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Interactive comment on "Bayesian deconstruction of climate sensitivity estimates using simple models: implicit priors, and the confusion of the inverse" *by James Annan and Julia Hargreaves*

Anonymous Referee #1

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Review of Annan and Hargreaves, "Bayesian deconstruction of climate sensitivity estimates using simple models: implicit priors, and the confusion of the inverse"

This paper is a tutorial arguing that researchers replace PDF sampling with a Bayesian framework. Overall, I quite liked the paper. I thought it was written at the right level and was very accessible to a non-expert like myself.

I recommend publishing this after the authors consider my comments below.

I have only one comment that I would strongly suggest the authors accept: they should put some code on-line that shows how they did the calculations. The advantage to doing this is that it will show the details of the calculation in a detail that it is not possible to

put into words in the manuscript. Overall, I was able to follow generally the explanation in the text, but I think I would have trouble actually coding up the procedure. Seeing example code would be very very helpful.

Ideally, they would include all of the code needed to generate the figures, but if they don't want to do that they could put the code on-line for one of the examples in Sect. 3.1, 3.2, or 3.3. There are lots of free places to put code (e.g., zenodo.com or, of course, github) that work well.

More minor comments: The abstract needs to be rewritten. It reads like the introduction of the paper, and it has paragraph breaks within it. I would try to make it more of a summary of the main points of the paper.

Last line on page 2: where does the 0.5 come from?

In equation 2, what part of that is the "prior"? in fact, the term "prior" doesn't seem to be defined anywhere in the paper, which seems to me to be an oversight.

Top of page 8: I would add a sentence here making explicit what you're doing: you're trying to back out what prior you'd need to get the same answer from a Bayesian analysis as you do from the naïve PDF sampling.

In e.g., Eq. 7, the authors re-arrange the equation so that delta T is on the LHS. Why is that done? It seems important, but I'm a bit lost.

Sect. 3.3.1: I am quite confused what's going on here. I think what they're doing is taking lambda from Forster and Gregory and then using a Bayesian analysis to convert that to a value of S. Is that right? I think that they could add just a few words to make this more clear.