Geoscientific Instrumentation Methods and Data Systems Discussions

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Comment on gi-2021-5

Anonymous Referee #1

Referee comment on "Observation of the rock slope thermal regime, coupled with crack meter stability monitoring" by Ondřej Racek et al., Geosci. Instrum. Method. Data Syst. Discuss., https://doi.org/10.5194/gi-2021-5-RC1, 2021

Dear authors and editor,

This paper presents a setup to monitor crack opening changes due to temperature variations in rock faces. It includes the following sensors: weather station and pyranometers, crackmeters and thermometers in boreholes. Three sites have been equipped on three different type of rocks and preliminary results are presented.

Monitoring thermal effects on rock slopes stability is a relatively new type of investigation and it is particularly interesting to understand the long term weakening of rock masses that eventually leads to failure. In my point of view this paper makes two original contributions. First it describes at setup that is robust enough for long term monitoring (several years) with a minimum of maintenance. Second a new temperature logger for boreholes was apparently designed or assembled from available pieces, however this device is not clearly described.

In my opinion, the weakness of this setup is that all temperatures are air temperatures. There is no direct measurement of rock temperature by contact thermometers (thermoresistance or thermocouple sealed to the rock). For instance, during a sunny summer afternoon, the rock temperature is quite often 10 to 20°C higher than the air temperature (max air and rock temperatures can also be shifted in time). Line 246 states that air temperature influences the dilatation of the blocks – this is only partly true. Correlation does not imply causation. In summer solar radiations will heat the rock mass, that will heat the surrounding air. A contact thermometer should be added to get a reliable rock surface temperature.

The air temperatures measured in the borehole can be at equilibrium with the local rock temperatures if the sections are perfectly sealed by the insulating material. But the paragraph §2.3 is not very informative about this part of the setup. As this is the most innovative contribution, that would be nice to have a picture of it and some explanations how it is introduced in the borehole.

Corrections and suggestions to authors

The abstract should be written again. It is too general and looks more like an introduction / advertisement. Here it emphasizes the innovative aspect of the setup, but at the end we

still don’t know what is new, specifications of sensors, etc.

Different terms are used to refer to “weather stations” (environmental station, etc..). I would keep “weather stations” for the whole paper.

Table 1 and rest of the paper: I guess that all the W/m3 should be W/m2

Table 2: add definition of symbols in legend. Why do the two unweathered sandstones have so different properties? the 1st one is odd.

Table 3: some mistakes in measurement reporting (180/30). Use 3 digits for dip direction (0xx)

Table 5: is the pyranometer measuring every 10 min too? I don’t see the point of this table, it can be supressed. Most of data are zero because of the night.

Figure 5: on the version provided I cannot see the line the corresponding to Branicka rock temp at 300 cm on (b)

Figure 7: cannot read the lines corresponding to temperatures (light grey)

Figure 8: I don’t see the interest of this figure for the present contribution. Suppress

L55: English proofreading / rewriting

L70: Chen 2017 missing

L91: delete “,”

L100 and L135: can you define the “global radiation balance”? what is global? where is the balance?

L147: the wavelength is certainly 2800 nm, not 1200 nm

L170: English proofreading / rewriting

L281-283: English proofreading / rewriting

L354: English proofreading / rewriting

L381-417: English proofreading the whole paragraph + errors in the references