Interactive comment on “The BRIDGE HadCM3 family of climate models: HadCM3@Bristol v1.0” by Paul J. Valdes et al.

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1 Overall Thoughts

The version of HadCM3 used regularly within the group at Bristol has clearly branched from the Met. Office’s original version. I think that this documentation (Valdes 2017) of it is a worthwhile contribution to GMD. I appreciate the provision of the source modifications and a list of the simulations. I would hope that in the final version there could be a link to the simulation output on the BRIDGE webpage. I had a couple queries, but suspect those could be addressed with revised sentences. I also found the figures and tables a little too small to be seen well on a printed version.

2 Queries

• Table 1 implies that two RHCrit values are due to level dependence rather than land/sea.
• Table 2 shows that MOSES2.2 (and hence TRIFFID) either is or cannot be used with the atmosphere only model. I wasn’t sure why.
• What is the 3A spectral scheme (p7, L19)
• You state the soil layer thicknesses are a function of soil heat capacity and conductivity on p9, yet provide their depths on the p12. Are they constant across the globe?
• Are the surface types, LAI etc prescribed for each gridpoint (so 2D) or just each PFT.
• You state moving from MOSES2.1 to MOSES2.2 have “particularly big” effect. Can you either quantify or refer to later section.
• In section 4.1.3 and the Table 2, you state that there is a ratio of solar radiation components that is 0. Is this correct, and what does it mean physically.
• Section 4.1.5 seems redundant as only the sea-ice diffusivity in Table 1 hasn’t been explicitly mentioned.
• What is the updating frequency of HadRM’s lateral boundary conditions - you state 6 hours on p17 and 3-4 hours on p18.
• Please provide a little more information about the HadRM3 vs HadAM3 diffusion - there are 2 parameters in Table 1 and isn’t clear to me what they mean.
• Some Figures (e.g. Fig2) appear to use different acronyms to the text.
The discussion on p24 about leeward precipitation appears to be in the opposite sense as shown in figure 4.

Section 5.1.3 does not discuss TOA flux - rather heat transports.

Fig 5 contains no explanation of the gray lines.

p27, l7. It isn’t clear to me what is meant by "larger annual variation" - within year or between years.

The references to Fig 9e/f need correcting

The discussion in Section 5.3.2 doesn’t necessarily recognise the big peak in the MODIS data at 250N - rather it considers the feature symmetric around the equator.

3 Sentence Suggestions

p2, l2. I wonder if the final sentence of the abstract should use "predominantly" rather than "particularly".

p2, l9. Flux corrections are not often discussed anymore, so I think you need to explain a little more

p7, l3. "which determine" occurs twice in quick succession.

p7, l13. Be explicit that this relates to RHCrit in Table 1.

p7, l26. you may want to consider giving the origin of some of the default fields.

p8, l14-15. This feels like duplication of prior sentence.

p8, l24. "direct" -> "dynamic"?

p9, l10. The end of this sentence reads awkwardly.

p10, l6. Reference and explanation of the Visbeck scheme?

p10, l11. "numerous" -> "multiple" and incorporate ref to supplementary info.

p10, l19. wrong section reference

p10, l24. This sentence has too many clauses. Split into two.

p11, l21-24. This reads awkwardly

p13, l16. Could this be related to section 3.1.2?

p19, l16. Rename section to "surface temperature patterns"?

p19, l32 " of 2" -> ", by 2"

Fig2 caption. section symbol §in a variable name

p25, l20. Spell FAMOUS correctly

p26, l2. You may want to add that this is despite the OHT biases.

p29, l15. remove paragraph break

p30, l7. I was unsure what “this version” of HadCM3 was from previous sentence. Refer to figure panel

p30, l11. Why only this resolution?

p31, l10-12. Can you refer back to the definition of these different terms?
- p31, l24 "and which" -> ". We additionally show that"