

Geosci. Model Dev. Discuss., referee comment RC2
<https://doi.org/10.5194/gmd-2021-48-RC2>, 2021
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Comment on gmd-2021-48

Anonymous Referee #2

Referee comment on "How biased are our models? – a case study of the alpine region" by
Denise Degen et al., Geosci. Model Dev. Discuss.,
<https://doi.org/10.5194/gmd-2021-48-RC2>, 2021

General Comments:

This paper is a well-designed and thoroughly referenced analysis of the biases introduced by applying poorly distributed measurements to the assessment of geothermal models and of the sensitivity of the influence of two model parameters (thermal conductivity and radiogenic heat production) on the modeled subsurface temperature. The problem being addressed is adequately described. However, it becomes difficult to determine if the authors have made their case effectively, since the sequence of the evidence being presented is often confusing and the density of the information discussed becomes rather high. For example, several figures are presented out of numerical order and Figure 12 is not described in the text at all. There are 114 histogram boxes in Figure 10 alone and 90 boxes in Figure 13. It is suggested that the manuscript would benefit and would more clearly communicate its message if there were fewer figures, if the figures were discussed in their numerical order, and if some of the figures were simplified. In addition, there are numerous grammatical lapses that are detailed in the technical comments and must be addressed before publication. The conclusions of this paper will be a worthwhile contribution to the literature, but publication is recommended only after major revisions to the text and figures are completed.

Specific (Scientific) Comments:

Abstract

1 Introduction

Page 2, Line 28: This section reads such that the first and second problems listed both

relate to the issue of data density with one directed in the vertical and the other related to horizontal data scarcity. If an additional distinction was intended, please clarify.

Page 2, Line 45: It might be helpful for the authors to clarify that by "global sensitivity analysis" they are referring to examining the entire parameter domain within the spatial extent of their model and are not referring to examining the parameters over the entire Earth.

2 Materials and Methods

Page 3, Line 77: It's not clear what is meant by "...only the vicinity of the input parameters is explored". Please clarify.

Page 5, Line 117: The data described are for the "southern foreland" of the Alps?

Page 5, Line 130: Do the temperature databases provide some criteria or indicator of data quality, or if not, what basis or method was used to establish the data quality to inform the data filtering and weighting?

Page 6, Line 135: The number of measurements for the four regions adds to 2,391 data points, but the previous sentence identifies 2,388 total data points. Please explain or correct the difference.

Page 7, Line 142: The rationale for the weighting factor of 0.5 for the Upper Rhine Graben and Alps data points is not obvious. Please elaborate.

3 Alpine Region

Page 11, Line 217: What is the difference between Figures 6 and 9? In general, it is good practice in a manuscript to clearly describe each figure within the text and to introduce them in numerical order. Presenting the figures out of numerical sequence creates unnecessary confusion for the reader.

Page 11, Line 234: The sentence that begins "Note that we do not present the results..." is confusing on several points. First, the text should introduce what is presented in Figure 8 prior to this sentence (and prior to introducing Figure 9). Also, Figure 7 does present a

sensitivity of thermal conductivity for the Upper Crust in the Po Basin, and Figure 8 does present a sensitivity of thermal conductivity for the Lower Crust in Saxothuringia, which conflict with the statement in the referenced sentence. Please clarify.

Page 12, Line 251: The organization and description of the figures discussed in this section are confusing, and Figure 12 is not introduced in the text at all. The reader should be provided a clear motivation and description for each figure in the manuscript.

4 Discussion

Page 15, Line 280: The sentence that begins "This might be a bias introduced..." is confusing. The number of data points (755) is the same for the Unconsolidated Sediments in URG (I_1) and for the rest (I_3)?

Page 17, Line 317: It seems like an overstatement to claim that "Hence, the bias...can be removed". The weighting procedure is not creating new information, it's simply rebalancing existing information. It would be more appropriate to say that the bias can be "reduced", especially in the context of the later statement that the paper does not aim to provide the ideal weighting scheme for the Alpine Region.

5 Conclusion

Appendix

Tables and Figures

Figure 6: What is the purpose of the thick horizontal black line? Remove if not needed. Same comment for Figures 10, 15, and 16.

Technical Corrections:

Abstract

1 Introduction

Page 2, Line 36: Suggest removing "long and" so that the sentence reads "The problem of data sparsity is widely recognized..."

Page 2, Line 40: Replace "do not arising" with "do not arise"

Page 3, Line 63: Replace "however only few" with "however, only a few"

Page 3, Line 66: Suggest replacing "to the data distribution..." with "to data distribution..."

2 Materials and Methods

Page 3, Line 77: Replace "independent" with "independently". The adverb is required to qualify the verb "are considered"

Page 3, Line 85: Replace "analysis to" with "analysis refer to"

Page 4, Line 108: Suggest replacing "clarity" with "brevity". Omitting a description provided elsewhere doesn't add clarity so much as it provides conciseness.

Page 4, Line 110: Remove the verb "is" before "provided", if the sentence that begins "For further information regarding..." is intended to be a list of four references.

Page 4, Line 112: Replace "in (Degen et al., 2020a)" with "by Degen et al. (2020a)".

Page 4, Line 114: Replace "in form of" with "in the form of". Remove the "," after "Fig. 1".

Page 5, Line 115: Replace "This temperature data is identical to the one presented in..." with "These temperature data are identical to those presented by..."

Page 5, Line 117: Replace "data is derived" with "data are derived". The word "data" is

grammatically plural; make related corrections universally in the manuscript.

Page 5, Line 118: For clarity, add "(URG)" after "Upper Rhine Graben".

Page 5, Line 125: Recommend replacing "This resulted..." with "This procedure resulted...".

Page 5, Line 125: Replace "temperatures" with "temperature".

3 Alpine Region

4 Discussion

Page 13, Line 260: Replace "are" with "is"; "the difference...is higher for deeper layers"

Page 15, Line 279: For clarity, replace "Po" with "in the Po Basin".

Page 15, Line 279: Replace "containing" with "it contains"

Page 20, Line 364: Replace "of the most of the Lower Crust" with "of most of the Lower Crust"

Page 20, Line 369: Change "arising" to "arises".

Page 20, Line 372: Change "observer" to "observe"

5 Conclusion

Page 23, Line 390: Recommend replacing "Throughout the entire paper..." with "In this paper..."

Page 23, Lines 398-399: Recommend replacing “parts” with “areas” or “regions”.

Page 23, Line 400: Replace “The model changes from the General-Focus...” to “The changes from the General-Focus model...”

Appendix

Table A1: Suggest replacing “acronym” with “symbol”.

Tables and Figures

Figure 10: Due to the high information density, it’s recommended to orient the boxes consistently (for example, hatched, colored, slanted) in all cases. This will make it easier for the reader to distinguish the sections of histograms. Also, this figure could be made somewhat wider to add some white space between the model parameter sections. Same comment for Figure 13.