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Interactive comment on "CO_2 fertilization effect can cause rainfall decrease as strong as large-scale deforestation in the Amazon" *by* Gilvan Sampaio et al.

Anonymous Referee #1

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The authors used a coupled dynamic vegetation-atmosphere model to compare the impacts of the CO2 physiological effect and deforestation on Amazon precipitation. The results show that physiological forcing (x1.5CO2) and deforestation (forest->grassland) yield same amount of precipitation decreases in the Amazon, but the underlying mechanisms are different. This manuscript is well written and the topic is of interest to the biogeoscience community. To help further improve the manuscript, I have several suggestions below:

Major comments: This study compares the idealized physiological and deforestation simulations. In reality, both rising CO2 and deforestation are influencing precipita-

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tion, so we are more interested in the compound effect of them. Although rising CO2(x1.5CO2) and deforestation reduce precipitation of a similar magnitude (12-13%), their mechanisms are different, and may amplify or attenuate each other. Here an interesting question arises: would the combination of rising CO2(x1.5CO2) and deforestation cause more or less than 25% of precipitation reductions? I am not sure how long it takes to run another scenario, but it is definitely worth a try.

Minor comments: Title: “CO2 fertilization effect”->“CO2 physiological effect”

Lines 138-140: temperature increases are due to reduced evaporative cooling effect in the physiological and deforestation scenarios, rather than precipitation decreases.

Lines 145-148: I think the logic here is that reductions in evapotranspiration and moisture convergence lead to precipitation decreases. More analyses of how land surface changes (physiology and deforestation) modify atmospheric processes and thereby impact moisture convergence and precipitation are needed here.

Section 3.1: add some statistical analyses of changes in stomatal conductance, leaf area index, transpiration, and atmospheric specific humidity in the physiological and deforestation scenarios.

Fig 5: To show how circulation changes impact moisture convergence, please also include moisture convergence changes in the physiological and deforestation scenarios in this figure.

Lines 196-198: as total evapotranspiration (transpiration+evaporation) is reduced, the decrease in soil water should not be due to increases in temperature and evaporation, but rather because of precipitation declines.

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