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Earth System Dynamics
Fubao Sun, Handling Editor

Dear Dr. Sun:

Please consider the **revised** manuscript, entitled "Dating Hiatuses: A Statistical Model of the Recent Slowdown in Global Warming -- and the Next One" (with Kyungsik Nam), for publication in *Earth System Dynamics*.

We have carefully and thoughtfully addressed the reviewers' comments, which we found to be constructive and certainly helped us to improve the draft, in the response and in the manuscript. A response to each reviewer follows. Because we have received positive feedback from four reviewers and this is our fourth submission (third revision), we sincerely hope that you can make a quick acceptance decision!

Sincerely,

J. Isaac Miller

Authors' Response to the reports of Reviewer #3 (Report #1) and Reviewer #4 (Report #2) on the 3rd submission of "Dating Hiatuses: A Statistical Model of the Recent Slowdown in Global Warming -- and the Next One"

Reviewer #3 (Report #1):

I thank the authors for their careful attention to my comments. They are addressed satisfactorily in the revised manuscript. Indeed, their manuscript successfully marries sophisticated statistical analysis with a sophisticated understanding of the science. As such, I believe the manuscript should be published.

- We appreciate the referee's time in helping us improve the manuscript!

I do have one last suggestion for the final manuscript. On pages 6-8, the authors repeatedly refer to the absolute and percentage of the missing heat that is associated with a given variable. For example, on page 6 (lines 9 – 10) they argue that volcanoes account for about 1.1 % of the missing heat and again on page 7 (lines 34-35) "that ENSO explains 23.7% of the missing heat. I suggest that the authors create a figure that allows readers to see these absolute amounts or percentages in one place. This will allow reader to compare various contributions. I realize that many of these findings are implicit in Figure 1. But the slopes of the temperature lines are much harder to quantify and interpret relative to a bar chart that explicitly shows the quantity of missing heat that is associated with volcanoes, ENSO, etc.

- **Added a bar chart** with the suggested information and some additional explanatory remarks. Thank you for the suggestion!

Also figure 1 does not show the change in temperature previous studies attribute to various factors. Indeed, the bar chart could also show the quantity of 'missing heat' that previous analyses attribute to a particular variable, such as volcanoes or ENSO. When possible, this would help readers compare the authors' results to those generated by previous studies, which the authors review on pages 1-2.

- The principle underlying this comment is sound, but unfortunately the implementation of this well-intentioned comment proved to be too difficult.
- It would be impossible, or nearly so, to compare the denominator, missing heat, across papers that define missing heat differently. If nothing else, many of the cited papers were published prior to our dating of the end of the hiatus in 2013, so they could not define it in the same way. Even those papers published later may not have defined the hiatus in the same way or over the same period (Schmidt et al., 2014; Karl et al., 2015; Yao et al., 2016; and Medhaug et al., 2017), as we wrote in the third paragraph.
- We considered trying to compare percentages instead, even though the denominators (missing heat) may be different. But not all of the preceding papers include calculations of missing heat and may present the hiatus differently. We thought it wiser to let the reader draw her/his own comparisons rather than trying to back out an object that the authors of those papers may not have had in mind.

Reviewer #4 (Report #2):
My concern is that the variable modelled and predicted in this study is subject to short- or long-term memory.

- **Added a clarifying sentence** to the sixth paragraph of the introduction: "In doing so, we carefully decompose the distribution of temperature anomalies into components with long memory, low-frequency, stochastic trending behavior (mapped to forcings from WMGHGs), with short memory, medium-frequency, cyclical behavior (the OMO), and with short memory, high-frequency, idiosyncratic behavior."
- We appreciate this very short yet very appropriate comment. We treated this issue carefully and extensively in our methodology, as described in the SOM. However, we acknowledge that this would not be clear to a time-series-inclined reader who chooses not to read the SOM. Although we did make it clear that we were using a methodology specifically aimed at series with stochastic trends, we did not make it clear in the main text that our measure of the OMO filters out both low and high frequencies. This should now be clear.

[We did not see any further comments in Report #2.]