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Geoscientific Instrumentation Methods and Data Systems
Discussions

Interactive comment on "Autonomous distributed temperature sensing for long-term heated applications in remote areas" *by* A.-M. Kurth et al.

Anonymous Referee #2

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This manuscript describes the components required for the setup and deployment of an autonomous DTS system for long-term heated applications in remote areas. As such, the manuscript is very topical for GI-MDS. The availability of such a system entails several advantages: (a) potential for research in interesting but rather inaccessible areas and environments, (b) time efficiency for operators and scientists, (c) real-time data access and possibility for remote data quality and system control. In this sense the paper constitutes a very useful contribution and gives guidance on how to compose and implement such a system.

On the other hand, the paper is (maybe intentionally) somewhat limited to the technical description of the system components, similar to a technical report or manual (c.f. summary sentence of the introduction (860, 01-03.) which underpins this impression.

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Additionally, I feel the level of technical (and particularly scientific) innovation is rather low. While the proposed system opens the window for addressing interesting scientific questions, the paper does not present a practical application, which would help gauging the performance and practicability of the autonomous system. Well aware that the scope of the journal is geophysical instrumentation, I still deplore that the manuscript does not present an experimental example as a proof-of-concept of the proposed instrument set-up including a small scientific finding. The authors apparently conducted such an experiment (Thur River?) but information on this is very sparse or inexistent although such data would be very helpful to demonstrate the functionality of the proposed autonomous DTS system for heated applications. The authors often refer to an experiment or experiences of the authors (e.g. 863, 09; 866, 01, 26; 867, 05, 11) while the actual experiment is not at all described or presented. I think that the inclusion and discussion of an application would nicely illustrate the potential and applicability of the proposed system. This should not require a full data analysis of the experiment (which would be beyond the scope of the paper and journal) and still be acceptable given the present length of the manuscript.

Overall, the paper is very well written and easy to read. Technical explanations are very detailed, clear and easy to understand. However, Section 2 needs some reorganization or changes in structure as indicated in the specific comments below.

Specific comments (according to occurrence in manuscript, not relative importance)

1. 857, 20: The value of 0.01°C is misleading as it indicates the potentially best case under ideal, stable conditions. In reality, i.e. environmental applications, it is larger, depending on the chosen sampling and spatial resolution, type of DTS instrument, etc.

2. 857, 07 – 859, 02: This part of the introduction is a nice description of relevant facts but elaborates on rather trivial points. The content is largely known and sufficiently discussed in the references cited in this section. This section should be more targeted to innovation.

GID

2, C311–C315, 2012

3. 858, 25: Here it should be mentioned if heat is injected into the cable or the surrounding media.

4. 859, 02: It would still be of interest for the community to know who did this study and where this data may be available.

5. 859, 12-16: It should be mentioned whether this system works for any commercial DTS unit.

6. 860, 06-10: The computer is sometimes an integrated part of the DTS system, depending of the unit. For point (iv) I would be more general and say, for instance, "temperature controlled enclosures for reference temperature measurement" instead of "water baths".

7. 860, 16 – 861, 20: The whole section is useful for new DTS users but environmental DTS literature now covers almost 10 years and a lot of information could be referenced. These paragraphs read like a field handbook and could possibly be condensed.

8. 861, 25 – 863, 24: I don't understand why this section is part of Section 2.1.1 "passive DTS components". It describes the whole background of active DTS measurements and therefore does not fit here. Also the next part (863, 25 – 864, 18) on cable calibration is somehow out of context here; I suggest making it an independent section and place it accordingly.

9. 862, 13-18: The electrical resistivity is a function of temperature, which is not mentioned here. How does this affect the presented relations?

10. 862, 26: Cross sectional area; not diameter.

11. 863, 11-14: a) It would be interesting to also have the actual stream temperature reported. b) Not clear: "if flowing water was present"; On line 11 it is said that flowing water was present. ?

12. 863, 28: Why is it necessary to have more than one water bath?

GID

2, C311–C315, 2012

13. 864, 28 – 865, 18: This part is a bit lengthy, describing minor technical details while it is not really clear what is the technical innovation beyond a few standard features.

14. 866, 11-15: 200-800m is not very long w.r.t. the potential range of many current DTS instruments. What would be typical applications for this short range of cable length in remote, inaccessible locations?

15. 866, 24 – 867, 01: It is not clear which data you are referring to; no experiment is described or mentioned. The mentioned data platforms where data are published are specific. I suggest generally mentioning the advantage of feeding measurements directly in a publicly accessible system, and then present your specific solution (GSN/OSPER) for your own data, which actually should be presented in this manuscript as an example and proof-of-concept. Btw, what is OSPER? No reference provided.

16. 868, 04: At the end of section 2.1.2 (866, 14) it is stated that the practical range is around 200m. The phrase used here "over long distances" may thus be misleading for may readers being familiar with the potential range of several km for many DTS systems. Simply say ". . .over distances of a few hundred meters. . ." or similar.

17. 868, 16-19: What is a typical overall consumption with all components (power converters, etc) included? Has such a set-up been tested and run for a sufficiently long time to evaluate its performance? I am somehow concerned if the system in grid-independent configuration would get the required power continuously from power supplies such as solar panels or wind turbines.

Minor comments:

1. 857, 01: Replace "sciences" by "conditions and processes".

2. 857, 18: Remove the work "or" and put DTS in parentheses.

3. 857, 19: . . .collection of distributed temperature data. . .

GID

2, C311–C315, 2012

4. 857, 27: . . .and for electrical insulation.

5. 858, 06: . . .the injected light wavelength. . .

6. 858, 17: . . .commercial Raman DTS systems. . . (Brillouin based systems can do <5cm!)

7. 859, 05: In remote and inaccessible regions without power. . .

8. 859, 09: . . .particularly in environmental science and engineering.

9. 859, 10: . . .independent of the physical presence of an operator, . . . enable research in scientifically interesting remote areas.

10. 859, 12: The autonomous DTS system proposed here consists of. . .

11. 859, 16: I would rather say “necessary” instead of “optional”.

12. 859, 18: Better say “constraints” instead of “issues”.

13. 859, 24: Give a (typical) value or range for “high voltage”.

14. 859, 25: Very interesting!!! Humans as animals similar to rodents? :-)

15. 860, 22: Remove the words “extremely” and “very”.

16. 862, 10: What exactly is meant with “length” here?

17. 863, 08: . . .require high voltage. Tests at the River Thur. . .

18. 864, 04: typo: unfeasible

19. 864, 09: . . .is known precisely and can be used. . .

20. 865, 16: Note that the system. . . 21. 867, 02: . . .an area with network coverage. . . 22. 868, 05: . . .which will enable measurements in. . .

Interactive comment on Geosci. Instrum. Method. Data Syst. Discuss., 2, 855, 2012.