

Dear Giacomo Medici,

Thank you for providing useful suggestions for the manuscript. We incorporated most of the suggestions, which improved the presentation of modelling procedure, description of results and discussion. Please find our detailed point-by-point responses to the comments below.

Kind regards,

Eszter Békési and co-authors

COMMENT #1 by Giacomo Medici

General comments

It's always good review original paper on large-scale hydro, and thermal models from Hungary! The research is also original and can be exported to many other areas of geothermal interests worldwide. Please, follow my comments to improve the manuscript.

Thank you for the constructive comments, we improved the manuscript based on the suggestions detailed below.

Specific comments

Abstract

Line 10. "The forward model is extended". Please, be more specific. The object of the sentence is unclear and the abstract is short with obvious chance for clarifications

We extended this sentence to be more specific about the methodology, please see the revised ms.

Introduction

Lines 17-61. Did you consider adding a general statement to steady state and transient modelling in other fields of geo-science? Many large scale (deep and large in plant view) flow models have been developed in the Pannonia Basin. Your country has an original and well recognized academic tradition on this aspect of geo-science.

We added further references to the introduction. For more details, please see the revised ms.

Lines 16-20. "Understanding...thermal evolution pattern". Long statement without references. Please, insert recent review papers in the field of geothermal energy for characterization, production and modelling:

- Review of Discrete Fracture Network Characterization for Geothermal Energy Extraction. Frontiers in Earth Science, 11, 1328397

- Direct utilization of geothermal energy 2020 worldwide review. Geothermics, 90, 101915.

We thank for the suggestion to include these references. We added other reference examples for the connection between lithospheric thermal field and geothermal energy potential, exploration and exploitation.

Line 44. Clearly state the other hot basins in Europe (e.g., Rhine Graben, Tyrrhenian Sea). They are not so many and you can avoid vague sentences in that way.

We extended the text with specifying other hot basins in Europe, such as the Tyrrhenian and Aegean basins with similar settings.

Line 61. Specify the 3 to 4 specific objectives of your research by using numbers (e.g., i, ii, and iii).

We extended this part of the manuscript, but we preferred not to use numbering but only describe the objectives in more detail.

Data and methods

Line 127. “We calibrated the thermal model with subsurface temperature measurements from hydrocarbon and geothermal wells”. Please, specify the depth of the temperature data used for the calibration. 0.2 - 5.0 km based on geothermal and hydrocarbon observations?

The depth interval is written later in the text: “200-5100 meters”. We will also make available the whole dataset used for calibration with the publication of the paper, together with the modeling results (<https://data.mendeley.com/drafts/vp7jdp79y4>). For now, availability is restricted to the reviewers.

Line 127. If we assume observations 0.2 - 5.0 km, did you discuss reliability/validity of the model much deeper? The model should not be very sensitive in the deeper part.

Line 127 – onwards. Do you need to add some detail on the sensitivity of your model with respect to the parameters?

We included a sensitivity analysis and discussed the potential effects of selected model parameters to the resulting temperature estimates. For more details, please see the revised ms and our detailed responses to the reviewers.

Line 127. Link the depth range of temperature observations to Figure 3a

It has already been linked to Fig. 3a.

Line 181-222. The time steps of your transient model should be much more clear when you describe the methodology. They should be clear from the first lines. Do you need a link with the Table 2?

For the transient numerical modelling of the temperature evolution of equation (2), a 3D explicit 3-step Runge-Kutta finite difference approach was used, with a finite volume approximation and adaptive timestepping. The sentence and reference have been added to the revised ms. We do not think a link with Table 2 is appropriate here.

Discussion

Line 342. "It has already been". Avoid to start a new sentence with "it". Please, revise the language.

Revised.

Line 347. "These factors". Difficult to follow. Please, remind the specific factors to the reader.

We extended the text.

Line 408. I suggest "considering this scenario". Avoid to use the word "this" alone.

Corrected.

Conclusions

Line 451. Insert a connector such as "indeed" to link the last two sentences.

We think the link is already clear here.

References

Lines 477-639. Please, integrate relevant literature as suggested above.

Other references added.

Figures and tables

Figure 3a. Please, increase the graphic resolution. Some details are difficult to read.

Corrected.

Figures 5 and 6. Make the figures larger.

Corrected.

Figure 8. Make the letters of the labels larger.

This would not fit properly to the figure, and we think the labels are readable in full size.