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Geoscientific Instrumentation Methods and Data Systems
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Discussions

Interactive comment on "Muographic data analysis method for medium-sized rock overburden inspections" *by* Hiroyuki K. M. Tanaka and Michinori Ohshiro

Anonymous Referee #2

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[11pt]article amssymb amsfonts latexsym

General Comments

This paper addresses a data analysis method of muographic measurements for medium-sized rock overburdens. The authors found that there is a simple relationship between the transmitted muon flux and the areal density along the muon path, as long as the overburden thickness is thinner than a few hundred meters. They propose a new analysis method to cancel experimental conditions and determine the areal density along the muon path by taking a ratio of transmitted muon fluxes after passing through partial layers of the overburden and by combining the independently measured density information for one partial layer. The technique to cancel

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Discussion paper

uncertainties in experimental conditions may be a method commonly used in the field of particle physics. However this proposed method certainly help make the job, the estimation of the rock overburdens, much easier. It may become a popular method widely used in the muographic measurements of medium-sized rock overburdens. This paper may, therefore, deserve to be published in GI. However there are several points which the authors should clarify before its publication. They are listed below.

Specific Comments and Questions

(1) Page 5 L6: “Fig. 3"
Probably there should be another figure, Fig. 0: CSDA range vs. E.
(2) Page 5 L16:
If there is a figure on the muographic observations of the rock overburden which is divided into two horizontal layers, readers may easily understand the principle of the method. Later, the numbers of muons (N_0, N_1) appear as measurable quantities. Please explain how you measure N_0 and N_1, respectively, in this figure. Where is the detector to be located for each measurement?
(3) Page 11 Table 1:
How did you calculate the numbers of events without casing and back stones, N_1?
(I understood the numbers of muon events N in Alvarez et al. (1970). For example, $N(72-75) = 1300 + 1290 + 1470 + 1482 + 1545 + 1352 + 1172 + 1087 = 10698$.
How about N_1?)
(4) Page 12 Table 2:
How did you calculate the ratio, ρ_0/ρ_1? The ratios, $< \ell_0 > / < \ell_1 >$, are missing? It would be better to have necessary information so that readers can follow the calculations and reproduce the results in this paper.
(5) Page 13 L9:
How did you calculate the Pyramid’s core density of “1.89 ± 0.20 gcm^{-3}"?

Technical Corrections
Page 6 Eq.(5):
It would be better to have a unit for the parameter A.
Or add "where E_c is measured in GeV, and X in m.w.e."
Page 6 Eq.(6):
Is it appropriate that this equation be referred to as a linear relationship?
Page 7 L14: "Eq.(6)" $\rightarrow$ Eq.(4)
Page 7 L26: "metrhod" $\rightarrow$ method
Page 14 L6: "N" $\rightarrow N_1$, "$(N_0/N_1)^{-1}$" $\rightarrow (N_0/N_1)$
Page 14 L7: "X/X_0" $\rightarrow X_1/X_0$

References

"Beringer, J. et al.: Review of particle physics. Phys. Rev. D 86, 010001, 2012."
It would be better to use the latest version of the PDG review,
Olive, K.A. et al.: Review of particle physics. Chin. Phys. C 38, 090001, 2014.