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# *Interactive comment on* "An ensemble of AMIP simulations with prescribed land surface temperatures" *by* Duncan Ackerley et al.

Anonymous Referee #2

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This paper describes an ensemble of experiments with the ACCESS AGCM in 'AMIP' style (with variants), but with the novel feature of fixing land surface temperatures. The method is described, then a large range of experiments where land surface temperatures are prescribed under various combinations of increased SSTs, fixed/variable stomatal resistance, changed CO2, changed solar constant. The analysis shows that the pattens of temperature, rainfall and MSLP are well preserved, and that the temperature fixing works effectively. Analysis is restricted to showing the effectiveness of the method throughout the very wide range of experiments.

This paper is a good fit for GMD, and is an effective and useful description of the methodology and effectiveness of this novel approach, and a generally clear description of the range of model results available for analysis.

I have only a few, mostly minor comments, essentially on clarifying the presentation:

(1) It is unclear what is done with snow cover, and surface temperatures over snow. What about inconsistencies such as snow cover present, but surface temperature > 0C? What if snow falls on an above zero point or is there already and T>0?

(2) Discuss early what is done over seaice (it is alluded to, but only later in the discussion).

(3) Why is soil moisture also set? This is not explained. Would it be possible to set T but not soil moisture? What would be the ramifications of that?

(4) P 3 lines 17-21: long complex sentence – break up

(5) P3, 25-27: Unclear sentence

(6) P4, l21: 'An initial estimate…'. Unclear – is this for freely varying T? Also start new para here.

(7) P7, l3: clarify why this is a 'radiative response' only: surface albedo of plants only is allowed to change? Also what about surface roughness?

(8) P7, L25: don't you mean on top of the ice sheets?

(9) Sometimes a hyphen means minus, and sometimes it means hyphen, and sometimes the mathematical minus is used. This all gets a bit confusing. Examples are P9, L19, 'A-ERA-Interim means 'A minus ERA-interim'. Fig 2 first line of caption, minus and dashed both mean minus. My suggestion (i) drop the hyphen e.g. in ERAinterim. (ii) when '-' means minus actually use the mathematical symbol (iii) the first time used, e.g. P9L19 spell it out "(i.e. A minus ERAinterim)".

(10) P9, L20. Please comment further on the temperature anomalies over the oceans, considering SSTs are fixed.

(11) P10, first para: worth noting that the biggest differences are over sea ice, where

surf temp is not prescribed.

(12) P10, L13: don't you mean that this is checking the climate change response is consistent for a given boundary change (e.g. SST)? After all you are comparing the differences.

(13) P11, L18: bias -> dry bias

(14) Table 4: why bother with italics AND asterisks?

(15) Section 3.4/Fig 3: why stop at 300hPa? It would be of interest to go higher, e.g. to 100hPa.

(16) P15, last line: spell out what a land/sea contrast of 0.25 means: Delta T ocean/Delta T land? See also line 9 on p16

(17) Fig 4. Can you put a heading over each column to help summarise for the reader? E.g. LHS could say "Land fixed, but changes to SST, CO2, stomates, SC", RHS could say "Land changes , isolated from prescribed land experiments" or similar. This would help the reader get their head around the complexity of these combinations.

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