

Interactive comment on “Convective self-aggregation in a mean flow” by Hyunju Jung et al.

Anonymous Referee #1

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This study evaluates the impact of mean flow on the evolution of self-aggregated convection through the imposed wind in surface fluxes. Due to the enhanced surface momentum fluxes, the convection eventually becomes quasi-stationary against the mean wind. The authors further point out that WISHE effects have a relatively small role for the convection to be quasi-stationary. The paper is compact and well written and deserved to be published after addressing the following comments.

Major comments:

1. My major concern is on the experiment design. I think the authors need to emphasize the difference between imposing a mean flow in the cloud-resolving model (i.e., nudge domain averaged horizontal wind in the model) and putting the model domain on a conveyor belt by adding wind only to surface fluxes. The approach proposed in

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this study potentially eliminates important processes, including the build-up of near-surface wind shear, the interactions between the mean flow and the cold pools, and the importance of boundary layer processes to the aggregation.

2. The discussion focus on the surface fluxes, but the convection structure change from UB0 to UB4 is not discussed. The only clue given in this manuscript is the cloud top height in Fig.5. Based on my eye measurement, the horizontal scale of the convection in UB0 is around 100 km. But the scale shrinks to 50 km in UB2 and maybe 20 km in UB4 at the end of the simulation. It raises an interesting question: Can we still call convection in UB2 and UB4 aggregated convection (i.e., convection sustained by its circulation). The change in convective structure might also explain why further increase the wind speed, the convection disaggregated.

Minor comments:

In Fig. 1 The Uabs evolution for UB0, UB2, and UB4 are quite different during $t=0$ to $t=5$ days. The UB0, which should be very close to no imposed wind, has no fluctuation within first 5 days but fluctuate strongly afterward. This is similar to UB2 but with higher Uabs; on the other hand, the Uabs in UB4 decreases linearly within the first 5 days suggest the active WISHE feedbacks proposed by the authors. Do you have any explanation for this?

Fig. 2 Quantities are averaged over 5 days and 10 km. What does 10 km mean?

Line 48 a grid spacing of 75m at the first model level. Add up to XXX m near the model top.

Line 89 day 22 doesn't make sense here. Do you mean 22 days after restart or 2 days after restart?

Line 91 same problem as line 89.

Fig 2 and others, it's better to put figure legend to all the figures.

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