

Interactive comment on “The role of convective overshooting clouds in tropical stratosphere–troposphere dynamical coupling” by K. Kodera et al.

Anonymous Referee #3

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This manuscript examines the stratospheric influence on the tropical convection. The authors argue that the upward propagation of the planetary wave during the NH sudden warming events would induce stratospheric equatorial upwelling, which in turn would enhance tropospheric convective activity. Although this is an interesting topic and relatively novel, I found the evidences shown are not convincing. This study is also lack of possible physical processes responsible for the linkages between stratospheric processes and the tropical convective shooting events. This paper may be publishable after addressing the major comments below.

Major comments:

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-My main concern is how robust are the results of this study. The results of this study are based on only two major SSW events. As the authors indicated in the introduction, “not all major SSW events necessarily have large tropical impacts”. So what are the results for other major SSW events? Would the difference in the latitude of the wave breaking really results in different tropical impact? If so, does that contradict with current working hypothesis that “lower stratospheric vertical velocity variation is coupled with the tropical convective activity.”

-Please give some possible physical mechanism that is responsible for the occurrence of the convective overshooting clouds during the SSW events.

-Figure 2: The correlation in this figure is based on 31-day period. What is degree of freedom? Are the correlation coefficients significant?

-Figure 1: In the NH after the onset of the SSW, there is upwelling signal in the vertical velocity (panel b), but no clear signature of the COV field (panel c). This feature is different from that in the SH. Please comment on this equatorial asymmetry.

-Figure 3: The results are based on for averaging over between 20S-0. What are the results for the NH counterpart?

-I would suggest using residual circulation (w^*), instead of vertical velocity to represent the vertical motion.

-Figure 4: Discussions on ENSO results are unclear. The author argues that the large different in OLR before the onset of the SSW events that are due to the opposite phase of the ENSO, and the small difference after the SSW events indicates the role of the COV-related deep convective activity. However, the similarity in OLR is not evident (second row in Figure 4); the amplitude of OLR for event 2009 is very weak, and localized to the northern Australia; the amplitude of OLR for event 2010 is much stronger and extended eastward to the date line. The argument “The distribution of the regions with low OLR becomes increasingly similar to that of COV during period (ii)” sounds

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speculative. And thus the conclusion is hand-wavy.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 23745, 2014.

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