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Comment

## ***Interactive comment on “Local sources of global climate forcing from different categories of land use activities” by D. S. Ward and N. M. Mahowald***

### **Anonymous Referee #1**

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Comments on the paper “Local sources of global climate forcing from different categories of land use activities” by Ward and Mahowald.

This paper estimates the Radiative forcing (RF) of Land Use and Land Cover Change (LULCC) and quantifies the contributions of three sectors within LULCC: agriculture, direct land modifications and wildfires. There is some novelty in this identification of these three categories. Although direct modification contributes the most, the authors find that India, China and Southeast Asia are the main sources via agriculture sector. For the year 2010, they find substantial positive RF mainly from agriculture sector and negative RF from wildfires. Assessment is also made for RF for four future RCP scenarios and two more additional scenarios. The main conclusion of the paper is that both in 2010 and in the future scenarios, the agriculture changes from LULCC has a

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positive RF but changes in wildfire due to LULCC leads to negative forcing. Direct modification of land provides the major contribution to positive RF.

I have two major comments on the paper. First, I do not find the rationale for the two additional scenarios TEC and Trop-BAU. These two scenarios are highly unrealistic in the sense that they try to project as if things are really bad in tropical countries. This is based on the assumption that things can never get better in tropical countries which will be stuck in poverty forever and economies there would never transition from agriculture. This attempt at selective conclusion can be identified in the introduction: “Results for the year 2010 show substantial positive forcings from the direct modifications and agriculture sectors, particularly from India, China, and southeast Asia, and a smaller magnitude negative forcing response from wildfires.” I suggest this sentence be removed in revision. The emphasis on deforestation and specifically tropical deforestation is surprising because deforestation fluxes have gone down in the recent decades and RCP scenarios do have smaller LULCC forcings (Table 1) compared to fossil fuels (FF). The RF from tropical deforestation is artificially inflated in Fig. 5 which shows only RCP4.5 forcing from FF in all 6 panels (b-g). Why the FF forcing from corresponding scenarios are not shown? This figure should show RF from respective scenarios in corresponding panels. My suggestion is that this paper should just focus on only the 4 RCP scenarios and remove all discussions relating to the 2 unrealistic future scenarios with excessive and unrealistic tropical deforestation.

Second, the paper has too long a section on methods. It has 9 pages now. I suggest the authors briefly discuss the methods in 1-2 pages and move the elaborate details to supplemental online material. This should greatly improve the readability of the paper. Otherwise, the presentation is sound. I recommend publication only after my 2 major and the following specific comments are addressed.

Specific comments:

1. In the abstract it would be clearer if the following message is explicitly mentioned:

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Both in 2010 and in the future scenarios, the agriculture component of LULCC provides a positive RF and wildfires provide a negative RF. Direct modification provides the major contribution to positive RF.

2. In the abstract you have mentioned 3 regions: India, China and Southeast Asia as substantial contributors to positive RF due to direct modifications and agriculture. This point is not made clear in any part of the results section. I suggest removing this sentence.

3. The methods section is lengthy. See my major comment. I suggest authors to prepare a flow chart for methods section in the main paper.

4. Page 1754 para 15: what do you mean by direct modification? Please define explicitly.

5. Page 1756, lines 2-5: “Forcing from changes . . . .” I believe the definition of adjusted forcing takes care of these changes.

6. Page 1756, line 9: “reduce” should be “increase”?

7. Page 1757, lines 1-3: Can you briefly explain why the flux was adjusted downward?

8. Page 1762, line 17: change “compare the” to “compared with”?

9. Page 1764: line 2: “this method”? Which method?

10. Page 1765, line 5: “-0.20” should be “-0.17” to be consistent with the table.

11. Figures 5 and 6: Delete the bottom 2 panels since they represent unrealistic deforestation scenarios.

12. Figures 7 and 8: What is the purpose of these figures? You have not shown the absolute values of total RF (Fossil fuels plus LULCC). By showing only the ratio of deforestation to FF fluxes, these figures have the potential to negatively portray tropical countries though their total emissions have been smaller so far. These figures

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again attempt to unrealistically show that things are bad in tropical countries. I suggest removing these figures or also show the total RF along with the ratios.

13. Page 1768, lines 10-15: Fossil fuel emission globally is now about 9 PgC/yr but LULCC emission is only about 1 PgC/yr. How do you justify that LULCC contribute more RF than fossil fuel emission? Please explain in detail.

14. Page 1770, line 15: expand VOC, it is not defined before.

15. In Figure 1, the direct modifications need to be defined more clearly (you have used land cover change which does not give a clear picture of what is to be conveyed)

16. In all figures, the font size of the labels should be increased for better readability.

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Interactive comment on Earth Syst. Dynam. Discuss., 5, 1751, 2014.

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