Response to review

Reviewer comment 2

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This work proposes three physically-based diagnostics for sea breeze events using atmospheric model outputs. The research topic is of interest to the research community. The manuscript is well structured and clearly written. I recommend a minor revision before being accepted for publication.

Specific comments

- There are resolution issues with all the figures.
  Apologies for the resolution issues. We created .jpeg figures with > 300 dpi, following the GMD manuscript submission guidelines, and embedded them in the pdf file, so we are not sure why there are resolution issues or how to fix this. We will mention this to the journal publication office.

- Ln 184: It might be helpful to be more specific about how the boundary layer height is determined. Did you use a fixed height, or did you post-calculated the PBLH?
  We have now noted that the PBLH is based on diagnostics output from the models, and have included some details on how these are calculated in the descriptions of model data (Sections 2.1 and 2.3)

- Ln 195: Add units for equation 3.
  We have now included more details on units in the text following Equation 3, for clarity.

- Did you find any systematic differences among the models and between models and obs, in sea breeze identification? Does high resolution model tend to diagnose sea breezes closer to obs?
  We have discussed this to some extent in the Discussion and Conclusion section of the submitted manuscript (7th paragraph of that section) and have now expanded on these points in the revised version in response to this comment. The key points are that higher resolution models (< 5 km grid) provide more detailed sea breeze fronts compared with coarser models (> 12 km grid), particularly for regions with complex coastlines, and produce more objects around Australia. In terms of being 'closer to obs', this is difficult to verify exactly due to a lack of a high-resolution observational network, and we mention this limitation now in the Discussion and Conclusion.

  We have also evaluated the models to a very limited extent using station observations applied to one of the sea breeze diagnostics (Supplement Section

S2), and this is mentioned (with added clarity) in Section 3.2 of the main text: "Because [the hourly rate of change diagnostic, H] is a time series method, it can also be applied to station observations and used as a model evaluation tool. This is explored in the Supplementary Material (Section S2.1), where it is shown that the models can represent spatial variations in observed hourly local changes over the entire 6-month period, as represented by the H diagnostic, with a high degree of accuracy. However, this depends on model resolution to some extent, with higher resolution models having higher correlations with observations".

- Do you predict any issues or have any recommendations for readers who would like to try your software and apply it to other regions?
  We believe that we have discussed a number of issues and recommendations in the Discussion and Conclusions of the submitted manuscript. For example:
  - L487: Based on the findings presented here, we suggest that the moisture frontogenesis diagnostic (F) could be useful for capturing sea breeze occurrences from atmospheric model data, specifically when applied to convection-permitting model output (around 4 km or less)
  - L491: A more practical benefit of applying the F diagnostic is that it requires near-surface winds and specific humidity only, in contrast to the SBI that requires model-level output
  - L494: The limitations of the F diagnostic should be kept in mind in future applications, including the potential to misclassify other frontal objects and moist onshore large-scale winds flow as sea breezes. These limitations could potentially be avoided by further development of filtering methods

  In the revised manuscript, we have now noted additionally in the Discussion and Conclusion that: "Care should be taken when applying the software and methods to regions of complex coastlines and topography, as well as convectively active regions, as these are potential sources of mis-classifications as shown in the results here".

  We have also amended the following paragraph to be more accurate in our recommendation:

  "Based on the findings presented here, we suggest that the moisture frontogenesis diagnostic (*F*) could be useful for capturing sea breeze occurrences from atmospheric model data across Australia using *sea_breeze*, specifically when applied to smoothed convection-permitting model output (around 4 km or less).... However, the limitations of the *F* diagnostic should be kept in mind in future applications to other regions or domains..."