

Interactive comment on “Coupling between the JULES land-surface scheme and the CCATT-BRAMS atmospheric chemistry model (JULES-CCATT-BRAMS1.0): applications to numerical weather forecasting and the CO₂ budget in South America” by D. S. Moreira et al.

Anonymous Referee #1

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General comments:

The manuscript describes the coupling and evaluation of the land surface model JULES to the atmospheric modelling system CCATT-BRAMS. In particular the evaluation compares the results from this system with the results from the original LEAF land model used in CCATT-BRAMS. As such, the manuscript clearly presents the improvement that the new JULES land surface scheme gives over the original LEAF scheme

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in all but the 10 m wind speed diagnostic, when compared to observations.

Specific comments:

There are a number of issues that need to be addressed in the manuscript before it should be considered ready for publication. These are generally minor in terms of the effort required to address them, but are important.

1. The abstract claims that the resulting JULES-CCATT-BRAMS modelling system that is able to give a good performance for any period of time and in any region of the globe. This has not been shown in the manuscript. In fact, the results only show that the model gives a good performance over South America. So this statement should be re-worded.

2. Both the abstract and the conclusions state that the modelling system can be made available to anyone on request to the 1st author. It also suggests that the system could be used for operational weather forecasting purposes. However, the author is not at liberty to sub-license the JULES code, under the terms of the research licence agreement, and hence the system can not be made available to anyone who has not signed the current JULES licence agreement. Hence the text should make it clear that this needs to be done. Also, the supplementary material should show this as a necessary requisite for obtaining the system. Moreover, the use of the system for operational weather forecasting is a commercial activity which is not included under the terms of the JULES licence agreement. Hence this statement in the manuscript should be removed.

3. p. 461. Cox et al. 2011 is a manuscript based on results from the MOSES and TRIF-FID system, it is not a standard reference for MOSES and certainly not for the Unified Model. A more appropriate reference for MOSES is: Essery, R.L.H., Best, M.J., Betts, R.A., Cox, P.M., Taylor, C.M., 2003: Explicit representation of subgrid heterogeneity in a GCM land-surface scheme. *Journal of Hydrometeorology*, 4, 530-543. In addition, a more appropriate reference for the Unified Model would be the following website:

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4. p. 461. The wording of this section is miss-leading. JULES has been developed from the MOSES and TRIFFID schemes, but they are not identified as two principle components of JULES. This section should be re-written to reflect this.

5. p. 461. line 24. Describing JULES as having the 5 modules as discuss here is miss-leading. The JULES are based around the boxes shown in Fig. 1. I would suggest that the text here is replaced with "The physics of JULES can be considered to fall into 5 areas"

6. p. 462, line 1. The first sentence is miss-leading as it suggests that photosynthesis in JULES depends mainly on CO2 concentrations. Whilst it does indeed depend upon CO2, this is not the main dependence. I would suggest that the word "mainly" is removed from the text.

7. p. 462, line 6. As mentioned in 4. above, TRIFFID is not identified as being part of the JULES model. As such, the words "TRIFFID module" should be replaced with "vegetation dynamics module"

8. p. 462, line 21. The meaning of this sentence is not clear. JULES explicitly includes runoff processes, that will be partly generated by rainfall. So I am not sure why the authors say this is being developed and is not currently available.

9. p. 463. Section 2.4. It is not clear if JULES has been coupled to CCATT-BRAMS explicitly or implicitly. This should be stated in the text.

10. p. 464, line 6. JULES also requires soil temperatures as initialization. As such, details of where these come from should be given at the end of the paragraph on line 15.

11. p. 465, lines 9,10. JULES can only use a timestep greater than half an hour for coarse resolution and when it is implicitly coupled to the atmospheric model. The actual timestep used for JULES will depend upon both of these and the text should be

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amended to reflect this.

12. Section 3. Throughout this section, the results from the ECMWF re-analysis are presented. It is not clear why this has been done. The re-analysis product is quite different from the other model results being considered here, for instance it uses screen level temperature and humidity data to nudge its soil moisture in the data assimilation steps. As such, it is not a clean (or perhaps even fair) comparison. As such it is not clear that the inclusion of these results add anything to the paper. In fact, I would argue that it just causes some confusion. As such, I would suggest that the results from the ECMWF re-analysis are removed from the manuscript. This would then also impact on the conclusion on p. 475 which mention the ECMWF results. This would also need to be removed.

13. Figure 5. the x-axis of this figure needs a title with units. The y-axis title should be replaced with something that is more meaningful (e.g., height above the surface)
General comments:

Technical corrections:

p. 459, line 20. This sentence does not make sense. I assume that the word "em" in the middle of the sentence is a miss-type, but it is not clear what it should be.

p. 460, line 11. "as well as not does no cause" should be replaces with "as well as not causing"

p. 461, line 10. "Meteorological Office" should be replace with "Met Office"

p. 461, line 11. "Meteorological Office unified model" should be replaces with "Met Office Unified Model"

p. 462, line 28. "soil humidity" should be replaced with "soil moisture".