

Review of the manuscript entitled “*Intermediate and High Resolution Numerical Simulations of the Transition of a Tropical Wave Critical Layer to a Tropical Depression*”, by M. T. Montgomery, Z. Wang and T. Dunkerton, submitted to *Atmospheric Chemistry and Physics*.

Recommendation: Accept with minor revision

General comment

This paper presents idealized calculations for the transformation of an African easterly wave into a tropical storm vortex using the WRF model. It is shown that the transformation can be interpreted in terms of the so-called “marsupial paradigm” for tropical-cyclone genesis proposed in a recent paper in ACP by the same authors. The idea is that, relative to the translating tropical wave disturbance within which the storm forms, there is a region closed circulation. This region provides a largely protected environment, allowing the air within it to steadily moisten, thereby providing conditions that are conducive to the development of sustained deep convection. Many features described in the earlier case study are confirmed or expanded upon in an idealized framework.

The paper is interesting, well written and is a natural and important extension of the earlier study. I recommend that it be accepted with minor revision. A list of minor comments that the authors may wish to consider in a revised version is given below. In particular, some attention to the figures and some of the figure captions is required.

Minor comments

Abstract and elsewhere: Many acronyms such as WRF, NOAA and NSF are not defined when they are first used. WRF is defined later, but many do not appear to be, e.g. ECMWF, TRMM, PBL, NCEP, Some of these are defined first on page 30!

P4, last paragraph, line 2: What are “symmetric lateral boundary conditions”?

P5, line below Eq. (1): You should explain that you are considering a zonal channel.

P6, 4 lines up: How can the reader recognize from Fig. 2b that the disturbance is confined below 500 mb?

P7, line 2: What criterion do the authors use for “finite amplitude”?

P8, First sentence of paragraphs 2 and 3: There is some repetition here.

P9, line 3: “cross-section”

P9, Pa2, line 2: “Hovmöller”

P10, Pa3, line 4: clarify “somewhat”.

P10, Pa3, line 7: you could probably delete “of course”, otherwise you need to insert some some commas.

P10, Pa3, line 8: Requires a comma after “fields”.

P11, Pa1, line 3: It might be better to put “generally” at the beginning of this sentence.

P11, Pa2, last sentence: Has too many “and”s.

P11, Pa3: I don’t find the description of Fig. 9a very accurate. It looks to me as if there are three (or perhaps) four VHTs forming a curved band near the centre of the domain and that these are marked by regions of positive OW. I wouldn’t necessarily describe this as a “core” which has the connotation of something roughly circular, and I find the term “moat” to be

unhelpful in this context (2nd line on P13). It looks to me as if the positive OW is confined to the VHTs, themselves, and is not really a disturbance-scale indicator as I was expecting.

P12, Pa2, line 5: Needs “the” before “order”

P12, Pa2, 3 lines up: What does the acronym “SF” mean?

P13, line 3: I would put “only” at the end of the sentence.

P13, last line: “wavelength” should be “wavelengths”.

P14, Pa2, penultimate line: I suggest inserting “in as much” after “simulation”.

P15, Pa2, line 6: I suggest “is associated also”.

P19, Pa2, line 3: Shouldn’t “correspondent” be “corresponding”?.

P20, Pa2, lines 3 and 4: “diabatically-forced”

P22, 3 lines up: I suggest “are designated also”

P23, Pa2, line 4: Spelling “convective”.

P24, Pa1, lines 6-7: I suggest “Moreover, the results ... ”.

P24, Pa2, line 9: I suggest inserting a comma after “mechanism”

P27, last line: I suggest inserting a comma after “small”

P28, 2 lines below Eq. (A9): Spelling “field”.

P28, 2 lines below Eq. (A11): I suggest placing “then” at the beginning of the sentence.

P29, Pa2, line 5: I suggest placing “therefore” at the beginning of the sentence.

P29, Pa2, line 10: I suggest “has meant also”.

P29, Pa2, line 12: I suggest “We know now”.

P29, Pa2, 4 lines up: I suggest replacing “But” by “However”.

P30, line 1: What do you mean exactly by “can’t be taken for granted”? Who would take them for granted?

P32: The Smith et al. 2009 reference needs updating.

Figures

Fig. 2 & 3: The ordinate and abscissa need labels with units.

Caption to Fig. 5: The caption should say what contour lines are plotted.

Figs. 6-19: The ordinate and abscissa need labels with units.

Fig. 11: What is UV in Fig. 11a and what are the units?

Caption to Fig. 12: What are the units?

Caption to Fig. 12: More description of the 2×2 deg box is required in the caption.

Fig. 17: I suspect that the power of 10 will be close to unreadable when the figure is printed.