

Geosci. Model Dev. Discuss., referee comment RC2
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Comment on gmd-2022-167

Anonymous Referee #2

Referee comment on "The pseudo-global-warming (PGW) approach: methodology, software package PGW4ERA5 v1.1, validation, and sensitivity analyses" by Roman Brogli et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2022-167-RC2>, 2022

The pseudo-global warming (PGW) approach, pioneered by Schar et al (1996), has been widely used in the regional climate modeling community as an alternative to the traditional GCM-based dynamical downscaling strategy. This manuscript presents an overview of the methodology and provides a detailed description of the forcing construction for PGW simulations in the case of the COSMO-CLM regional climate model (RCM) and ERA5 reanalysis. The pressure adjustment is particularly highlighted to maintain the important physical and dynamical balances in large-scale motions, such as the hydrostatic balance, the thermal wind balance, and the geostrophic balance. The methodology is validated by comparing against the standard GCM-RCM simulation and a set of sensitivity tests. Along with the development of a Python-based software package (i.e., PGW4ERA5), this work will greatly facilitate the preparation and implementation of PGW-type simulations and further promote the application of the PGW approach in the regional climate modeling community. I have a few comments for the authors' consideration and clarification.

1. The authors focus on the construction of the three-dimensional fields which are required for deriving the lateral boundary conditions for PGW simulations, but completely ignore the discussion on the construction of lower boundary conditions such as sea surface temperature, sea ice, sea level pressure etc. As well as the text, the workflow in Figure 2 needs revisions to include the missed information of lower boundary conditions.

2. The proposed procedures for PGW simulations are specifically designed for the COSMO-CLM model, but are generally applicable to other RCMs. Nevertheless, some adjustments may be necessary when the software package is applied to other models because of different initialization and input data processing strategy. For example, in the case of the WRF model surface pressure is computed using the input sea level pressure and geopotential at pressure levels by the standard initialization module, and the computed surface pressure and input temperature fields are then used to reconstruct the geopotential using the hydrostatic equation. In this particular case, perhaps the pressure adjustment is only required for surface pressure.

3. As far as I'm aware, outside Europe the 38-pressure-level ERA5 data are most commonly used, instead of the native model level data; the latter is much larger and its downloading is time-consuming.

4. English editing is needed to correct grammatical errors.