



## ***Interactive comment on “Influence of parallel computational uncertainty on simulations of the Coupled General Climate Model” by Z. Song et al.***

**Z. Song et al.**

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### **Response to Referee #1**

*(Note: referee comments in black and our reply in blue)*

#### **General comments**

Comment: This paper addresses the interesting question of the climate model uncertainty due to the round off and presents a methodology for estimating how many realizations of a climate model are necessary. It's very common to change CPU configuration or computational platform during a long-term model run in climate research. But some results could be quite different. And this uncertainty is a common prob-

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lem for every climate model. The author suggests that the ensemble mean method could reduce the uncertainty and the minimum member number is 15 and minimum averaged years is 30 (the time-average can consider as the another meaning of the ensemble mean). In general, I consider the results reported here to be helpful to our understanding and use of the climate models, especially in model evaluation. And the paper is clear and concise yet complete. I would like to recommend this paper could be accepted for publication in GMD after some minor revision.

*Reply: We would like to express our sincere thanks to the referee for providing the valuable comments and suggestions. These comments and suggestions greatly help us in improving this manuscript.*

#### **Specific comments**

I have some comments and suggestions below which might improve the paper.

1) Figure 3 shows that the deviation from the mean is reduced when the number of ensemble members increases, until at  $N = 54$ , then the difference is zero. As you definition of the deviation, which is defined as difference from the 54-member average, of course it becomes zero. If you use different N, such as 30, 40, or even more, the conclusions of the ensemble size are also the same?

*Reply: Yes, the conclusions are nearly the same when the ensemble size is more than 20. We analyze the deviation of the Global-SST and Nino-SST with different standard value by different ensemble numbers (Fig. 1 in this comment). Although the deviations decrease as the numbers increase, it is noticed that the curve shapes are quite different when the number of cases is less than 20, and the deviations decrease rapidly. In contrast, when the ensemble number is larger than 20, the curve patterns are very likely: the deviations decrease rapidly when the average number is less than 15 while the deviations decrease slowly when the average number is larger than 15.*

2) Does the ensemble size required depend on the variable, spatial average, location

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etc., all of which determine the standard deviation associated with the variable one is interested in? In other words, is the number 15 or 30yr a universal answer? I suggest and encourage the authors do deeper research for these issues in the future.

Reply: Thanks for your suggestions. Indeed, we noted that the number of years of ensemble mean used to average for reaching convergence of Global-SST and Nino-SST is not exactly consistent in Figs. 3 and 5. So we think the results and conclusions will depend on the variable, spatial average, location etc. Because SST is the important parameter to measure the coupled climate system, in the present paper we just mainly focus on SST. And other regions or variables such as precipitation and radiative flux will be analyzed in the future.

3) Page 3298, line17, "Community Atmospheric Model (CAM3)" should be "Community Atmospheric Model Version 3 (CAM3)".

Reply: Changed, thanks.

4) Page 3298, line17, "the Parallel Ocean Program (POP 1.4.3)" should be "the Parallel Ocean Program Version 1.4.3 (POP 1.4.3)".

Reply: Changed, thanks.

5) Page 3298, line25, "CLM", "CSIM" and "POP" are suggested revised to "CLM3", "CSIM5", and "POP1.4.3" to consist to atmosphere model name CAM3.

Reply: Changed, thanks.

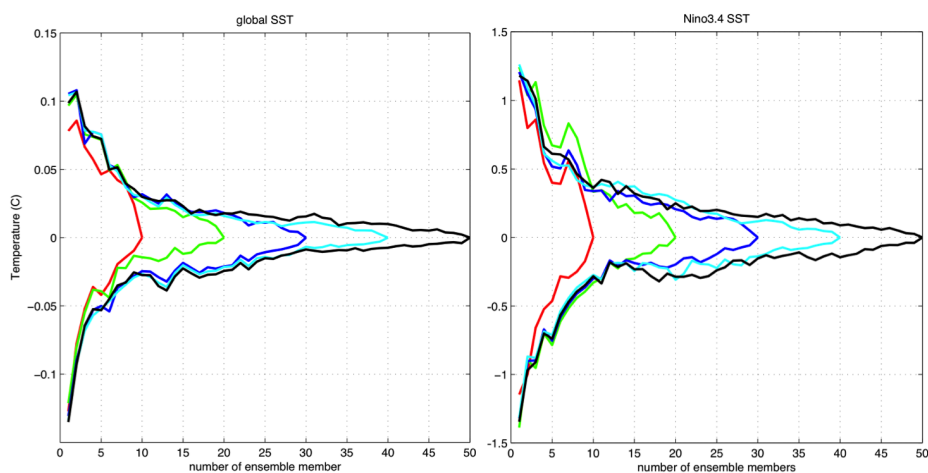
6) Page 3299, line5, "The Land model" should be called "The Surface Land Model".

Reply: Changed, thanks.

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Interactive comment on Geosci. Model Dev. Discuss., 4, 3295, 2011.

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**Fig. 1.** The evolution of max and min Global-SST(left) and Nino-SST(right) deviation with the number of ensemble member. The red, green, blue, cyan and black lines indicate the 10, 20, 30, 40 and 50 members

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