

Geosci. Instrum. Method. Data Syst. Discuss., author comment AC1
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Reply on RC1

Ondřej Racek et al.

Author comment on "Observation of the rock slope thermal regime, coupled with crackmeter stability monitoring: initial results from three different sites in Czechia (central Europe)" by Ondřej Racek et al., Geosci. Instrum. Method. Data Syst. Discuss., <https://doi.org/10.5194/gi-2021-5-AC1>, 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 a 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 (thermo-resistance 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.

Answer: In the previous version of the manuscript the system of borehole temperature probe and direct rock surface temperature measurement was not clearly explained. Newly added description of this device, together with scheme, should explain this part of monitoring better. Our borehole temperature probe measures directly temperature of surrounding rock mass and additionally, there is one thermocouple placed directly on the rock slope surface. To reducing the influence of air temperature the borehole between the thermocouples has been insulated to prevent air exchange/heat conduction.

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.

Answer: Thank you for this suggestion. Part about compound borehole temperature probe was enlarged and a new picture with scheme of device was added.

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.

Abstract was rewritten according to your suggestions demands. Hopefully, now it represents the whole article in a better way.

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

Answer: Thanks for this suggestion. It was our mistake and inattention. In the reviewed version of the manuscript we maintain continuity with "weather station" term.

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

Answer: Our mistake. We have rewritten the tables and the concerned parts of the manuscript.

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

Answer: Legend was rewritten. Table was reworked to be clearer. Second unweathered line actually belongs to Branická rock limestone values.

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

Answer: Thank you for your suggestion, it was reworked according to your comment.

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

Answer: Yes, pyranometer measures every 10 minutes, same as all environmental and borehole temperature monitoring. Following your suggestion, the table was suppressed.

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

Answer: Graph was reworked to be more readable.

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

Answer: Graph was reworked. Hopefully in the second version of the manuscript it is easier to read.

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

Answer: Figure 8 was suppressed.

L55: English proofreading / rewriting

Answer: rewritten

L70: Chen 2017 missing

Answer: Chen 2017 reference was added to literature.

L91: delete “,”

Answer: Deleted

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

Answer: Actually, better expression is in this case solar radiation balance of rock slope surface (incoming/reflected solar radiation). Global radiation balance concerns whole planet and is not limited only to solar radiation. Thank you for your suggestion, in new version of manuscript this sentence was rewritten.

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

Answer: Yes, sorry for this mistake. It was rewritten in the new version of manuscript.

L170: English proofreading / rewriting

Answer: rewritten

L281-283: English proofreading / rewriting

Answer: rewritten

L354: English proofreading / rewriting

Answer: rewritten

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

Answer: rewritten

Thank you, for your comments and suggestions.