

Atmos. Chem. Phys. Discuss., referee comment RC1
<https://doi.org/10.5194/acp-2021-325-RC1>, 2021
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Comment on acp-2021-325

Anonymous Referee #1

Referee comment on "Large eddy simulation of boundary-layer turbulence over the heterogeneous surface in the source region of the Yellow River" by Yunshuai Zhang et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-325-RC1>, 2021

The authors performed 12 LES simulations to depict the effect of the circulations induced by surface anomaly heating (patches) on the boundary-layer turbulence. Then analyzed the effects of the underlying surfaces and background flows on boundary-layer turbulence, the effects of patch-induced circulation on the turbulent intensity and heat flux, and the turbulence in the surface layer etc. Although this study is interesting, some editing and further explanations would benefit this manuscript. I am recommending minor corrections. Detailed comments are listed as follows:

General comments:

-Add Liu et al. (2018, 2020) into Introduction.

Liu, R., Liu, S.M., Yang, X.F., Lu, H., Pan, X.D., Xu, Z.W., Ma, Y.F., Xu, T.R., 2018. Wind dynamics over a highly heterogeneous oasis area: an experimental and numerical study. *J. Geophys. Res.* 123, 8418–8440.

Liu, R., Sogachev, A., Yang, X., Liu, S., Xu, T., Zhang, J. 2020. Investigating microclimate effects in an oasis-desert interaction zone. *Agricultural and Forest Meteorology*, 290, 107992.

-Line 82: Should describe specifically what kind of model is.

-Lines 151-152: "horizontal grid-spacing of 200 m. A vertically stretched grid with a

minimum spacing of 1.1 m was utilized in the surface layer and a maximum of 64.8 m above 2000 m", 200:1.1, very large ratio. Is it ok for simulation?

-Line 171: What's the real size of Ngoring Lake and Gyaring Lake? Does 30 km width reflect the real lake?

-Line 249: Please specify the time period of the daytime.

-Line 290: Please explain what the "h" means is.

-Lines 306-308: Please cite refs that can support this hypothesis.

-Figure 5: The heights of A1L and A1L_C is the same, why? The vertical coordinate may be z_i ?

-Lines 368 – 372: Why the effects of the heterogeneity on the TKE for the runs with balanced surface heat fluxes are less significant? Have other studies have the same phenomenon?

-Lines 399 – 415: Discuss the result with Zhou et al.(2018) and Liu et al. (2020).

Zhou, Y., Li, D., Liu, H. and Li, X.: Diurnal variations of the flux imbalance over homogeneous and heterogeneous landscapes. *Boundary-Layer Meteorology*, 168:417–442. <https://doi.org/10.1007/s10546-018-0358-2>, 2018.

Liu, R., Sogachev, A., Yang, X., Liu, S., Xu, T., Zhang, J. 2020. Investigating microclimate effects in an oasis-desert interaction zone. *Agricultural and Forest Meteorology*, 290, 107992.

-Section 4: What's the difference between ambient wind, background wind and background flow?

Specific comments:

-Line 48: The sentence "..., which has improved our understanding of the transfer and spatial and temporal variability of the turbulence" is a bit redundant and it is unclear exactly what point you are making. I would suggest rephrasing.

-Lines 128 - 133: I would suggest rephrasing the sentence.

-Line 135: There are two "and", please rephrase the sentence. The same as Line 217, Line 225 etc. Please check throughout the manuscript.

-Line 141: When was the Landsat image acquired?

-Line 150: Please specify the "135 km×30 km×6 km" means: Length? Width? Height?

-Figure 3: The legend should be "T(K)" in figs 3a and 3b. What's are the units of w and u in figs 3c and 3d?

-Line 456: "fig.03" should be "Fig.S3". The same as line 459. Please check "fig" or "Fig" throughout the manuscript and make them unified.

Technical corrections:

-Line 32: Miss interpunction between "m" and "s⁻¹".

-Line 35: Change "it" to "them".

-Line 90: Delete ",," after "heat".

-Line 119: Should be the entrainment layers of PBL.

-Line 122: "data" should be "Data".

-Line 248: "distribution" should be "distributions".

-Line 474: Delete increasing.