Dear Reviewer,

This work has been in submission multiple times over the last year and a half, and it is possible that you have reviewed it before. Thank you for your service. Despite the rejections, we believe this work is impactful and solves a true problem (encumbrance on simulation code due to high communication overhead at scale) and although the idea is simple (terminating particles at boundaries), the results are surprising (the loss in accuracy is not large). Before this EGPGV submission, we have done a major revision to best address the feedback we have received previously.

Our reviews often have a mix of high scores and low scores. We are heartened by the high scores and have tried to take comments from the low scores into account in each revision. We feel it is within our community norms to not provide an extensive revision report document detailing ever prior review and a response. That said, we do continue to improve the paper each revision and have done a major revision of the work for this submission and believe the contents of this document would be valuable for previous and new reviewers. We list the several changes to the manuscript below.

The following changes were made during the major revision:

1. **Complete rewrite.** Overall, we have done a complete rewrite of the manuscript to improve clarity and remain up to date with current advancements in the field. In particular, a comprehensive review of Lagrangian analysis recently published clearly identifies the biggest challenges and potential of Lagrangian analysis. Our rewrite has been motivated by the desire to address feedback from reviewers, clearly identify the motivation and contribution, better describe the method, and improve the analysis of our study through the use of violin plots and heatmaps that show error distribution.
2. **Table 1.** We’ve introduced this table to outline the differences between performing distributed memory particle advection in post hoc settings versus performing it in situ. Our hope is that this table helps provide clarity as to why post hoc techniques are not directly applicable or in many cases not even viable in situ.
3. **Evaluation Metric – Reconstruction Accuracy.** Previous reviewers were unhappy with the use of an average error computed over the entire flow map. As part of our revised analysis, we are now using violin plots to show the distribution of error to provide a clearer idea of reconstruction error introduced. Further, rather than computing the error over the entire flow map (averaging over all particle trajectories), the violin plots only show the error of reconstructing the discarded trajectories. The remaining (stored) flow map is already as accurate as the traditional Lagrangian approach.
4. **Comparisons.** In this paper, we have studies that provide insight into two comparisons. First, comparison to the traditional Lagrangian approach as the number of ranks/data blocks increases for a fixed size grid resolution. We note that our study evaluates the end of the spectrum where the limitations of local flow maps are more evident. Second, comparison to the traditional Eulerian technique under sparse temporal settings. We only include this study to satisfy previous reviewer requests. We believe an extensive comparison would be repeating prior works and deviating from our focus in this paper. In both of these cases, we compute full pathlines over the duration of the simulation.
5. **Notional example and discussion of early termination.** Our manuscript now contains a notional example and our reasoning for why particles that terminate early cannot be directly used without further innovation of post hoc interpolation techniques. Specifically, post hoc interpolation schemes that can consume flow maps that contains particle trajectories starting and stopping at arbitrary times. We have included this text to address previous reviewer’s questions regarding why we don’t store termination location and time.
6. **Limitations, Discussion and Future Work Sections.** We have introduced these sections to clearly point out the limitations of the approach, possible solutions, and the multiple directions of future work for computing in situ Lagrangian flow maps.

Best regards,

Authors of Scalable In Situ Computation of Lagrangian Representations via Local Flow Maps