Review of ACP manuscript egusphere-2026-5350 by Diamond et al.

The manuscript **Drizzle drives model differences in the Southeastern Atlantic Stratocumulus Transitions with Aerosol-Rain-Radiation interactions (SEA STARR) large eddy simulation intercomparison project** by Diamond et al. presents a nice model intercomparison study of five different LES models (including two SAM variations) of a composite stratocumulus to cumulus transition case in the Southeastern Atlantic. All models qualitatively simulate a deepening-warming transition in the control (i.e. high-aerosol) case, while they considerably deviate in low-aerosol scenarios. The authors trace this back to the different microphysical parametrisations and how rain is represented therein.

General comments

I enjoyed reading this paper, it is well-written, the results are interesting and the conclusions are supported by the figures. The methodology is sound, although I am not a specialist when it comes to observational campaign data. I would have liked to read more about the origin of the uncovered biases, but I understand that this is outside the scope of a model intercomparison paper. That said, I am confident that this work will provide a solid foundation on which modelling groups can build.
I have one major comment, but apart from that only minor comments mostly for clarification which, I believe, will strengthen the manuscript. I am happy to support publication of this work in ACP, after these points have been addressed.

Major comments

My major comment targets something the authors already mentioned once in the discussion in lines 691ff: While three models (NOAA-SAM, UW-SAM, MIMICA) use 25 μm as a rain cutoff, the two other models (DHARMA, DALES) use 40 μm, which is a rather large deviation. Clearly, the different models are set up and tuned differently, however, I would like to see the impact of this threshold by e.g. decreasing the DALES threshold (as DALES produces significantly less precipitation) or similar. I acknowledge that the authors already noted that the models do not simply deviate according to this threshold, so it is highly unlikely that this will remove the biases. However, my intention is to gain a better sense in general of how much this choice affects the results, as the main discrepancies are traced back to the microphysics and in particular, the rain.

Minor comments

L. 145f.: I did not quite understand the vertical velocity smoothing, even though the reference is given, could you please clarify this.

L. 176f.: Why is the control simulation initialised at 100 mg^{-1} as N100 instead of 1000 mg^{-1}, but not the N30? If you want the same initial conditions, why not use it in every case?

L. 370f.: This sounds like every LES model uses the 25 μm cutoff for rain, which is not the case for two of them.

L. 391ff.: Why are you using the humidity to compute the inversion height for LASIC data instead of the potential temperature as in the LES?

L. 414ff.: This seems a bit inconsistent, why are you using a different metric to compute cloud fraction in DALES compared to the other models?

Figs. 3-6: This might be only a plotting issue: Visually with the shading, it looks like day and night are both exactly 12h long for all three days. However, given that the trajectory covers around 8 degrees in North-South direction and is in August, there should exist a (slight) deviation between day and night (as is also stated in L. 241f.).

Fig. 4: What is the difference between the CLARIFY z_i and z_c and why can either of them be higher at different flights?

Figs 4-5: Although the observations should evidently fit to the control simulations, I think it would be helpful if you added them to panels b) and c) as well, especially if you are comparing them as in L. 444ff.

L. 503ff.: This aerosol retention is puzzling, do you have any suspicions why this happens in MIMICA (e.g. stronger winds, etc.)?

Sect. 3.3: I think the N_c-LWP state space analysis is very enlightening, however, during reading, I was wondering what the time series looks like. I think it would be very helpful to add one plot showing the temporal evolution of rain (analogously to Figs. 3-6) to add a bit more context.

L. 519f.: This is very interesting, have you investigated this further and have a clue where this might originate? Or was this observed before in other studies using MIMICA/DALES?

Fig. 9: This is a great plot summarising a lot of information. I have one question: Given that the purple contours show values of 30, 90 and 270, this is probably not the probability distribution (as stated in the caption) but rather the actual amount of samples?

Technical comments

Fig. 3: Please introduce the abbreviations z_{i} and z_{c} (see above CLARIFY comment).

L. 463: Missing units after 542.

Fig. 6: Please also use the 6 hourly x-ticks as in the previous figures and add ticks to panel a) for visibility.