Geoscientific
Model Development
Discussions

Interactive comment on "The Canadian Earth System Model version 5 (CanESM5.0.3)" *by* Neil C. Swart et al.

Anonymous Referee #3

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Review of The Canadian Earth System Model version 5 (CanESM5.0.3) by Neil et al. for GMD.

The paper describes the last version of CanESM. The main goal is to provide a reference for people who will analyse CMIP6 model outputs.

Like all model description paper, there is a conflict between the need to be as comprehensive as possible, while keeping a reasonable paper length. In this point of view, the paper achieves a good and relevant compromise. It includes a short description of the model components, with all references for the reader who wants to go further in details. It contains a classical choice of model diagnostic to evaluate the model climate. It contains also informations0, of the model sensitivity to standardised scenarios of CO2 increase. This content nicely matches the main objective of the paper.

I really appreciated the honesty of the authors, particularly when they described the consequence of the bug in p1 version, corrected in the p2 version.

The paper also includes information about model quality control and performance. This is not of interest for CMIP6 data users. But model developers will find useful information on the way other teams work. Information that is hardly presented elsewhere.

The general organisation of the paper is good. As non-native English speaker, I won't comment the quality of the syntax. I found very few typos, and thanks the authors for their careful proofreading.

The main weakness of the paper is that the model is assessed in comparison with data and with the previous version of the model. There is no comparison with the CMIP5 models. This is not a major concern, as the model outputs will be used during CMIP6, and CamESM will be compared to CMIP5 and CMIP6 model in the next months by other authors.

To sum up, this is a very good paper that perfectly fits the reason why GMD has been created for. I think it can be published after a few technical corrections.

Major concern

Line 351. I do not understand how "version control, run isolation, strict checking and logging" can insure that the climate is reproducible. I agree that up to now, nobody has observed that lack of bit identical reproducibility in an ESM can drive to a different climate. But we have also theories of deterministic chaos showing that this is possible.

Minor concerns

Line 125 and following. Is there some specific representation of the urbanised areas ?

Line 151 and following. The melt water of the glaciers goes to the runoff scheme. How did you design a 'river' routing scheme for the ice sheets ? (from slopes ?)

Line 162. For the NEMO TKE scheme, a better reference than Gaspar et al. 1990

could be Blanke, B. and Delecluse, P.: Variability of the Tropical Atlantic Ocean simulated by a general circulation model with two mixed layer physics, Journal of Physical Oceanography, 23, 1363–1388, 1993.

Line 218. What is the computing coast of CMOC and CanOE compared to NEMO dynamics and to LIM2 ? It is significant or not ?

Line 777. Bentson et al. 2013 is not in the bibliography. Probably a typo, for Bentsen.

Line 809. Mathews et al. 2009 is not in the bibliography. Probably a typo, for Matthews.

Line 840. What is "Global Mean Screen Temperature" ? GMST generally stands for Global Mean Surface Temperature.

Line 1335. Year of the paper is embedded in the URL of the DOI.

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