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Comment on acp-2021-9

Anonymous Referee #2

Referee comment on "A large-eddy simulation study of deep-convection initiation through the collision of two sea-breeze fronts" by Shizuo Fu et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-9-RC2>, 2021

GENERAL COMMENTS

In this paper a series of large-eddy simulations are performed to investigate the processes involved with the initiation of deep-convection regime. LES describing the collision of the two sea-breeze system in a peninsula is not a original argument and are not mentioned. Anyway this study presents a novel configuration for the numerical models that considers a cloud model joined with an offline lagrangian model.

The principal conclusion of this investigation is that DCI occurs after the collision of sea-breeze fronts through the development of three generations of convection. In this context authors gave full explanation in the manuscripts and detailed the processes involved in the three stages of convection development inside the peninsula.

From the technical point of view the analysis of data is coherent with the objective, so I recommend publication with minor revision.

SPECIFIC COMMENTS

- In my opinion the abstract should be more general and, in some way, reformulated. It actually contains the main hypothesis (lines 15-17): "The two sea-breeze fronts move inland and collide, producing strong instability and strong updrafts near the centerline of the domain, and consequently leading to DCI". But starting from line 17 it contains the results of simulations, that is the discussion about the three stages and the intensity of surface heat flux necessary to generate a DCI. I would expect more details in the physical process being investigated and the analysis of LES runs for the conclusion final paragraph.
- Another point not sufficiently discussed concern the role of "environmental wind", perhaps a further run with this wind > 0 would be necessary. It is only said that "the environment wind is set to zero to simplify the analysis." But this is not sufficient in my opinion.
- Line 135: Please provide references for ERA5 reanalysis
- 1 : This is not clear, above is said that "The prescription of the surface fluxes is guided by the ERA5 reanalysis data." then total heat flux is prescribed by the sinusoidal eq.1.
- At line 165 it is written that "cloud water mixing ratio greater than 0.01 g kg^{-1} ", but this quantity is not described in the model-setup paragraph 2.2.
- Analysis are performed each $dt=10$ min first then at 1 min interval, but the time step of the cloud model is not introduced.
- The "connection" between the cloud and lagrangian model is realized every time step ??? The description from line 149 to 155 is quite superficial, other studies doing this coupling should be mentioned.