Referee #1

We thank the reviewer for his or her assessment of our study. The comments help us to improve that the figure and main results come out more clearly.

Major comment

1. May-Jan period does miss important active periods over Africa in Mar-Apr and over Amazon in Feb. Dataset could be a little longer at least covering one year cycle to remove some of the doubts on the representative of the results.

That is good comment. But as I described in text, collocation data within 10 km (MLS horizontal FOV across track is about 7 km) in tropics between CALIPSO and MLS is from May 2008. Recently CALIPSO version 3.01 data are released but when this study is done, version is not match between before and after Feb. 2009. That's why I used nine months data from May 2008 to Jan. 2009. It could be studied for next step to see one full year or longer. However, we can see continental (Africa, and America) deep convection in other period as shown figure 1. Therefore, we believe that the result with other four months might affect little.

2. Showing anomalies of absolute value is important. But readers also deserve to know the relative change (e.g. in percentage) to get the picture of how large these anomalies are. There is no description of such in the whole paper.

I add zonal averaged anomalies in percentage in figures.

3. One confusion is between Fig 3 and 4. Fig3c shows cooling at 16-18 km over the regions with cloud. However, Fig 4a shows warming at the same altitude but with cloud over 10 km. Figure 1 and 2 show that most of clouds have tops over 10 km. So should not we expect Figure 3c and Figure 4a be close?

A) Fig 3c and 4a have big difference (Fig 2 in previous version is erased and so Fig 3c and 4a is now Fig 2c and 3c. I used previous figure number). Fig 3c is temperature anomalies departed from zonal mean temperature in cloudy sky, but Fig 4a is departed from local mean clear sky temperature. Therefore Fig 3c shows longitudinal difference of convective cooling but Fig 4a shows local convective cooling from clear sky (local). Fig 4a is similar (slightly difference due to background temperature) to Fig 3c minus 3b.

4. Ozone anomalies at 18-20 km are interesting indeed. However, authors forgot to mention that this anomaly is below 5 %. Hypothesis of downward motion is proposed to explain this. However, could not this small anomaly also be from extra vertical mixing induced by gravity waves from deep convection?

The vertical mixing by gravity wave breaking can be happen near cold point, but the vertical mixing by gravity wave reduces vertical gradient, and does not always indicate positive anomalies. The new figure shows that ozone always increases up to 7-8 % in deep convective case at 18-20 km.

5. Based on your schematic diagram Fig 11, the tropopause should be warmer over cloudy region. However, we know it is generally colder there, your Fig 3 shows this as well.

A) The tropopause (near cold point) can be either colder or warmer over cloudy region. In the TTL, if the level is below cloud top, cooling anomaly is existed, but warming anomaly occurs when the level is above cloud top as shown Fig 4. Previous figure 11 showed only later example. I changed Fig 11 with both mechanisms. I guess that you concened the tropopause over warm pool area. As shown in Fig 1, cloud top peak is about 16-17 km over warm pool area, and it is well corresponding to the coldest anomaly is shown in Fig 3.

Minor comment

1. P8967, line 8, do you use nighttime dataset for MLS and CloudSat also?

Yes, I do. I added this in the text.

2. P8968, line 18, this is a good example of comparing apples to pears for two reasons: a) different regions, MISR curve is analyzed 10 degree zone larger than CloudSat and included more dry areas such as Sahel, this potentially could lead to very different mean profile. b) if Calipso+ cloudsat is at 0130, MISR is at 1030 (or both 1030 and 2030?, you need to be specific), what the difference can be from the diurnal variation of the clouds, especially over land? If MISR dataset is not important in the paper, suggest remove Figure 2b.

I agree with your comment. After suggestion from other reviewer, I omitted to compare between CALIPSO and MISR directly. Instead, I referred other previous papers which addressed general comparison with other satellites.

3. P8969, line 3. Which zone? 15S-15N? There is no description on this in both text and figure caption. Though you mentioned this in section 2, it would be friendly to have full description in the figure caption.

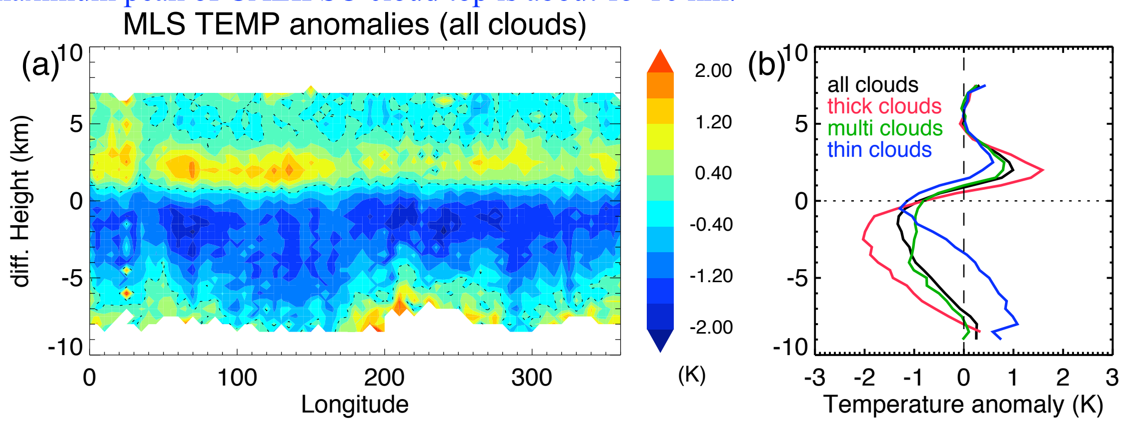
Ok, I did it.

4. P8969, Fig 3 and 4, what is the error bar and vertical resolution of the MLS temperature?

MLS temperature vertical resolution is about 3 km in upper troposphere and lower stratosphere, and its precision is about ± 0.8 K (Schwartz et al., 2008).

5. P8970, Fig 5. Do you have limit on the cloud top range? Please be specific in the caption.

I used all clouds whose tops are above 10 km in this figure. Following figure shows temperature anomalies when we use clouds whose tops are over 14 km, which penetrate LNB. However, the figure is little different from figure 4 (previous figure 5) because the maximum peak of CALIPSO cloud top is about 15-16 km.



6. P8972, Fig 6. Describe in the caption what NS and NW mean.

I described it in both text and the caption.

7. P8973, Fig 7. Change H2O to water vapor in Fig. H2O include water vapor and ice clouds.

I changed it.

8. P8973, line 18, remove “can”

I did it.

9. P8973, line 26, deposited instead of condensed.

Thank you. I corrected it.

10. P8973, Do you have speculations on the slight increase of water vapor above cloud between 17.5-19 km?

Water vapor minimum is near 17-18 km, and slightly increase above this height because of methane oxidation. This water vapor increasing above this level can increase water vapor anomaly in air sink.

11. P8973, what is happening over Africa at 14 km in Fig 8? Artifacts? Or some meaningful observations?

I found that it is error, and I recalculated it with careful screen, and re-plot it. Thank you.