

Interactive comment on “The influence of vegetation on the ITCZ and South Asian Monsoon in HadCM3” by M. P. McCarthy et al.

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General comments

We thank the reviewer for their useful comments. In particular at the time of submission we were not aware of the recent publication by Swann et al. that they have pointed out. The original review comments are copied below, and our response is in bold. The methods, results, and overall conclusions are unchanged, but we have undertaken substantive revisions to parts of the manuscript to improve the presentation and address common points raised by all the reviewers. Therefore the responses below will make reference to the appropriate sections in the revised manuscript

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The topic is interesting but the delivery feels sloppy and insufficient. Swann et al. published a more complete version of the same topic in PNAS 2 months ago. I recommend using that study as a starting point for this one.

I agree with the reviewer that the Swann et al. paper is an important one for us to acknowledge. However there are sufficient differences to warrant exploration of this area outside that publication. It is encouraging that our study and that of Swann et al. have some complementary findings, such as the response in the location of the tropical convergence zone, but I feel that our manuscript is sufficiently distinct from Swann et al. to warrant publication. I do agree with the reviewer that drawing out these differences more explicitly will help to better define the scope and purpose of our own analysis.

In particular in our study we quantify the impact of different estimates of present day vegetation distribution all of which have or are used in different configurations of the Hadley Centre climate model. An additional two paragraphs have been included in the introduction to discuss the Swann et al. result and more clearly define the unique aspects of this manuscript

Specific: 1) Abstract: Make the list of results more specific. As written, this list is vague.

the abstract has been redrafted to more clearly state the main findings

You say "fourth" but I didnt see the other 3 listed.

I agree "fourth" was misleading as written so has been removed

This sentence ("The role ... climate") is convoluted. Im afraid I do not understand it.

the sentence has been redrafted.

Line 19 has an example of how to be more specific with the results.

2) Section 2.3: I do not understand the difference between TRIF 1 and 2. Is the difference explained eventually in line 27? If that is the difference, then the Table is

incorrect. You say "are initialized from" but what is initialized? The atmosphere? The land? As written, I understand "the vegetation", yet I had assumed that the veg was prescribed. Top of p. 97 is not described well. Hard to follow. The next paragraph has info that will be hard to retain as I read the climate response.

The description of the modelling experiments caused some confusion to all the reviewers so section 2.3 has been rewritten. The versions 1 and 2 of each set up were originally done to have a set with and without leaf phenology and were otherwise the same. The leaf phenology was found not to play an important role, consistent with previous studies so the results of the both sets of experiments were used to provide 60 year samples rather than 30 years for each description of the vegetation cover. Hopefully this is now better expressed in the revised manuscript. Fig. 1 has been simplified to show only the total vegetation change and needleleaf trees to improve clarity, for completeness the other panels from the original figure will be included in the supplementary material.

3) Section 3.1: Ok to write this, but I will not retain this info, so I recommend a table summarizing these results by zone or region or feature. Possibly include in the table Comment the most likely veg causing each result. Plus references to past studies that support each result. Also highlight statistical significance.

This section has also been rewritten to more clearly focus on the key changes and the processes involved. Figures 2 and 3 have been simplified to show only annual mean responses. This means figure 2 now also includes panels showing the impact on the shortwave response, and a new figure 4 shows the importance of the needleleaf tree cover in the surface temperature and snow cover perturbations. These revisions and the references therein should therefore provide a clearer summary of the main results.

4) Several figures are too small to read and with too much information to know where to focus.

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The figures have been modified to reduce the number of panels presented, and to use colours rather than linestyles to differentiate the experiments in Figures 2 and 5. The additional information removed such as change in shrub and grass cover (Fig. 1), or seasonal effects (Figs 2-4), are useful but not critical to the results and conclusions and therefore can be provided as supplementary material

5) I did not find the presentation of the atmospheric response sufficiently and/or directly linked to the veg. E.g., veg change leads to latent heat flux change which leads to change in the atmospheric circulation.

The link to vegetation is more strongly made with the addition of a new figure 4 linking needleleaf tree cover to temperature and snow, and a more structured discussion in section 3.1 It is also important however to stress that these are not idealised experiments modifying a single aspect of the land surface to quantify a specific mechanistic response, but they should be seen as a set of experiments designed to test model sensitivity to a variety of plausible but different representations of vegetation cover, and a variety of surface feedback process are likely involved in reality.

Interactive comment on Earth Syst. Dynam. Discuss., 3, 91, 2012.

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