

Interactive comment on “The basic mechanism behind the hurricane-free warm tropical ocean” by Z. Yuan et al.

Anonymous Referee #2

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In this manuscript the authors attempt to explain the absence of hurricanes in certain regions through an argument invoking the vertical component of the Coriolis force. In the absence of westerly flow the vertical acceleration associated with this term would be less than or equal to zero. The authors speculate that the lack of westerly wind bursts in the tropics off the Brazilian coast thus limits the generation of organized ascent and hurricane formation.

My primary concern is with Eq. 4 of the manuscript, which forms the basis for the authors' argument. It is well known (e.g., Phillips 1966, JAS) that the implementation of the traditional approximation used to derive Eq. 1 of this manuscript fails to preserve the angular momentum principle of the exact set. If one instead lets $r=a$ in the metric coefficients for the spherical geometry (and in the expression for the "earth velocity"),

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and employs this approximation in the rotational form of the momentum equations, the angular momentum principle of the exact set is preserved AND the first and fourth terms on the RHS of Eq. 1 of this manuscript DO NOT APPEAR. Thus, in this implementation of the traditional approximation (which preserves the angular momentum principle) vertical acceleration of a parcel arises from the imbalance between the perturbation buoyancy and vertical pressure gradient terms (having subtracted out the hydrostatically-balanced reference state). Of course, on large scales the perturbation field is approximately hydrostatically balanced, and vertical motion is typically deduced from the mass continuity equation.

One might call into question the traditional approximation itself in certain applications. In particular White and Bromley (1995, QJRM) cite diabatically driven synoptic-scale motions in the tropics as an example of where the "cosine Coriolis" terms might make small quantitative contributions to the momentum budget. I suggest that the authors review the aforementioned articles (and others) and develop a more well-motivated, rigorous approach to the problem at hand. At this time I cannot recommend acceptance of the manuscript.

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