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Interactive comment on “Development and operation of a muon detection system under extremely high humidity environment for monitoring underground water table” by H. K. M. Tanaka and A. Sannomiya

Anonymous Referee #2

Received and published: 9 December 2012

Thank you for the opportunity to review this paper.

The paper describes a Cockcroft-Walton PMT that was developed for use in a high humidity environment. The paper also presents water table levels observed from 1999–2011, and argues that muon radiography measurements would provide useful information on the water table level, and the Cockcroft-Walton PMT would be suitable as part of a system for making these measurements.

This paper addresses relevant scientific questions within the scope of the GID special

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edition. There are good descriptions of the problems with operating scintillator-based detectors in humid conditions. The article is worth publishing. However, I recommend changes to the abstract, Figure 2, and there needs to be quantitative justification that muon radiography data will be useful.

In the abstract, on line 2 change "performed" to "planned", because this paper does not describe any muon radiography measurements. On line 10, change "borehole-based measurement" to "borehole-based water gauge measurement"; this distinction is necessary because some groups are developing borehole-based muon detectors. In the abstract and introduction, please state the geographical location (town? country?) where the test takes place.

In Section 2 there are statements made about muon detectors that are specific to the authors' detector design and choice of PMT. It needs to be clear that the problems being solved are not general. Specifically on pg 721, line 20: Insert "Our" before "Conventional" (plastic scintillator is not the only way to detect muons underground). On pg 721, line 22: state the PMT model number and make it clear that the long HV cable requirement is specific to the authors' choice of PMT – there are other PMTs where compact HV supplies eliminate the need for long HV cables. To better understand the problems on pg 722 lines 12-14 and 18-20, please consider including a schematic of the detector design with dimensions.

Figure 2 needs a scale. The caption says there are lines that show the maximum and minimum water levels from 1999-2010, but I can't see them. Please make the description of all the lines clearer. Consider using a legend.

The justification on pg 726 for muon radiography is purely qualitative. There needs to be a calculation or simulation to justify that muon radiography would be useful.

Technical corrections:

pg 720, line 4: change "in a the drainage tunnel drilled underneath an the estimated

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fault plane" to "in a drainage tunnel drilled underneath the estimated fault plane". (2 errors here)

pg 720, line 5: change "In order to suppress the moisture effect" to "In order to suppress moisture effects" (2 changes here)

pg 720, line 6: change "Cockcroft-Wwalton photomultiplier tubes (CW-MPT)" to "Cockcroft-Walton photomultiplier tubes (CW-PMT)" (2 errors here)

pg 720, line 22: change "magnituide" to "magnitude"

pg 721, line 8: change "mechanical fluncture zone" to "mechanical fracture zone"

pg 721, line 9: change "Similar type" to "A similar type"

pg 722, line 8: change "leakage current increase" to "leakage current to increase"

pg 722, line 8: change "power suply" to "power supply"

pg 722, line 9: remove "strongly"

pg 722, lines 10-11: no need to define HV again.

pg 722, line 11: change "including that includes a" to "including a"

pg 722, line 22: only capitalize the first letter of "Hamamatsu"

pg 723, line 5: change "has a the" to "has a"

pg 723, line 16: "bore holes" to "boreholes"

pg 724, line 3: "bore hole" to "borehole"

pg 724, line 20: For "1500 VDC.The", insert space before "The"

pg 725, line 3: insert space between "38" and "days"

pg 725, line 16: remove "repaired"

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pg 726, line 11: remove "by muon radiography." at end of sentence

pg 726, line 21: change "dries" to "dry"

pg 730, for the temperature column heading, add C to make it clear this is celsius, not fahrenheit

Interactive comment on Geosci. Instrum. Method. Data Syst. Discuss., 2, 719, 2012.

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2, C317–C320, 2012

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