Thank you very much for your thoughtful comments and feedback regarding our manuscript. We appreciate the time and effort you and the reviewers have invested in evaluating our work.

We acknowledge the concerns raised and recognise the need for substantial revisions. We believe that our study offers valuable insights for the community, and we would like to address the reviewers' and your comments in detail to strengthen the manuscript. To point out our aims more clearly: our analysis attempts to characterise the updrafts and downdrafts in the anvil of deep convective clouds, with their dynamic, thermodynamic, and microphysical properties, using aircraft observations (up to 14 km). The novel aspects are to study the anvil characteristics of deep convective clouds and whether we can explain their motion with concepts of hydrometeor loading and latent cooling. The difference in microphysical structure between clouds at lower altitudes and higher altitudes potentially contributes to their dynamical and thermodynamic properties, which are investigated in this study.

Below, we have provided specific responses to the points you raised. Additionally, we have addressed each of the reviewers' comments in the interactive discussion.

- How generalisable are the results obtained? Are they applicable to other convective situations?

  The campaign measured convective clouds at different life stages. As far as the upper levels (10-14 km) are concerned, the generalisation is robust. since the measurements are from the anvil of deep convective clouds (Wendisch et al., 2016). Amazonian deep convective cloud anvils typically occur at an altitude of 12 km, with anvil top heights reaching their maximum at 13.5 km (Dodson et al., 2018), thus our measurements, which were aimed at deep convective clouds but avoiding the core region (due to flight safety), are well withing the typical range of deep convective cloud anvils. Furthermore, the results from our study exhibit characteristics consistent with those reported in previous investigations. For example, at the microphysical level, the particle size distributions from higher altitudes resemble those from Frey et al. (2011) in which the particle size distribution of the anvil of the Mesoscale Convective System (MCS) over West Africa has been sampled. The draft characteristics, such as width and mass flux of drafts, show a similar vertical profile to those reported by Yang et al. (2016) for lower altitudes of convective clouds sampled over the tropics and midlatitudes. The novelty of our investigation is that we can extend these characteristics further to higher altitudes (>10 km). Since the in-situ observations of tropical deep convection at high altitudes are scarce, the present dataset is a valuable contribution to this limited body of knowledge. The main objective of this study is to gain a deeper understanding of the characteristics of deep convective cloud anvils, which cover large areas and thus constitute a significant part of the convective system. In the revised manuscript, we have explained and discussed the our findings within the context of the ACRIDICON-CHUVA campaign.

- I think it would be better to show updraft and downdraft fractions rather than number, because the number can more easily be biased by e.g. flying very high.

  Thank you for the suggestion. In the revised version, the number of drafts in Figure 1b is now replaced with fractions (number of drafts in one altitude bin / total number of drafts) of updrafts and downdrafts. According to a comment by reviewer #2, we have given detailed information on number of drafts. In terms of drafts, 1478 drafts are from above 10 km, and 557 drafts are from below 10 km. Additionally, following the comment of reviewers' comments, we have added 90% confidence interval for mean and percentile curves.

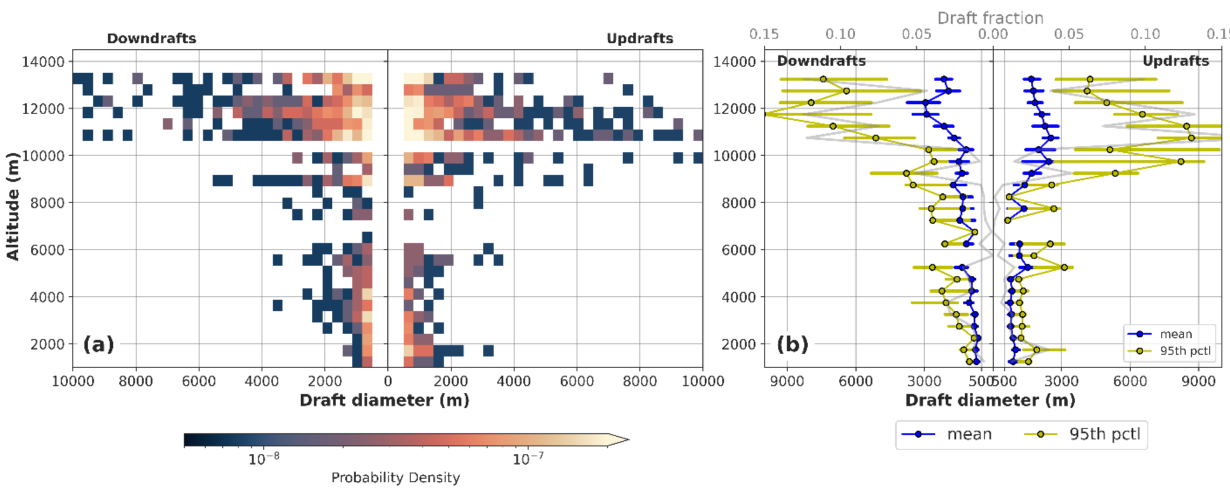

Figure 1 (revised) : Altitude-wise draft diameter statistics of all in-cloud drafts. (a) Joint Probability Density Function of Draft diameter and altitude (b) mean (blue) and 95th percentile (yellow) values of diameter of drafts. 90 Confidence intervals for mean and percentile curves are indicated by the error bars.

- Reference to the simple 1D downdraft model of Srivastava (1985, https://doi.org/10.1175/1520-0469(1985)042<1004:ASMOED>2.0.CO;2) should be made. They e.g. show that downdrafts are more intense in higher relative humidity environments, because this makes dry downdrafts more negatively buoyant w.r.t. the environment.

  Thank you for suggesting the inclusion of findings from Srivastava (1985). Environmental dependence is indeed a factor that influences draft characteristics. Srivastava (1985) provides insights to understand the downdrafts that occur in the sub-cloud layer, driven by the evaporation of raindrops, and sensitive to the surrounding environmental conditions. However, our analysis does not show a direct relationship with latent cooling and cloud dynamics at higher altitudes. Moreover, we focus the environmental sensitivity is not the focus of the current study, thereby making it difficult to compare with the results of Srivastava (1985).

- The analyses appear rather random, and little effort seems to be made to synthesise results and provide perspectives.

  Thank you for bringing attention to the concern regarding the study outline. In attempt to answer our research question, which is to explain the dynamical, thermodynamic and microphysical characteristics of anvil clouds with high-altitude in-situ observations, we analysed variables which relate to these aspects in the clouds. The results are essential to characterise the anvil cloud dynamics, which is complex due to the interplay of multiple processes occurring at various scales such as latent cooling/warming, entrainment/detrainment, ice microphysical interactions etc. We synthesised the results by providing a general overview (statistics of draft width, mass flux, etc.) and explaining specific interactions (hydrometeor loading and latent cooling). We found that the anvil cloud deck anvil downdrafts are not dominated by a single physical process. While the thermodynamic process does not explain downdrafts on its own, other processes such as radiative cooling and gravity waves produced by updrafts could contribute to them. However, it is not possible to evaluate the different hypotheses using only observational data. A future study will employ LES to evaluate the different contributions.

  Our results carry relevance as they can also be used to inform numerical simulations. For instance, we show the draft width and airmass flux characteristics in upper levels, and that we can expect ice supersaturation in downdrafts of the anvils of the deep convective clouds. To provide more clarity, we rewrote the introduction and reorganised the results and discussion to mitigate ambiguity and provide perspectives. In the revised version, we pay special attention to clarify which observational findings require high-resolution modelling (cloud and turbulent resolved models) to refute them.

We believe that with our changes, we have significantly improved the manuscript and hope to have addressed all raised concerns appropriately.

Thank you again for your guidance and consideration.

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