We thank the reviewer for giving detailed critiques of the manuscript. Addressing these comments have led to substantial improvements in the manuscript. Please find below the reviewer comments in **Bold**, our responses to them in regular text, and changes to text if any in *Italics*. Thank you.

This is an interesting study and well-written manuscript that describes and tests a new physically based technique for retrieving vertical and entrainment velocities at the top of a stratocumulus layer over the ocean using cloud motion vectors. It is an achievement to estimate the vertical velocity and entrainment velocity "strictly grounded within the observations". The work is methodical, the results demonstrate the potential usefulness of the new approach, and the manuscript is well-structured. Entrainment velocity is an important parameter for understanding and modelling ABL processes, and the exchange of heat, moisture, and pollutants at the earth's surface as well as at the top of the ABL. The manuscript presents a valuable work that is both timely and important, and will be a significant contribution to the field.
Thank you!

Major limitation:
One significant drawback of the current study is the use of ERA5 as a reference for the satellite retrievals. ABL, low-level clouds, and top entrainment are examples of small-scale processes that are poorly resolved in the reanalysis and depend on highly uncertain model physics (parameterization schemes). It is not very compelling to evaluate direct estimations of CTH, w, and w_e based on satellite data using reanalysis as a reference.
Furthermore, the rationale for data selection is somewhat illogical since it stresses that the new approach eliminates the need for reanalysis to provide vertical air velocity. This is a noteworthy development, however, it is unclear why ERA5 may then be used as a reference.
We thank the reviewer for this comment, similar comment was made by the other reviewer. We fully agree that as ERA5 is a numerical reanalysis model, the PBL, w and w_e from it cannot be treated as observational truth. In this work, ERA5 is not used to validate the MISR-based retrievals of cloud-top vertical velocity (w) or entrainment velocity (w_e), nor do we claim that agreement with ERA5 implies absolute accuracy. Rather, ERA5 is used strictly as a sanity check and as an independent physical reference for the satellite derived estimates. Hence, the title of the article is "Towards retrieving cloud top entrainment velocities…", rather than "Retrievals of entrainment velocities …". Perhaps due to us being unclear, these points did not come across clearly in the submitted version of the manuscript. In the revised version we have clarified this issue by adding the following sentence to the introduction and summary sections.

Introduction Section:
"The present study does not attempt a formal validation of the retrieved w or w_e. Comparisons with ERA5 reanalysis model are solely made for physical consistency check and not as an observational benchmark. The uncertainty estimates reported herein arise

from analytical propagation of known MISR cloud-top height and wind uncertainties, which have been independently characterized in prior studies (e.g., Mueller et al., 2017; Mitra et al., 2021). The goal of this work is therefore to demonstrate the feasibility and internal consistency of a stereo-only observational retrieval of entrainment, rather than to establish absolute accuracy."

Summary Section:
"While this study demonstrates the feasibility of retrieving cloud-top vertical velocity and entrainment rates from MISR observations alone, it does not constitute a formal validation of the retrieved magnitudes. The comparison with ERA5 serves only as a physical consistency check and contextual reference. The ERA5 reported PBL height derived from the potential temperature gradients are used herein, while those derived from relative humidity (RH) gradient might be more applicable for low-level clouds (Von Engeln and Teixeira, 2013). A rigorous evaluation would require independent observations of vertical motion, inversion height, and entrainment at comparable spatial scales. Long-term ground-based facilities such as the ARM Eastern North Atlantic (ENA) site provide a promising opportunity in this regard, combining frequent radiosondes with cloud radar and lidar observations in marine stratocumulus regimes. A future evaluation strategy could involve regime-based compositing of MISR overpasses collocated with ENA observations and statistical comparison of estimates of cloud top heights, vertical air motion, and entrainment rates derived from ground-based instruments. Such an approach would respect inherent spatial and temporal mismatches while providing an independent test of the MISR retrieval framework."

Minor comments:
Line 12-13: "output from European Center for Medium-range Weather Forecasting (ECMWF) reanalysis model (ERA5)" -> "European Centre **for Medium-range Weather Forecasting (ECMWF) reanalysis (ERA5)"**
Thank you for catching this, we have fixed the typo.

ERA5 provides reanalysis fields derived from a combination of observations and modelling, and as such cannot be considered as model output. The model used in a chain of processes to produce the reanalysis is IFS.
Agreed, the sentence has now been rephrased as "… data from the European Centre for Medium-range Weather Forecasting (ECMWF) reanalysis (ERA5)."

Line 19: „a generate a global climatology"-> „generate a global climatology"
Thank you. Corrected.

Page 13 – It should be mentioned here already that ERA5 estimates of cloud top height are higher and less spatially variable than MISR CTH.
We appreciate the suggestion. It has been implemented.

Line 42: Explanation of what a Twin Otter is and some reference to its use in meteorological observation should be added. The same is valid for UAS.

The Center for Interdisciplinary Remotely Piloted Aircraft Studies (CIRPAS) at the Naval Postgraduate School (NPS) in Monterey, CA owns and operates an instrumented Twin Otter aircraft that has been long used to study low-cloud processes. It is an unpressurized low-flying and slow moving (~50 m/s) aircraft that can make in situ measurements of aerosols, cloud, thermodynamic, dynamic, and radiative properties. Data from multiple Twin Otter field campaigns have been summarized in Sorooshian et al. (2018). We particularly highlight two studies that have explicitly derived entrainment rates, Gerber et al. (2013) for the Physics of Stratocumulus Top (POST) field campaign, and Norgren et al. (2016) for the Gulf of Mexico Atmospheric Composition and Climate Study (GoMACCS) field campaign.

The Unmanned Aerial Systems (UAS) can make observations of thermodynamic and at times that of cloud properties. UAS can fly in low to moderate wind conditions at speeds ranging from 10-36 m/s. We want to highlight observations collected during the recent TRacking Aerosol Convection interactions ExpeRiment (TRACER) field campaign summarized in Lappin et al. 2025.

Sorooshian A, MacDonald AB, Dadashazar H, Bates KH, Coggon MM, Craven JS, Crosbie E, Hersey SP, Hodas N, Lin JJ, Negrón Marty A, Maudlin LC, Metcalf AR, Murphy SM, Padró LT, Prabhakar G, Rissman TA, Shingler T, Varutbangkul V, Wang Z, Woods RK, Chuang PY, Nenes A, Jonsson HH, Flagan RC, Seinfeld JH. A multi-year data set on aerosol-cloud-precipitation-meteorology interactions for marine stratocumulus clouds. Sci Data. 2018 Feb 27;5:180026. doi: 10.1038/sdata.2018.26. PMID: 29485627; PMCID: PMC5827690.

Gerber, H., G. Frick, S. P. Malinowski, H. Jonsson, D. Khelif, and S. K. Krueger (2013), Entrainment rates and microphysics in POST stratocumulus, J. Geophys. Res. Atmos., 118, 12,094–12,109, doi:10.1002/jgrd.50878.

Norgren, M. S., Small, J. D., Jonsson, H. H., and Chuang, P. Y.: Observational estimates of detrainment and entrainment in non-precipitating shallow cumulus, Atmos. Chem. Phys., 16, 21–33, https://doi.org/10.5194/acp-16-21-2016, 2016.

Lappin, F., de Boer, G., Klein, P., Hamilton, J., Spencer, M., Calmer, R., Segales, A. R., Rhodes, M., Bell, T. M., Buchli, J., Britt, K., Asher, E., Medina, I., Butterworth, B., Otterstatter, L., Ritsch, M., Puxley, B., Miller, A., Jordan, A., Gomez-Faulk, C., Smith, E., Borenstein, S., Thornberry, T., Argrow, B., and Pillar-Little, E.: Data collected using small uncrewed aircraft systems during the TRacking Aerosol Convection interactions ExpeRiment (TRACER), Earth Syst. Sci. Data, 16, 2525–2541, https://doi.org/10.5194/essd-16-2525-2024, 2024.

Line 55: “of of” -> “of”

Thank you for the catch. Corrected.

Line 74: “the retrieval method can be extended to the global: - Can it also be applied over land?
YES, but with caveats. For low clouds over land, especially over bright surfaces (snow, ice, desert) or for very low clouds, MISR stereo may misidentify surface features as clouds. This can however be flagged and screened using a high-resolution and modern DEM.

Line 207: Please remove “model” here, and also remove “model output” from Table 1.
Accepted, the words have been removed.