

Review of “Vortex streets to the lee of Madeira in a km-resolution regional climate model”

**Recommendation:** Minor Revisions

## Summary

This is a well-written paper offering insights into vortex streets created by the island of Madeira, using satellite observations as well as model data. A case study as well as a 10 year climatology are discussed. I think this is an interesting paper and I do not have any major concerns. The paper should be acceptable after some minor revisions.

## Main comments

1. I might suggest omitting the details about the precipitation climatology. You could mention that you checked it, but I'd only focus on those parameters relevant to vortex shedding.
2. Line 109: A grid spacing of 1.1 km is not convection resolving; rather, it is “convection allowing” (to resolve convective motions, a grid spacing of about 100 m is needed).
3. Line 109, 121: In the modeling world, one distinguishes between grid spacing and resolution (the resolved scale is several times larger than the grid spacing). I saw your statement in line 143, but I would still recommend using “grid spacing” instead of “resolution” when talking about the model setup.
4. Throughout, replace “shedded” with “shed.”
5. Line 196-197: This needs to be justified better.
6. Line 222 ff. (vortex identification criteria): I found these criteria quite subjective; maybe you can use a typical vortex street to show, and justify, why these criteria were used? Did you also consider criteria such as the kinematical vorticity number or Okubo-Weiss number? If not, why not?
7. Section 3.2: You refer to Supporting Information, rather than showing images. It is good to have those animations, but the reader ought to be able to follow the presentation by what's provided in the paper. Please include snapshots of these animations that allow the reader to follow along.
8. In figure captions and in the text, please make it clear when you discuss modelled vortices or observed ones.

## Specific comments

1. Line 19: Turbulent flows are well-mixed and hence neutrally stratified in the atmosphere, no?
2. Line 30: Do you mean “lifetime of individual vortices”?
3. Line 38: This seems like a very specific result from that study—is this relevant background for readers to follow your study?
4. Line 42: Why is there convergence at the surface when there is subsidence above?
5. Line 44: Don’t understand what “turbulent stresses are tilted” means
6. Line 44: Rotunno didn’t suggest that turbulent stresses is inessential, but that the vorticity is generated via baroclinity rather than surface drag (but turbulent stresses were still needed to tilt the vorticity if I understand correctly).
7. Line 71: Suggest “conserved” instead of “conservative” here.
8. Line 83: Suggest focus instead of focused.
9. Line 94: Are these extreme events related to vortex shedding? Otherwise it is not clear why these events make Madeira a good location to study vortex streets.
10. Line 98-99: I’ll leave it up to you, but I’d let the readers decide whether the present study makes a “significant contribution.”
11. Line 110: Reword: ... without employing the shallow and deep convection schemes.
12. Lin 196: Use “a” gravity wave aloft? Also, a gravity wave is associated with vertical displacements, no?
13. Line 109: Please define the “crosswise island diameter.”
14. Line 246: Please clarify the criterion, which to me reads like “< 450, 450-900, or > 900 km<sup>2</sup>”
15. Line 260 ff: Why are the precipitation amounts relevant in the context of vortex shedding? Just to gauge the quality of the simulations? Can the climatology be shortened? I’m not sure what purpose it serves.
16. Line 196: We also show...

17. Line 329: “within the ellipse” is ambiguous; is this along the major axis?
  18. Line 345: You mention that the isobars are “deformed toward a circle, which led to a stronger north-easterly flow.” Are you suggesting that the symmetry is related to the wind speeds? Please explain (or delete the phrase).
  19. Line 347: Vanishment -- > weakening
  20. Line 408: Reword: ... does not suggest as good a performance... or something like that.
  21. Line 400: Perhaps you mean you did not wish to include vortices shed from other islands?
- 22.** Line 438: Conducive **to**.
23. Line 444: widens → weakens?
  24. Line 466: Again, my suggestion is to avoid statements such as “our results are of considerable interest” – time will tell.
  25. Line 514: displayed → display
  26. 518: noises → noise

## Figures

1. Fig. 8, 2<sup>nd</sup> row: Is this the shedding **rate**? If it is the “number of vortices shed” it should be an ever increasing number.
2. Fig. 13: Why not use (shaded) contour plots instead of the pixel plot?