Editorial comment — Map attribution in Figures 1 and 2

Author response: We thank the editor for pointing out the missing map attribution. The required Esri credit has been added to the captions of Figures 1 and 2.

Changes in manuscript:
Both captions now include the map attribution and “Powered by Esri.”

Report #1

Line 55 – mention the dates/duration for the campaign?

Author response: We thank the referee for the suggestion. The HI-SCALE campaign comprised two approximately four-week intensive observation periods in 2016 (24 April–21 May and 28 August–24 September). These dates have been added to the Introduction.

Changes in manuscript:
The dates and duration of the two HI-SCALE observational periods have been added to Section 1.

Line 142 – the IFS with DDH approach still needs a reference?

Author response: We thank the referee for pointing out the missing reference. We have added Gustafson et al. (2020), which describes the IFS-DDH approach used to derive large-scale forcing for LASSO simulations, including the 114 km forcing scale used in this study.

Changes in manuscript:
The reference has been added to the description of the IFS-DDH forcing approach in Section 2.1.

Report #2

The authors have revised the manuscript substantially in response to both referees. They addressed most of my first-round comments, and the paper is much clearer as a result.
My remaining questions are few, and I recommend one more minor revision for clarity. The comments below follow the order of the revised manuscript, and line numbers refer to the clean version.

Specific Comments

L22. The abstract mentions 'practical guidance for designing flight strategies', but I could not find where this guidance is stated in the paper. Could the authors spell it out in the Conclusions, noting that the model field is held fixed within each 10-min interval, or rephrase the claim?

Author response: We thank the referee for this suggestion. We have modified the Abstract and Conclusion to emphasize the evaluation of sampling representativeness rather than practical flight-design suggestions. We have also clarified in the Conclusion section that the results are based on an idealized sampling framework, which limits the interpretation of realistic flight conditions.

Changes in manuscript:
The relevant statements in the Abstract and Conclusions have been revised accordingly.

L77. Should 'west' read 'east'? Bartlesville (about 95.98° W) lies east of the SGP site (97.49° W).

Author response: We thank the referee for identifying this. The direction has been corrected from "west" to "east" in the revised manuscript.

Changes in manuscript:
The sentence now reads "The ARM AAF deployed the G-1 research aircraft from an airport in Bartlesville, Oklahoma, approximately 130 km east of the SGP observatory (36°36'26''N, 97°29'16''W)."

L247. Could the authors clarify what 'direct comparison with the LASSO simulations' refers to here? L88 and L168 state that the HI-SCALE data are used only to define the horizontal sampling geometry and are not compared with the simulations.

Author response: We thank the referee for pointing this out. The HI-SCALE aircraft data were used only to design the horizontal geometry of the prescribed sampling trajectories and were not used for direct comparison with the LASSO simulations. The corresponding wording has been revised to maintain consistency with the description in Sections 1 and 2.

Changes in manuscript:
The statement at L247 has been revised to clarify that the HI-SCALE flight tracks were used to define the horizontal sampling geometry rather than for direct model–observation comparisons.

L357. The domain mean is 'computed over only the vertical layers intersected by the flight path', but I could not find which grid points within those layers enter the domain mean, or which samples enter the trajectory average. L175 defines CWC as liquid water 'within cloudy air', and L430 states

that clear columns are excluded for cloud base and top, but there is no similar statement for the CWC averages.
Several numbers suggest that both are in-cloud means. The 19410 valid zigzag samples at slow speed (L416) are about 1 % of the 91 × 21600 trajectory positions. The domain means in Table 1 (0.40–0.56 g m-3) would be large for an all-sky mean, given that 81 of the 91 cases have a maximum CF below 50 % (L495). And the reference profile in Fig. 8 stays between about 0.5 and 1 g m-3 up to 10 km, although the caption describes it as 'computed over the full model domain' (L471).
Could the authors state whether both averages include only cloudy points (e.g. CWC > 0.2 g m-3), and define what counts as a 'valid' sample? If they are in-cloud means, that is a reasonable choice, but the abstract and conclusions should then refer to in-cloud CWC. This follows up my first-round comment on the all-sky reference.

Author response: We thank the referee for pointing out this ambiguity. We have clarified accordingly in the revised manuscript. Both the trajectory-averaged CWC and the corresponding domain mean are based on cloudy CWC values only, with cloud-free trajectory and model grid points excluded from the calculation. The domain mean is calculated over the vertical layers intersected by the flight path, so that the sampled and domain-mean CWC represent the same vertical portion of the simulated cloud field.

Changes in manuscript:
The description of the CWC averaging in Section 4.1 has been revised to clarify that both sampled and domain-mean CWC are calculated from in-cloud CWC values. The corresponding statement in the Abstract and Conclusions has also been revised accordingly.

L359. Should 'Field et al., 2016' read 'Field and Furtado, 2016', as in the reference list?

Author response: We thank the referee for identifying this. The citation has been corrected to match the reference list.

Changes in manuscript:
The citation at L359 has been corrected from “Field et al., 2016” to “Field and Furtado, 2016”.

L377. The domain-size comparison mentioned here appears only in the response letter. Could these numbers be added to the Supplement? Is there a reason the 2018–2019 cases were not included?

Author response: We thank the referee for this suggestion. The previous domain-size comparison did not include the remaining Version 1 cases from 2018–2019. We have now extended the comparison to include all 91 cases analyzed in this study and added the results to the Supplemental Material. The comparison distinguished the 2015–2016 Alpha 2 cases (14.4 × 14.4 km) from the 2017–2019 Version 1 cases (25 × 25 km).

Changes in manuscript:
The domain-size comparison has been added to the Supplemental Material (Table S3), and Section 4.1 has been revised to refer to these results and clarify the limitations of the comparison.

L482. If nBias is defined as for Table 1, a level-leg nBias of 1.56–1.81 would mean the sampled CWC is about 2.6–2.8 times the reference, yet in Fig. 8 the level-leg curves lie below the black reference curve over most of the 2–5 km layer. I raised the positive biases in this comparison in the first round, and the response corrected only Table 1. Could the authors check these values, using the same definitions as for Table 1?

Author response: We thank the referee for pointing out this inconsistency. We re-examined the vertical-profile comparison and recalculated the correlations, nBias, and nRMSE. With this consistent comparison, the level-leg profile has correlations of 0.57–0.65, nBias values of –0.38 to –0.34, and nRMSE values of 0.56–0.58. The sine wave, staircase, and zigzag profiles generally show higher correlations and smaller errors over the same altitude range. We have updated the values and corresponding discussions in Section 4.3 accordingly.

Changes in manuscript:
The statistics and discussion in Section 4.3 have been revised accordingly. The calculated correlation, nBias, and nRMSE values have been updated, and the interpretation of the effects of vertical sampling strategy and flight speed has been revised accordingly.

L488. 'Increasing flight speed generally improves agreement within the common altitude range.' From the values given at L464 and L476, the level-leg correlation decreases with speed (0.36, 0.21, 0.15), the sine wave shows no clear trend (0.48, 0.40, 0.43), the staircase changes little (0.32, 0.40, 0.40), and only the zigzag increases (0.42, 0.53, 0.60). Could this statement be revised to match the numbers?

Author response: We thank the referee for pointing this out. We have revised the discussion of the speed dependence accordingly. After recalculating the comparison over the common altitude range, increasing flight speed tends to improve agreement for most vertical sampling profiles, although the response is not uniform across all configurations. In particular, the level-leg and staircase profiles show increasing correlations with speed, while the sine wave and zigzag profiles do not follow this trend. We have therefore modified the previous statement.

Changes in manuscript:
The discussion in Section 4.3 has been revised to indicate that increasing flight speed tends to improve agreement for most profiles, while the response varies among sampling strategies. The role of vertical trajectory geometry and upper-level variability has also been clarified.