

Geosci. Model Dev. Discuss., referee comment RC1
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Comment on gmd-2022-71

Anonymous Referee #1

Referee comment on "Characterizing uncertainties of Earth system modeling with heterogeneous many-core architecture computing" by Yangyang Yu et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2022-71-RC1>, 2022

This paper presents a method for identifying and understanding the characteristics of computation uncertainties of Earth system modeling in heterogeneous architectures. The computation uncertainties and acceptable error tolerances in GPU-based high-performance computing and Sunway systems have been analyzed. The development of the Earth system models in heterogeneous systems is becoming more and more popular. This paper provides foundation support for developing and porting Earth system models in heterogeneous high-performance computing systems. The paper reads well and can be accepted after minor revision. See the below:

- In the introduction, I am confused about the sentence "regular increases in the number of supercomputing processors came to a stop roughly one decade ago." However, the number of supercomputing processors has been increasing in the recent year. I suggest to change it to "regular increases in the processing frequency of supercomputing processors came to a stop roughly one decade ago."
- Figure 3 shows a lot of similar codes. I hope the authors state clearly the difference in codes between homogeneous and heterogeneous computing environments.
- In Table 2, I am confused about the results that the mean SAT values are different between Intel_C_64 and Intel_C_32 modes in the tenth significant digit. However, the 32-bit variables have only 7 significant digits. Please state clearly the experimental results.
- Table 3 lists seven simple model modes applied to homogeneous and heterogeneous computing environments and the Intel mode is not shown in the later experiments. I hope the authors state clearly the role of the Intel mode.
- I hope the authors point out the types and versions of all compilers in Section 3.3.