

Interactive comment on “Role of vegetation change in future climate under the A1B scenario and a climate stabilisation scenario, using the HadCM3C earth system model” by P. Falloon et al.

P. Falloon et al.

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The authors thank Reviewer 1 for the comprehensive and constructive review, and agree that the points they raise will improve the paper. In summary, we would plan to revise the manuscript according to all of their suggestions.

Specific responses:

MAJOR COMMENTS 1. We agree that the paper would benefit from a clearer message throughout the paper linking to the key findings, and will alter the paper accordingly. 2. We agree that the results section could be greatly condensed/moved, and/or improved and would do so in a resubmission. 3. Use of shrub/scrub: the intended use

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is "shrub" throughout. Apologies for any confusion - we will amend this in a resubmission.

SPECIFIC COMMENTS (responses in capitals)

Section 4.1: There is a lot of focus on the May 2008 paper. I understand that this is where the 2C20 simulation comes from, but I wonder what the authors are hoping the reader to learn from the comparison with the results of this other model. This comparison needs a clearer focus and message. OK, WE WILL CLARIFY THE FOCUS AND MESSAGE ACCORDINGLY.

Section 3.3: I would like to see a quantification of the impact clouds on changes in albedo - how much change in albedo is there during cloud free conditions? The authors should be able to quantify this. OK, WE CAN ADD INFORMATION TO TABLE 2 AND THE TEXT QUANTIFYING CLOUD FREE ALBEDO.

7604 In25: also Pongratz et al 2010 OK

7605 In13: also Foley 1994 OK

7608 first half: also consider Lawrence and Swenson 2011 OK

7614 In10: a map of the AMZ and HIGHLAT regions would be helpful. It could go in the supplement if necessary GOOD SUGGESTION, WE WILL ADD THIS TO THE SUPPLEMENT.

7615 In17-19: Is it possible to put any sort of standard deviations on these numbers? Does the model vary vegetation fraction at all in the long control run? WE CAN ADD THIS TO THE DISCUSSION OF RESULTS ON VEGETATION CHANGES.

7617 In2: "Changes in soil carbon seem to explain much of the global total carbon trends." I expect that the authors have sufficient information to answer this question more definitively. (Also line 7617 In19, "appear to be") WE WILL MAKE THESE STATEMENTS STRONGER SINCE THE DATA SUPPORTS DOING SO.

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7620 In17-18: Is the change over land only due to albedo or have the authors just assumed that change in temp over land must be due to albedo? This sentence does not make that clear. WE WILL REMOVE REFERENCE TO ALBEDO FROM THIS SENTENCE - IT WAS SIMPLY A COMPARATIVE OBSERVATION.

7623 In6: Winter and spring where—Boreal seasons or local seasons? If local seasons how are these defined in the Tropics? Please use months to be more clear. OK, WE WILL DEFINE AS BOREAL SEASONS AND USE MONTHS IN THE TEXT.

7630 In13: The authors indicate that they do not find large temperature increases in water limited regions - where is this discussed in the text? I didn't see a discussion of the water availability to plants. How does water stress drive PFT distribution changes in this model? OK, WE WILL ADD DESCRIPTION OF PLANT WATER STRESS MECHANISMS IN THE METHODS, AND DISCUSS RESULTS ON TEMPERATURE CHANGES IN WATER LIMITED REGIONS IN THE RESULTS SECTION.

7635 In13: Why do grasses not replace lost trees in the Amazon? Is the main loss of latent heat flux evaporation or transpiration? I would expect it to be transpiration, but this sentence indicates otherwise THIS IS PREVIOUSLY DISCUSSED IN COX ET AL 2004 (SEE REFERENCE BELOW). WE WILL CITE THIS PAPER, BUT ESSENTIALLY, GRASSES DO INITIALLY EXPAND TO COVER THE AREA WHERE TREES COVER IS LOST BUT THE WARMING AND DRYING BECOME TOO INTENSE EVEN FOR THE C4 GRASS PFT, HENCE BARE SOIL REPLACES THE GRASSES. WE WILL ADD A QUANTIFICATION OF THE BREAKDOWN OF EVAPORATIVE FLUXES INTO SOIL, CANOPY, AND TRANSPIRATION IN THE RELEVANT PART OF THE RESULTS SECTION.

7635 In13: "Summer" is ambiguous - please use months. OK, AS DISCUSSED ABOVE.

Fig 1. The axis labels are too small to read OK, WE WILL INCREASE THEIR SIZE.

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Fig 2. The layout of this figure could be improved. If possible make the maps larger. The labels are on top of each other. Some whitespace could be removed and only one colorbar is needed. THANKYOU, WE WILL FOLLOW THOSE SUGGESTIONS.

Fig 3. The colorbar boxes are too small to see the colors. OK, WE WILL INCREASE THEIR SIZE.

Fig 5. The maps are very small and difficult to see and only one color bar is needed. OK, WE WILL MAKE THOSE CHANGES.

Supplemental Material: Image quality in the supplemental figures is poor and the text is difficult to read. OK, WE WILL IMPROVE QUALITY AND SIZE ACCORDINGLY.

REFERENCE: Amazonian forest dieback under climate-carbon cycle projections for the 21st century P. M. Cox1, R. A. Betts, M. Collins, P. P. Harris, C. Huntingford, and G. D. Jones, *Theor. Appl. Climatol.* 78, 137–156 (2004), DOI 10.1007/s00704-004-0049-4

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