

## ***Interactive comment on “A comparative study of large scale atmospheric circulation in the context of future scenario (RCP4.5) and past warmth (Mid Pliocene)” by Y. Sun et al.***

### **Anonymous Referee #1**

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In this paper, the authors compare the changes in Hadley and Walker cell between the mid-Pliocene and the RCP4.5 experiment carried out with the IPSL-CM5A model. They show that Hadley cell expands in both two warm climates. Some differences still exist in the responses of Walker cell. The paper is well written in a nice logic. I suggest the paper should be published on the CP with minor revisions.

### Major comment

I suggest authors to revise the sentence in page 1462, line 9-10. The impact of SST on the different responses of Walker cell should not be neglected. When we check the figure 5, clear differences in SST between the mid-Pliocene and the RCP4.5 experi-

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ment (Figure 5d vs 5e) can be observed in the tropical Pacific. Here, the mid-Pliocene experiment was run for  $\sim 700$  years. In this experiment, the upper ocean has reached equilibrium. Thus, the relative larger warming can be observed in the eastern tropical Pacific (Figure 5e), when compared to the western tropical Pacific. This warming pattern agrees with observations. In contrast, the RCP4.5 experiment actually was run for 150 years, after the atmospheric CO<sub>2</sub> became stable at 543 ppm. In this experiment, the upper ocean can not reach equilibrium. When compared to the control run, strong warming appears along the equator Pacific. Seen in this way, due to the different experimental design, the responses of tropical Pacific SST should be distinguished in the mid-Pliocene and the RCP4.5 experiment. The different changes in tropical Pacific SST highly likely cause the different responses of Walker cell in these two experiments.

## Minor comment

Please check if the colour scale of Figure 4c is same as Figure 4a and 4b.

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