

## ***Interactive comment on “The Land Use Model Intercomparison Project (LUMIP): Rationale and experimental design” by David M. Lawrence et al.***

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Land use change is a necessary component of CMIP6 and a thorough and well argued case is made in this paper on how it should be done. Overall, this is a hugely ambitious MIP but one that if pulled off with a decent number of modelling groups would make profound strides forward. I think it will confront modelling groups and implementing these experiments will be challenging. But these experiments seem to be well thought through, appropriately designed and effectively described. My recommendation is therefore accept with minor revisions.

In the text from line 60 to 83 I got rather lost as to the argument. For example, the link between the sentences on line 69 seems opaque. The sentence starting "Levis" is about crop modelling, the previous sentence is about irrigation. I know what you are

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trying to say but it does not really follow logically through this paragraph.

Line 111. Adaptation is local in most instances. I think its a big call to suggest CMIP6 models can inform us about adaptation given their spatial resolution. Maybe the best way to argue this is that LUMIP might provide approaches to this question at far higher resolution in RCMs?

Lines 112-119 are well stated. Hugely ambitious but well stated. The #5 does not really seem to fit to me however - although it is an important question. I am not proposing any changes but it might be worth a little more rationale?

Line 128 - I got confused here. I am not clear what the text "did not translate as such in land-dover data sets" really means

Line 130-135 - just a comment. This is the Porsche of LULCC science. I remain fearful that for most CMIP6 models the sophistication of the science presented here will disengage groups. A response "no it won't" is fine and time will tell.

Lines 219-225 0 I really did not know what you were trying to get across here.

Line 225 and 226 - I was confused here too. If the experiment is "constant land use" and you define fixed land use for a "relevant year" that implies to me you change land use annually and that implies anything but "fixed". Some clarification would be helpful.

Line 263-266 - this is a really important and valuable requirement.

Line 276, 282, 314 Figure X means what ?

Most of Section 2 is pitched at a good level of detail - balancing information that a reader might want with what a modeller doing the experiment might want. I do not think I could implement the experiments from this document - nor do I think that is a sensible thing to attempt. Is there going to be some place where full instructions will be given?

As someone who has worked in this place I can see the value of the different hierachy

C2

of experiments - with coupled, uncoupled etc. I wonder if that should be explained for the non expert - why your experiments are constructed in the way they are. I know this would be clear to the authors but it might not be to a non-land cover modeller?

Line 474 - model evaluation is testing your model against observation. Model benchmarking is asking the question how well a model should perform given the information content in the forcing. I do not think they should be confused although I acknowledge they most certainly are in the community. You could resolve this by simply saying "need to improve diagnostics for land surface model evaluation and/or benchmarking in general".

line 495 - please no! Not student t-tests for LULCC. At the least you need a Findell test but there is far more to it and you need to account for field significance.

Line 555-557 - It is great to see coupling strength in here and a sensible solution implemented

Line 568-70 - seems vague. I appreciate you cannot resolve all aspects of this paper but this seemed particularly vague on extremes.

Line 600- is the reporting of subgrid variables a request or a requirement. I think it should ideally be required but that might put considerable stresses on many groups in terms of data handling. No specific recommendation here, but suggesting it should be clearer.

Minor edits

Line 3 First sentence of abstract does not make sense. Add "changes" after large

Line 19 "with respect to-" does not make sense.

Line 21 - The acronyms do not necessarily make sense to some readers and I think might be better avoided in the abstract. I do not know what ScenarioMIP is (!) and perhaps I should.

C3

Line 59 - is this correct? 40% of the total radiative forcing? I would have guessed its 40% of the change in RF.

Line 66 "Other examines are numerous" is not a sentence.

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