Responses to Dr. Yuqing Wang review comments

First of all, we would like to acknowledge Dr. Yuqing Wang for his careful review valuable comments. Please see below for our responses to Dr. Wang's comments. Our responses are marked by **<RE>.**

1. The authors compared the one-month simulation with the climatological monthly mean satellite observations. Since satellite data are currently available from MODIS for cloud fraction and liquid water path, I am curious why the authors have not used the observations during the same time period in their comparison, for example, those in Figs. 2, 4, and 17. The vertical cross section of cloud properties may also be found somewhere. The authors can refer to Wyant et al. (2010) for more relevant datasets for comparison.

<RE>: We have replaced the climatological precipitation data from Xie and Arkin (1997) in the figure 17 with 2008 July monthly mean observed precipitation. Text has been modified to reflect this change.

MODIS dataset (at MODIS website), as we know, does not have the low cloud. To be consistent we used both observed low and total cloud data from ISCCP. Since ISCCP does not have the cloud properties for the simulated month either we used climatology instead. We did not find observed vertical cross section of cloud properties.

2. The stratocumulus deck core over the Southeast Pacific is around 10-15oS. Could the authors show some vertical-longitude cross-sections at 10oS, as shown in some previous studied, such as in McCaa and Bretherton (2004) and Wang et al. (2004a and b, 2005)? At this latitude, the cloud deck is generally more stable and persistent than that at 20oS, where synoptic disturbances force much larger variability of stratocumulus clouds

<RE> We chose cross-sections along 20S was because some VOCALS observations were along 20S. We hoped we could compare our simulation results with VOCALS observation. But it looks like this is something we may have to do in the future. Text has been modified to explain. We also looked at the cross-sections along the 10S. Those cross-sections also show our proposed theory. Figures 1 and 2 are examples of moistening rate due to shallow convection and turbulent transport along 10S.

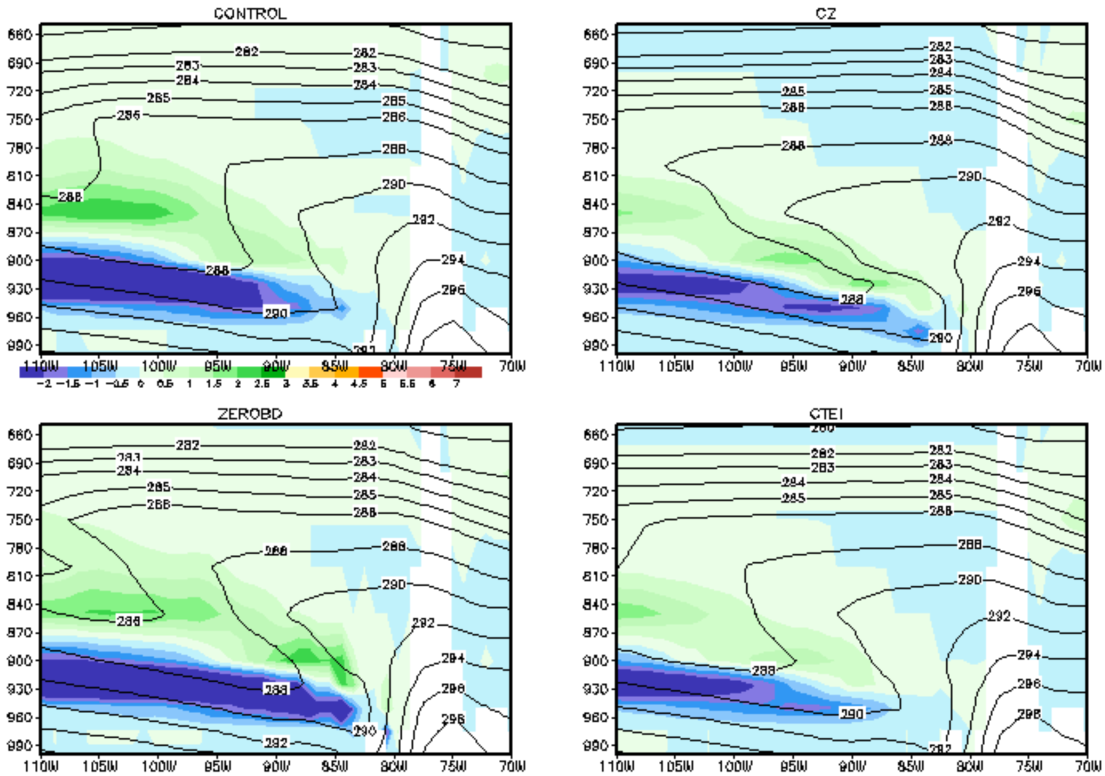

Figure 1. Vertical cross-sections of ensemble monthly mean moistening rates (g/kg/day) along 10S in shades due to shallow convection in the four experiments

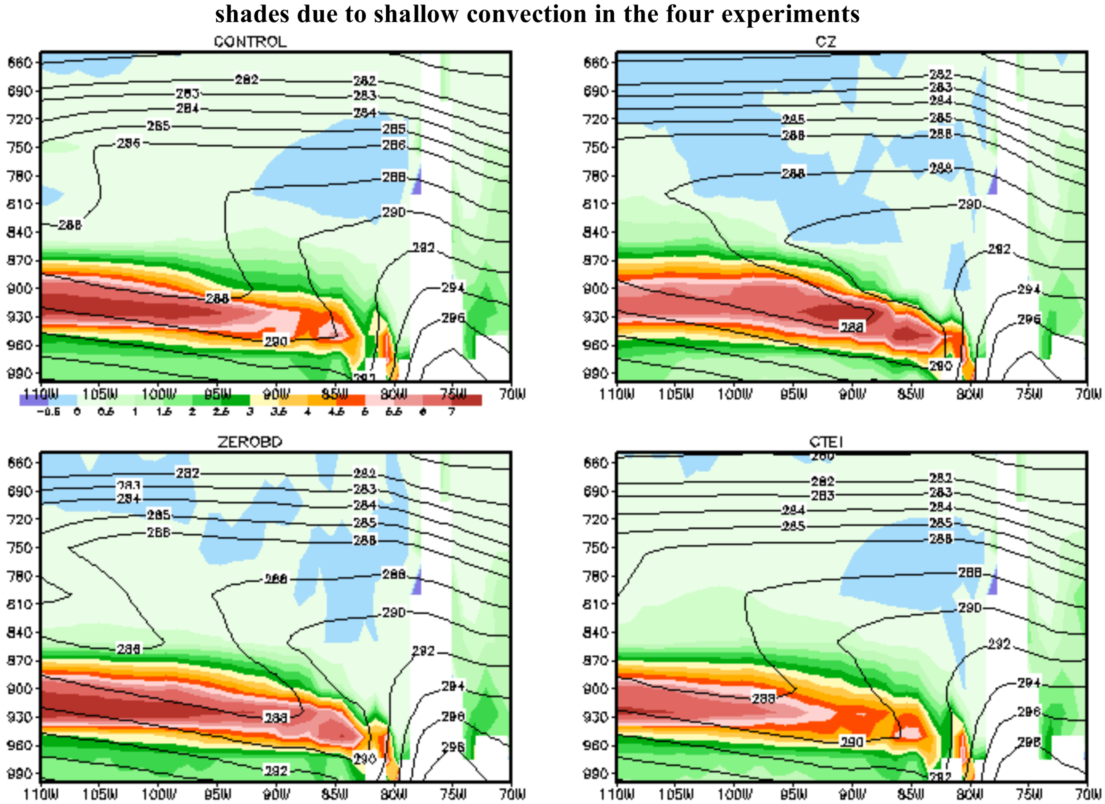

Figure 2. As in Fig. 1 except for moistening rates (g/kg/day) (shade) due to vertical turbulent diffusion.

3. When the authors discussed the mechanism for the cloud-top radiative cooling, they attributed the enhanced cloud fraction to a positive feedback, which is a local process. In Wang et al. (2005), they elaborated a positive feedback between the stratocumulus clouds and cloud-top radiative cooling through large-scale circulation feedback. Could the authors mention that possibility or examine the processes in their model results?

<RE> We examined omega along 20S and 10S. We did not see the peak downdraft near the inversion. So the positive feedback between long wave cooling and dynamic warming found by Wang et al. (2004a) in their simulation did not apply to our cases. But, text has been modified to reflect referee's comments.

4. The authors also mentioned the possible effect of cumulus parameterization (RAS) in their model simulation. For example, in the second paragraph on page 18480, they wrote "RAS helps to produce clouds through the detrainment of cloud water at the cloud top". I am not quite sure how active of deep convection in the studied region. Have the authors looked at the details in this regard? This needs to be examined if this is the case.

<RE> RAS is modified from AS. It can account for a spectral of convection including deep and shallow convection. But as in AS, RAS is not effective enough to take care all the effects from the shallow convection. That is why we need an explicit shallow convection scheme. RAS contributes to the formation of the clouds by detraining cloud water at the cloud tops. In the model output, there is a diagnostic variable called convective heating rate (K/day) due to RAS to quantify RAS activity. It is shown in the following figure. In Figure 13 in the text, the negative heating rate due to large-scale condensation may be related to the evaporation of cloud water detrained by RAS at the convective cloud tops.

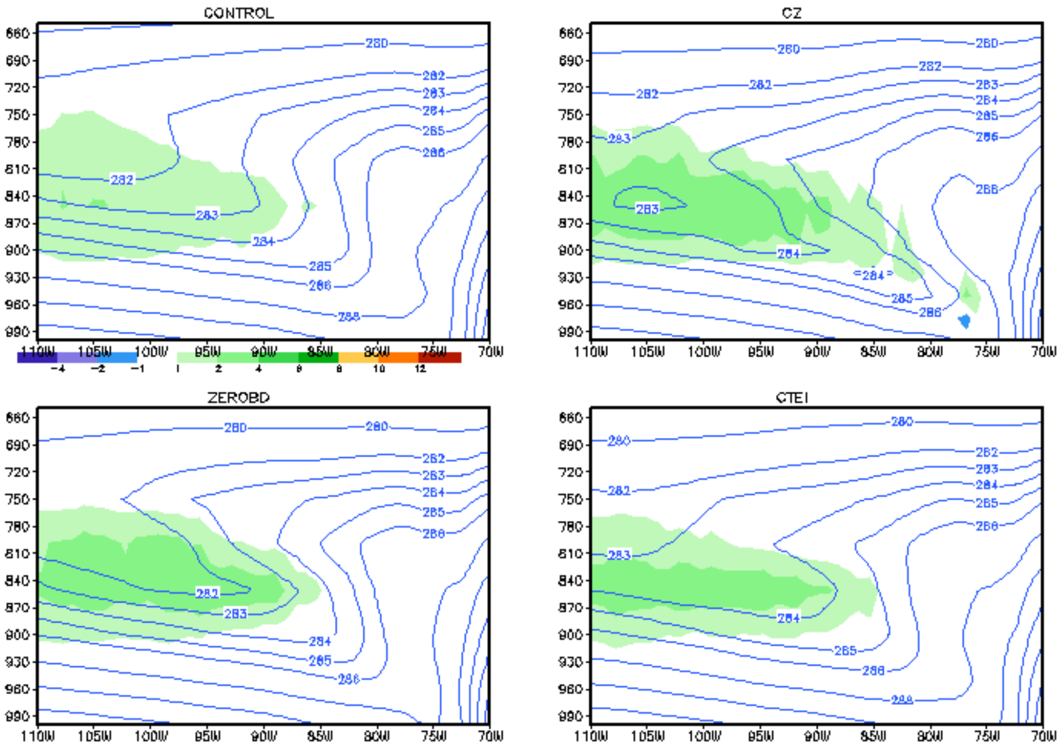

Figure 3. Vertical cross-sections of ensemble monthly mean moistening rates (g/kg/day) along 20S in shades due to RAS in the four experiments.