Point-by-point responses to reviewers' comments

We thank both reviewers for their detailed and constructive comments and suggestions. Following these comments and suggestions, we have

- done additional computations and provided more statistics in the discussion in Figure 7;
- added a paragraph in Section 2 to better descript the buoyancy term (BT) and shear term (ST) calculation method;
- added two panels to Figure S1;
- added a satellite image to show organized structures (cellular convection) in Figure 1.

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

Comment on acp-2022-221
Anonymous Referee #1
Comments on "Triggering effects of large topography and boundary layer turbulence over the Tibetan Plateau on convection"

General Comments:
The manuscript tries to analyze the diurnal variations and formation mechanism of low clouds at different elevations based on ERA5, the satellite cloud classification products and data sets from automatic weather stations from June to August of 2010-2019 in China. The author further discuss whether there exist triggering mechanism for convection over the Tibetan Plateau (TP), and whether there is an association among low air density, strong turbulence and ubiquitous "popcorn-like" cumulus clouds. The authors select two typical large topography regions (TP and Rocky mountains) to analyze the triggering effects of large topography and related dynamical structure within the boundary layer on convective clouds. Some interesting results have been obtained. I suggest that this manuscript could be accepted after minor revision.

Specific Comments and suggestion:
The writing of this manuscript needs to be improved. Such as the title maybe should change to "Triggering effects of large topography and boundary layer turbulence on convection over the Tibetan Plateau "
Done.
L110-113: The author used 0.25° x 0.25° ERA5 reanalysis data to calculate the buoyancy term (BT) and shear term (ST) in the TKE equation for each grid. How to interpret this method compared with traditional calculation of BT and ST in a micro-scale micrometeorology especially on the large TP terrain with strong heterogeneity? On the other hand, is it reasonable to used M-O similarity theory in

this grid?

Thank you for your comments. Of course, there exists uncertainty for the ERA5 reanalysis flux data especially on the large TP terrain with strong heterogeneity. However, in situ eddy covariance observations are too sparse to meet the needs of this study. Thus we use ERA5 reanalysis data to calculate the BT and ST. It is only an approximate calculation method of surface flux by using M-O similarity theory. Recent study (Xin et al., 2022, https://rmets.onlinelibrary.wiley.com/doi/epdf/10.1002/joc.7589) showed the bias errors of fluxes are generally smaller in ERA5 than in ERA-Interim. The Root mean square error between ERA5 flux data and in situ eddy covariance observations at eight sites over the TP are ranged from 21.82 W m^{-2} to 46.73 W m^{-2}. We think this accuracy can meet the needs of this study. More studies need to evaluate the uncertainties of ERA5 flux data over the TP in future.

L150: “Figure 2 (a)” should change to Figure 2. In fig 2 caption “The monthly mean” should be “The summer mean”(June to Aug).

Done.

Line 241 and 259: which is the relationship of BT and ST between calculated form the point measurement (such as soda) and from the ERA5 gird?

Compared to the 0.25° x 0.25° ERA5 reanalysis data, we think point measurement (such as soda) can reveal more local micro-scale information especially for the heterogeneous land surface.

Move the text in line 290-294 to line 203, and add more descriptions to show why the author select TP and Rocky Mountain as two typical large topography regions in subsequent paragraphs.

Thanks for your suggestion. We add more descriptions to illustrate this issue in line 228-234.

Line 297: Please show the range of latitude and longitude for TP and Rocky Mountain. Same for line 303.

Done.