

Point-by-point responses to reviewer2's comments

We thank reviewer 2 for his (or her) detailed and constructive comments and suggestions. Following these comments and suggestions, we have

- added a satellite image (Figure 1b) to show the spatial distribution of cloud in southeastern TP.
- revise the paragraph in Section 2 to better describe the shear term (ST) calculation method, and re-calculate shear term;
- added Figure S2 to show the spatial distribution of daily mean vertical velocities W at 500 hPa in summer over land in East Asia;
- done additional computations and provided more statistics about PBLH and LCL in the discussion in Figure 4c and 4d;

Our revisions are indicated in the revised version with tracked changes. Below are our point-by-point responses (in blue).

General

The paper was improved, and the authors gave answers to my questions, but several points need further clarification before I can recommend the paper's publication. There are still many language issues, and I think this version requires still major English Editing.

In the following, I refer to line numbers of the version with marked changes.

Major revisions

1) The paper by Wang et al. (2020) has a very similar topic. It would strengthen the paper when in the introduction the differences of goals to those of the new paper would become clearer. I guess, the main difference is the comparison with North America, but perhaps there are others?

Yes. The main difference is the comparison with North America. In addition, we focus on the effect of large scale vertical velocities on clouds. There are significant large scale ascending motions in most parts of TP (except part of western TP and Qaidam Basin with descending motions) as shown in Figure S2, which lead to less LCC in northwestern TP and Qaidam Basin.

2) The hypothesis on the role of the TKE budget terms is better explained in Wang et al (2020). So, please refer also here to the Wang et al. (2020) paper. It can serve as a motivation for your study in the introduction!

Thank you for your suggestion. We add the two key points proposed by Wang et al. (2020) in the introduction.

3) Description of the determination of wind shear (equations 4-10): I strongly recommend writing L directly as a function of τ and H where H is heat flux (see equation 1 in Gryanik et al. 2020). Then one can tell that after prescribing values for τ and H from the model, L is determined and then via equation 4 the shear term. However, this method contains an inconsistency. Namely, when ERA5 takes other similarity functions than those of Dyer (1974). Please check this. If yes, then the shear does not correspond to the

44 model equations and is just an approximation. This drawback needs to be explained.

45 Thank you for your suggestion. We have revised the description of the determination
46 of wind shear. Based on the ERA5 physical processes documentation, we re-calculate the
47 shear term by using the similarity functions under unstable (or stable) condition. We think
48 the new shear term results will be more consistent with ERA5 model.

49 4) After adding the 2500m contour lines in Figure 2, I see that not the whole TP
50 region has high LCC, but roughly one third of the region is not concerned. This should be
51 discussed!

52 Thank you for your comments. We add the spatial distribution of the vertical
53 velocities at 500 hPa in Figure S2. We also add some discussions about the effect of
54 vertical velocities on clouds over the TP, and explain why there are high LCC in northern
55 part of TP (80-90E, 34-36N) in Figure 2 in line 272-278.

56 5) I asked to explain results showing wind vectors (now Figure 4a and 4b). But I am
57 not satisfied with the answer that the legend is now simply skipped. So, are the wind
58 vectors now only a schematic? One needs to understand the effect quantitatively. Please
59 note that this is one of the most important results (the central figure) for explaining the
60 different LCC in the North American and Asian region. This needs explanation in the
61 paper, not just for me!

62 The vertical velocities are not of the same magnitude as the horizontal velocities,
63 so wind vectors are only a schematic. In order to show the true values, we remove the
64 vectors in Figure 4a and 4b. Now we use black and green contours to show the W-
65 and U- wind components, respectively.

66 6) I had asked for the discrepancy concerning the PBL and LCL (now in Figure 4).
67 The authors answered this but this caused no change in the text (or did I oversee this?)
68 Without further explanation, I would conclude from Figure 4 c) and d) that something is
69 wrong with the definition of PBL since LCL cannot be so close to PBL over huge
70 distances. This needs explanation in the text.

71 The original Figure 4 (c) and (d) only show the mean PBLH and LCL at 2:00 pm
72 local time, thus the deviations between mean PBLH and LCL are generally less than 500
73 m (or 50 hPa). The y-axis ranges from 1000 hPa to 300 hPa, thus LCL seems to be close
74 to the PBLH. To avoid the above misunderstanding, we plot the new Figure 4 (c) and (d)
75 with the purpose of showing the PBLH and LCL versus longitude in East Asia and North
76 America, respectively.

77 7) Language: in principle, the text can be understood but there are still many errors
78 in almost every third sentence (smaller ones with just wrong articles but also larger ones
79 with grammar and wording).

80 Done. We invite a cooperator to revise the paper.

81 **Minor revisions**

82 Line 48: I think acronym TIPEX was not yet explained here.

83 Done.

84 Line 49: In which paper, the term popcorn like cumulus clouds was used the first
85 time for this area? Please cite.

86 Done.

87 Line 69: sentence starting with 'according to'. It is too long and could be better

88 understood by splitting the information into two sentences.

89 Done.

90 Figure 1 Caption needs to be changed. Is cloud fraction shown? Just 'digital number'
91 is not enough information.

92 We have revised the Figure 1 caption, and add one panel (Figure 1b) to show the
93 spatial distribution of cloud. We also calculate the mean cloud fraction over the
94 southeastern part of TP (92.7-96.2E, 29.5-31.3N).

95 Figure 2: delete second occurrence of summer in the caption. Blue line is hard to see,
96 replace it by white? 1) Which cloud characteristic is changing?

97 Done.

98 Line 174: I cannot understand the sentence. What is shown in Figure? What is
99 'raised' cloud?

100 We revise the sentence, and delete the unclear expression "raised".

101 Lines 178-180: Indices L, M, H are not explained.

102 Thanks. We add the explanation in Figure 3 caption.

103 Figure 7: write e) and f) in the same size as a) b) c) d).

104 Done.

105 Line 307-313. These sentences need language revision. It is difficult to follow. But I
106 am also afraid that the difference PBLH-LCL should not be interpreted at all (see major
107 point 6).

108 Done. We have revised the sentences, and answered point 6.