

Geosci. Model Dev. Discuss., referee comment RC1
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Comment on gmd-2021-399

Anonymous Referee #1

Referee comment on "An online ensemble coupled data assimilation capability for the Community Earth System Model: system design and evaluation" by Jingzhe Sun et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2021-399-RC1>, 2022

This work developed a weakly coupling assimilation system for Community Earth System Model (CESM) using EAKF. This is demonstrated by OSSE twin experiments. Different from some assimilation systems of CESM developed by other groups using the DART, an assimilation software tool developed by NCAR, this work develops a technique for on-line assimilation analysis using the compute-domain/datadomain data process strategy and parallel schemes. The authors claim such an on-line assimilation scheme can save a lot computational expense compared with commonly used off-line assimilation by DART. Indeed, the computational expense is a critical issue in numerical simulation and prediction, especially for real-time operational prediction. Thus, I support this work although it only addresses the technique advantage, not much about the scientific merits of data assimilation itself. However, I have two large concerns and wish the authors to address them before I recommend it to be accepted.

1) The most spotlight of this work is based on the conclusion that the computational expense of such an on-line assimilation system is much computationally economic and efficient, compared with the traditional off-line system. However, this work does not show any evidence to support this conclusion. The authors should present details and results on the computational efficiency, for example, CPU time for one step of assimilation, the entire time of an period of analysis etc.. A systematical comparison against the off-line experiment is the most idealized and expected. Without these supportive evidences, this work seems empty and pale.

2) The readers of this work should mainly be geoscientists, who may not be strong in computer science. The authors should consider the scope of readers in presenting their work so that this work can be fully understood and further reproduced by the readers of interests. Thus, I suggest authors to pay attention to the presentation in describing how to implement on-line the assimilation system.