

Geosci. Model Dev. Discuss., referee comment RC2
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Comment on gmd-2020-388

Anonymous Referee #2

Referee comment on "A climatology of tropical wind shear produced by clustering wind profiles from the Met Office Unified Model (GA7.0)" by Mark R. Muetzelfeldt et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2020-388-RC2>, 2021

The web site lost my longer, more polite version of this review by timing out irreversibly while I was editing it — all irritation here is directed at the Web site, not the authors, but I have limited time to re-write this, and will probably not review for this low-rent "journal" in future. Very annoying!! But I won't belabor it lest that happen again!!

This manuscript describes an interesting effort to characterize the multidimensional space of wind shear into a reduced set of "representative" profiles. If the Abstract can make the study's details clear in a taut manner (and I do think it can indeed be done at that length), the text may require only minor revisions and streamlining.

The text is student-like: rather chatty, rather chronological, overly defensive and justifying of its arbitrary aspects, belaboring of common methods (like PC truncation), and brimming with the motivating conventional wisdom that wind shear plus instability may connect to a sense of convective "organization" that is somehow salient to mesoscale blob sizes seen in radar and satellite data. That motivating notion suffuses the discussion of method choices and interpretation of results (by turns more and less convincingly). Some streamlining is certainly recommended, but the main major issue is to make the actual work clearer: if an Abstract reader can know what was done, then discussions about the why of the details and the verbalizations of what the figures show and the speculative interpretations can remain loose, just a minor revision.

I suggest the abstract below. If it is incorrect, then the present paper wasn't clear enough about the method details, and hopefully those can be corrected in a pithy abstract summary not much longer than this one.

ABSTRACT

Toward the goal of linking wind shear to mesoscale organization of deep convection, instantaneous wind profiles (two wind components on twenty 50-hPa levels) from tropical grid columns in a climate model are distilled into a tractable number (10) of types. To aim at the goal, only columns with significant CAPE are considered, and only those with at least one level-to-level vector shear strength in the upper quartile of all such shear strengths. To isolate the shape aspects of this screened set of wind profiles, they are rotated into u' , v' components along and across the 850 hPa wind direction, and normalized by the maximum wind speed at any level. These normalized profiles are then smoothed by a 7-PC truncation, which preserves 90% of the variance of normalized velocity. The smoothed normalized profiles are re-dimensionalized into m/s units, and viewed as points in the 40-dimensional space $\{u'(p), v'(p)\}$. The points are assigned to 10 clusters, based on Euclidean distance in this 40-space, after all winds (**or all Euclidean distances?**) at upper levels ($p < 500$ hPa) are multiplied by 1/4 to emphasize the low levels where convective organization effects of shear are thought to be strongest. Each cluster has thousands of smoothed profiles with different locations, times, and 850 hPa wind directions. To summarize these statistically, we stitch each cluster's median u' and v' at each level into a pseudo-profile of wind that can be expressed as a hodograph. For each cluster, the stitched-median hodograph and a wind rose summarizing the statistics of 850mb wind direction are displayed, along with the geographical map of frequency of occurrence, seasonal frequency of occurrence, etc. Geographical patterns are evident, and some interpretations are offered. Some sensitivity tests of the method's details are reported.

One top-level method question: Why is the "representative" hodograph for each cluster made of stitched medians of u' and v' at each level, rather than as an average of the 10 or 100 profiles nearest the cluster centroid? Are you sure the shear (the important thing) will be preserved through these screenings and normalization and summarizations of the level-wise wind components themselves?