

Report #1

Submitted on 23 Jul 2026

Referee #1: Daniel MacDonald, dmacdonald@umassd.edu

Anonymous during peer-review: Yes No

Anonymous in acknowledgements of published article: Yes No

Checklist for reviewers

1) Scientific significance

Does the manuscript represent a substantial contribution to scientific progress within the scope of this journal (substantial new concepts, ideas, methods, or data)?

Excellent **Good** Fair Poor

2) Scientific quality

Are the scientific approach and applied methods valid? Are the results discussed in an appropriate and balanced way (consideration of related work, including appropriate references)?

Excellent Good Fair Poor

3) Presentation quality

Are the scientific results and conclusions presented in a clear, concise, and well structured way (number and quality of figures/tables, appropriate use of English language)?

Excellent **Good** Fair Poor

For final publication, the manuscript should be

accepted as is

accepted subject to **technical corrections**

accepted subject to minor revisions

reconsidered after **major revisions**

rejected

Were a revised manuscript to be sent for another round of reviews:

I would be willing to review the revised manuscript.

I would not be willing to review the revised manuscript.

Suggestions for revision or reasons for rejection

(visible to the public if the article is accepted and published)

My only further comment for the authors to take into consideration is in regard to the discussion about critical Froude numbers at liftoff, found in the revised text around lines 680-685. I still believe that a critical Froude number of 1 is not strictly a theoretical construct but should be found in natural systems as well. However, under conditions of varied cross channel bathymetry, supercritical Froude numbers can be observed at liftoff in cases where the liftoff front is "anchored" at a specific location with a critical local Froude number (see MacDonald and Geyer 2005, JPO). Given that this might contribute to the supercritical Froude numbers

observed at liftoff in the Patos Lagoon mouth I suggest that it would be useful to also mention the potential for supercritical liftoff due to cross channel bathymetry.

We thank the reviewer for this suggestion. During last Physics of Estuaries and Coastal Seas meeting, at Portland, Maine (Aug, 2026), we have the opportunity do discuss these results with other coastal physical oceanographers, and especially Dr. Rock Geyer. He suggested us to adopt a more pragmatcal calculation of g' , in a similar way used in MacDonald and Geyer (2005). The results changed dramatically, and are looking more coherent with the theory. Of course, now there is the question about the best way to scaling the Froude Number, and why our first attempt didn't work? We changed the discussion to incorporate the new results, however, we keep the previous results as to call the attention of the scaling problem.

Report #2

Submitted on 29 Jul 2026

Referee #2: Óscar Álvarez-Silva, oalvarezs@uninorte.edu.co

Anonymous during peer-review: Yes No

Anonymous in acknowledgements of published article: Yes No

Checklist for reviewers

1) Scientific significance

Does the manuscript represent a substantial contribution to scientific progress within the scope of this journal (substantial new concepts, ideas, methods, or data)?

Excellent **Good** Fair Poor

2) Scientific quality

Are the scientific approach and applied methods valid? Are the results discussed in an appropriate and balanced way (consideration of related work, including appropriate references)?

Excellent Good Fair Poor

3) Presentation quality

Are the scientific results and conclusions presented in a clear, concise, and well structured way (number and quality of figures/tables, appropriate use of English language)?

Excellent Good Fair Poor

For final publication, the manuscript should be

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rejected

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I would be willing to review the revised manuscript.

I would not be willing to review the revised manuscript.

Suggestions for revision or reasons for rejection

(visible to the public if the article is accepted and published)

The authors have satisfactorily addressed the vast majority of my previous comments. In particular, the revised version places the measurements in a broader hydrodynamic context and considerably strengthens the discussion of the turbulence and mixing parameters used throughout the study. I consider the manuscript suitable for publication.

I have only one remaining minor comment. In the response to the reviewers, the authors state that they revised the manuscript to clarify that the threshold values of the buoyancy Reynolds number ($Re_b = 15$ and 200) are subject to statistical uncertainty and scale dependence. However, I was unable to identify this clarification in the revised manuscript. While the physical interpretation of the different Re_b regimes has been improved, the manuscript still presents these threshold values as universal criteria. I suggest adding one or two sentences acknowledging the nature and limitations of these values, consistent with the explanation provided in the response to the reviewers.

Apart from this point, I have no further comments.

We thank the reviewer for pointing this out and apologize for the oversight in the previous manuscript version. We have now explicitly added this clarification to Section 5.5 (lines 799–800) to acknowledge the statistical uncertainty and scale dependencies associated with these buoyancy Reynolds number thresholds, as follows:

*'These results suggest that the classical Ri threshold alone may not fully capture the complexity of mixing dynamics in this system. Such limitations of the gradient Richardson number as a universal mixing proxy have been recently documented in other diverse high-energy, wind-dominated systems (Arevalo et al., 2022; Álvarez-Silva et al., 2026), where vigorous mixing and asymmetric hydrodynamic structures persist even under seemingly stabilizing density gradients. **While the transitional criteria $Re_b = 15$ and 200 inherently involve statistical uncertainty and scale dependencies,** the buoyancy Reynolds number (Re_b) provides a more robust description of turbulent efficiency in this energetically active plume, capturing the full spectrum of mixing states that traditional stability thresholds may overlook.'*