

## ***Interactive comment on “The Monash Simple Climate Model Experiments (MSCM-DB v1.0): An interactive database of mean climate, climate change and scenario simulations” by Dietmar Dommenget et al.***

### **Anonymous Referee #1**

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Review of “The Monash Simple Climate Model Experiments (MSCM-DB v1.0): An interactive database of mean climate, climate change and scenario simulations”, by Dommenget et al., submitted to Geoscientific Model Development.

#### Major Comments:

The authors propose the Monash Simple Climate Model experiment database for understanding climate processes for controlling mean climate, as well as how model climate in response to changes in CO<sub>2</sub> or solar radiation forcings. It is an informative and

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interesting experiment database and I can see the value of it. Therefore, I recommend the manuscript for publication after the authors address the following comments.

While it is understandable to use a simple model to understand the key processes that controls the climate and their response to different forcings, there are still limitations of what this simple model can achieve compared to the fully coupled global climate models or earth system models. I think it is important to discuss in details for the mean temperature or its seasonal cycle in response to certain processes that are significantly different from observations or previous GCM studies, at least for the processes discussed in this paper. For example, the cloud feedbacks are much more complicated in the full GCMs or in the real world. There is even large uncertainty from observations.

As the authors also pointed out, the model dynamics are not fully resolved in this energy balance model framework. The authors tried to comment on some of the drawback in the simulations because of lacking model dynamics, such as the midlatitude heat transport due to baroclinic waves. Similar issues of heat and momentum transport in the ocean are also present in this simple model configuration. Therefore, a more detailed discussion on how the mean climate or climate response would be without considering these dynamics in the atmosphere and ocean.

Another issue is using the word “observed” in many places in the text and figures. Unless I am mistaken, all these “observed” fields are still model simulations. It is misleading to use the word and I suggest to use something like “control” simulations to avoid confusion.

#### Detailed Comments:

1. Line 36, uncertainties of what?
2. Line 38, 10 degree C of surface temperature?
3. Lines 267-273, so, there is no other topography effect in this type of simple model simulations other than the effect on emissivity or CO<sub>2</sub> concentration?

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4. Line 364, the eccentricity from 0.3 to 0.3?
5. Lines 429-432 and 496-499, I am not sure I understand why the strong cooling is due to the water vapour feedback. Is it because the water vapour is much less over the desert or mountain regions so that the warming effect due to water vapour is reduced.
6. Line 473, what is "it" that dampens the seasonal cycle.
7. Line 532, what do you mean by slow down the seasonal cycle?
8. Figure 11c, what are the red line and blue line? It's not explained in the caption.

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