The paper of **Sakaguchi et al.**, entitled '*Technical descriptions of the experimental dynamical downscaling simulations over North America by the CAM5.4-MPAS4.0 variable-resolution model*' ; https://egusphere.copernicus.org/preprints/2023/egusphere-2022-1199/ ; presents the design of the CAM-MAPS coupling and the comparison of experiments using variable resolutions (against uniform resolutions).
The paper combines technical descriptions of the experimental set-up and of the post-processing and investigation of the sensitivity to the resolution, and, additionally gives the main insights of the simulated climate for present-day and future projection (RCP 8.5 scenario).
The paper is well organized. It presents the main framework, a view of the results, but it also presents the limitations that arise to computation constraints, physical choices, … Additional materials in annexes are relevant. The way to access to the code and data is fine, with also some tools to prepare experiments, to read and/or interpolate outputs.
I only have very minor questions and suggestions that I give below. With this, I think that only a minor revision would be needed to improve the paper before accepting its publication.

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**Main remarks:**

***CAM-MAPS coupling:***
**Lines 170-181:** It is not easy to follow how exchanges take place along the vertical grid(s). Is there an interpolation/extrapolation along the vertical? If possible, a kind of schematic view of the way it is done could help to better understand.
**Figure 2** is the only figure that explains the MPAS-CAM coupling and I think it could be improved to better support the text:

- Adding a box could help to identify CAM;
- What is the role of subroutines p_d_coupling/d_p_coupling? vertical interpolation? Timestep management?
- Are surface parameters tendencies provided to MPAS or are they only used inside CAM physics?

***Section 3.1***:
I think this section, and in particular the two first paragraphs could be reorganised for more clarity… maybe speaking first about the different resolutions used, then describing the time-stepping and the physics schemes in CAM. Finally explanations of the different runs with the "eval" and "rcp8.5" simulations could be given (and only at that final point, the specific treatment of the sea surface/sea-ice could be given, and also the explanations about the differences with downscaling experiments done with limited area models, i.e. direct downscaling from GCMs or "pseudo-warming" downscaling with addition of climate-change signals).

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**Other comments:**

***1. Introduction***
line 74: The reference here should be to Figure 3 I think.
Caption of Figure 1 and line 88: Maybe, it's not necessary here to speak about the use of ERA-interim SST and sea-ice cover, as this piece of information suits more to the experiments description in the section 3.

***2. Model description***
line 128: "*... the default physics option for this version of CESM...*". Two versions are cited in this

sentence. If possible, rephrase to better relate “default physics” with “version 6”.
line 169: “*... the updated atmospheric and tracer states are passed to the CAM physics.*”. Please see my remarks about Figure 2. As there are two groups of parametrizations, a better identification of CAM “contours” would be useful.

***3. Downscaling experiments***
line 222: “*...but still covers the most of the NA CORDEX domain.*”. Not precise.
Line 274: “*climatological*”
line 297: “*...the so-called NAM grid...*”. Please refer also here to Table 2 which contains information about NAM grid resolutions.

***5. Simulations***
line 390: I think it’s Table 5 (and not 2).
line 478: “*CONUS*”
line 544: “*...in SAT...*” in TAS?

***Annexe C***
Tables C3 and C4: I am just wondering what are the meaning of having daily max/min temperatures in 6-hourly and 3-hourly outputs. Is it to identify the timing of these minimum and maximum in the day?