

## ***Interactive comment on “Design and Applications of Drilling Trajectory Measurement Instrumentation in Ultra-deep Borehole Based on Fiber Optic Gyro” by Yimin Liu et al.***

### **Anonymous Referee #2**

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#### General comments

The topic addressed in the manuscript is relevant and adequate for this journal, as it perfectly fits the aims and scopes. The authors focus on the development of drilling engineering in the field of high-temperature geothermal energy, which requires accurate trajectory and drilling path measurements. As the issues associated to sampling in high temperature and pressure environments need to be considered, the instrument here presented seems to have chances to become a very reliable option to reach such a goal. It is based on the interference fiber optic gyro and is said to be able to work continuously for a considerable amount of time under temperatures up to 270 °C and

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pressure values of 120 MPa, which is really remarkable. A significant effort has been done as well to test the instrument.

To my opinion, the design, experiments and results can be reproduced by fellow scientists, provided they have the required material resources. Nonetheless, it is somehow strange to state it can work in environments up to 270 °C and 120 MPa, but when presenting the experimental results in the boreholes, the values of temperature and pressure seem to be quite far away (in one of them the highest temperature measured was 43.4 °C). To my opinion, this fact is a weakness of the manuscript, at least the way it is here presented.

Furthermore, I find it is missing a more detailed analysis on the data obtained through the experimental measurements here presented. I would encourage the authors to deep into these results and therefore be able to reach stronger conclusions.

#### Specific comments

- Introduction section. I would have expected here a wider explanation of the state of the art in the topic. Maybe Table 1 information can be as well explained in the manuscript in an extended way, so that this issue is covered.

- Discussion section. A significant part of this section is not really a discussion; rather than that its contents might better fit in an introduction or conclusions section. I suggest to extend the discussion and/or reorganize the contents.

- Figures. Some figures which are actually photograph pictures might be removed, as they do not seem to provide significant information (for instance -but not only-: 23, 24, 25). Moreover, are all the figures original for this paper or are some of them taken from other previous works? If the latter is true, please cite the original reference. Besides, make sure that all the acronyms or symbols which appear in the figures are earlier defined. Otherwise, please add this information in the caption. This is especially relevant for figures which are schematic representations or flux diagrams.

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- Figure captions. They are often extremely short. More details would be useful to help the reader easily understand the figure message. Example: Figure 1 caption would benefit from having extra information about what all the lines and points mean. Please, consider clarifying the reference system and/or using different colours or width/type lines for each kind.

- Units. A couple of times (Tables 1 and 2) it is stated a voltage magnitude with corresponding units "MPa", which seems strange to me. Can you either clarify or correct this?

- Tables. I doubt that all the tables are really necessary. Is Table 5 content not available in handbooks? Please carefully check that it is properly stated which magnitudes (and units) are presented in all the tables. In some of them it seems not to be clear.

- Language. It is sometimes not as fluent and precise as expected; occasionally it seems inappropriate for a scientific journal. This includes strange expressions or an inadequate use of commas. Furthermore, some parts of the text are repetitive, which makes the manuscript less attractive. I would suggest to consider removing the duplicated information, and rewording several sentences which lack of scientific or technical vocabulary. In addition, a few lines in different pages of the manuscript are written in a language which is not English. This is something really odd.

#### Technical corrections

- Please check that all the acronyms are defined the first time they are mentioned. This includes not only the abstract, but also the first mention in the rest of the manuscript.

- Lines 61-67: consider including some references here to support these statements.

- Table 2: the way it is used the term "Units" here is confusing to me. Is it correct?

- Is the coordinate system in figures 20 and 21 the same as in figure 1? If not, why?

- Line 368: I think there is a missing dot over "T". If not, what is stated there seems to

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me senseless.

- I do not understand why some tables appear at the very end of the manuscript, even after the references section.

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Interactive comment on Geosci. Instrum. Method. Data Syst. Discuss.,  
<https://doi.org/10.5194/gi-2019-39>, 2019.

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