

## ***Interactive comment on “Reexamining the barrier effect of Tibetan Plateau on the South Asian summer monsoon” by G.-S. Chen et al.***

**G.-S. Chen et al.**

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Thank the reviewer for the comments and suggestions. We address the concerns as the following point by point:

Comment #1: “Model climatology may affect result. Please include JJA precipitation and surface wind climatology of the control experiment in Fig. 2. Based on Meehl et al. (2012), the CCSM4 performance for the East Asian summer monsoon precipitation is very poor with no Meiyu/Baiu rainfall band. Therefore, caution is needed for change of the East Asian monsoon with this experiment.”

Authors Reply: Thanks for the comments. We add the JJA climatology of precipitation and surface wind of the FULL\_TP experiment in Fig. 2 in the revised version. The

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configuration of the model is exactly same as the model used by Boos and Kuang (2010). They have compared the climatology with observations. Generally to say, the summer precipitation of the South Asian monsoon is well simulated. In the manuscript, we mainly focus on the South Asian monsoon. We have cautions to study the change of the East Asian monsoon.

Comment #2: “I do not understand why FULL\_TP minus NO\_TP shows negative precipitation anomalies over the broad regions of India and the Indochina Peninsula. Please explain why this mechanism creates subsidence to the “southwest” (not northwest) of the heating of the eastern Tibetan Plateau. The low-level entropy changes are just results of precipitation failure over India, and thus do not explain the fail of the barrier blocking mechanism.”

Authors Reply: Thanks for the nice comment. The authors do not agree with the reviewer that the precipitation change over India is a failure of the model. Numerous geological observations indicates that the northwestern Indian became drier when the eastern part of Tibetan Plateau expanded and uplifted (Molnar and Rajagopalan, 2012).

The mechanism (Line 309-316) not only creates subsidence to the “southwest”, but also creates subsidence to the “northwest”. Fig. 2 (b) clearly shows that the precipitation also decreases to the northwest to the Tibetan Plateau. However, the more decrease happens over the Southwest due to the monsoon-desert mechanism (Rodwell and Hoskins, 1996). The main point of the monsoon-desert mechanism is that the ascend happens over the Indian monsoon region, due to the west propagation of the Rossby wave, the descent happens to the west of the ascend region.

Comment #3: “Differences in experiment setup could be the reason of the low-level entropy. The coupled modeling approach in this experiment may have resulted in lower temperature (and thus lows moisture) over India, as suggested by previous literatures.”

Authors Reply: It is great idea. It is correct that differences in experiment setup could

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be the reason for the change of the low-level entropy. Here the point we want to make is that with changing the experiment setup, the Himalaya Mountains' "block effect" still exists, but the low-level entropy does not change as proposed. So the proposed mechanism to explain the "block effect" does not work. The coupled modeling approach in this experiment does not generate lower temperature over the Indian subcontinent. On the contrary, the temperature is higher over Indian in the FULL\_TP experiment.

Please see the attached figure of JJA surface temperature changes between FULL\_TP experiment and NO\_TP experiment.

Comment #4: "Difference of CAPE may not necessarily lead to difference of convection. Rather than comparison of CAPE between FULL\_TP minus NO\_TP, compare favorable regions for convection in each experiment."

Authors Reply: Thanks for the comment. We add the OMEGA (vertical velocity) changes between FULL\_TP minus NO\_TP in Fig. 3 to show the convection changes. It also shows that the convection is weaker in the FULL\_TP experiment. Please see Line 252 and Line 259.

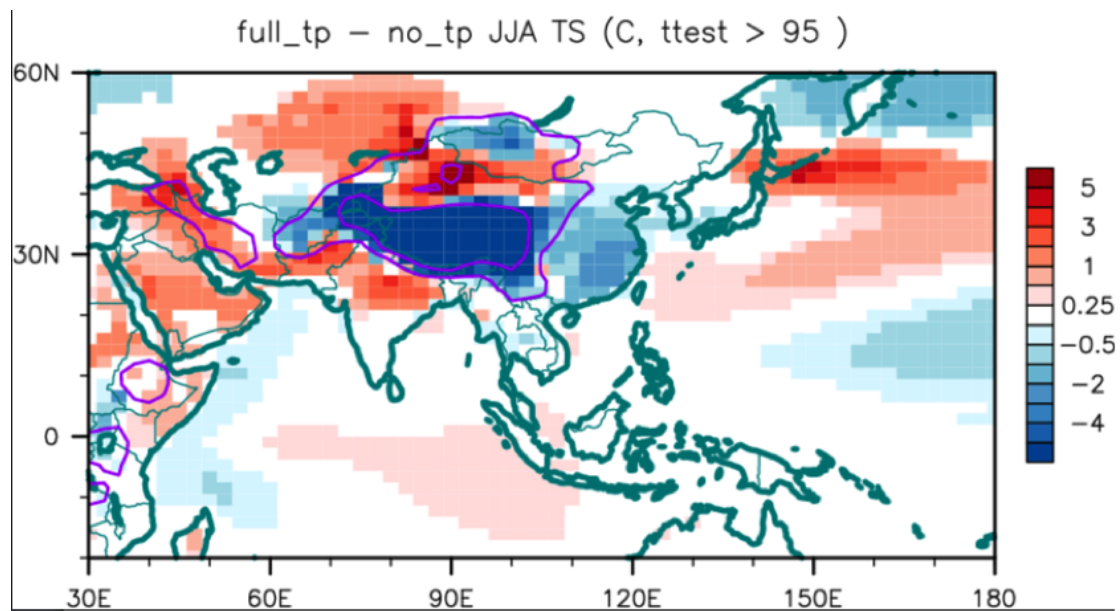
Comment #5: "Authors may wish conduct another set of experiments where effect of air-sea interaction (changes in SST) is investigated."

Authors Reply: Thanks for the great suggestion. We will conduct this set of experiments later. However, the main point of this manuscript is that the "barrier effect" of the Tibetan Plateau can not fully explained by the mechanism of low-level entropy change. We will publish the effect of air-sea interaction in another manuscript.

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Interactive comment on Clim. Past Discuss., 9, 5019, 2013.

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