placed in this laboratory in October 2009 to establish the feasibility of the muon tomography and to test the sensor performance in a calm environment, where we are protected from atmospheric noisy particles. However, the presence of radon in the gallery as well as charged particles issued from the decay of gamma rays may create a background noise. This noise shift and smooths the signal inducing an under estimation of the rock density. The uncorrelated background has been measured by placing the planes of detection in anti-coincidence. This estimation is preponderant and has to be combined to the theoretical feasibility evaluation to determine the best experimental set-up to observe muon flux fluctuations due to density variations.
The muon densitometry experience is here exposed with the estimation of its feasibility. The data acquired from different locations inside the underground laboratory are presented. They are compared to two models representing the layer above the laboratory corresponding to a minimum and a maximum muon flux expectation depending on the values of the rock density.