

Geosci. Model Dev. Discuss., referee comment RC2
<https://doi.org/10.5194/gmd-2021-331-RC2>, 2021
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Comment on gmd-2021-331

Anonymous Referee #2

Referee comment on "CondiDiag1.0: a flexible online diagnostic tool for conditional sampling and budget analysis in the E3SM atmosphere model (EAM)" by Hui Wan et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2021-331-RC2>, 2021

General comments:

This paper documented a new model development tool called CondiDiags1.0 to facilitate conditional sampling and budget analysis in atmosphere model development. This tool is already being implemented in the EAM model with flexibility to be ported to models with similar data structure and time integration method. The authors also demonstrated the use of this tool with three carefully selected examples.

To select variables and monitor them at specified sampling condition is a common practice that is often conducted by model developers in developing new modules or in debugging. A general tool like this would avoid duplicated effort attempted by individual developers and help maintain a clean code base. The manuscript is well structured and written clearly. It is suitable to publish to GMD after addressing below comments, which are mostly minor.

Specific comments:

The manuscript indicated that the version 1 of this tool has implemented in EAM with several successful use cases. EAM is the target host model for now, but it is flexible to be used in other AGCMs. Some possible improvement to make the paper/tool more comprehensible for the general audience:

- Elaborate on terminology that is specific to EAM/CAM, just to name few: physics state, physics buffer, cam_in, cam_out, tphysbc vs tphysac...
- The zenodo doi linked two versions of EAMv1 with and without CondiDiags, but it is not

straightforward to see the codes of CondiDiags and how it interfaces with EAM. Not sure about the best approach, but I wonder if the authors can supply with an additional package with standard CondiDiags and a template that could be used as an example for external users? Is there a general guideline about adopting ConndiDiags with other AGCM as a host model?

- It is not explicitly indicated that if CondiDiags has already be available in EAM code base and readily to be used for EAM developers?

Technical corrections:

In session 2.1, the definition of "process" and "component" seem ambiguous. Ln 117-119: indicate that deep convection contains two sub-components, with the parameterization of impact of convection on temperature and humidity, the parameterization of convective momentum transport. Is process B a more frequent case than processes without sub-processes? It might be useful to have some definition on process and component?

Ln 130. Is there a relationship between the location of where outfld is called to check-points? Is the location of outfld process-dependent?

For the inactive checkpoint, are they off by default but can be turned on easily with name list change?

Ln 237: "If a value of 101 (moist) or 102 (dry) is used, the the...." Shoud be "..., then the"?

Session 5.2.4 The process of turning on vertical integral and assign moist/dry air mass for mass-weighting is a little hard to comprehend. Maybe try simplifying if possible...