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Dear Reviewer # 1:

Thank you very much for your comments on the manuscript (ms) entitled "*The basic mechanism behind the hurricane-free warm tropical ocean*" (acp-2009-742).

We are sorry for overlooking your last comment. The following is the corresponding reply.

Comment 6:"Finally, the writing and more importantly the logic is very difficult if not impossible to follow"

Reply: Before we started, we designed the following logic for the ms: let the observations speak first, then use the geophysical fluid dynamic equation (governing atmospheric behaviors) to interpret the observations, reveal the basic mechanism and reveal the leading signal useful for forecasting, finally extract the weak leading signal (revealed by the nonlinear equation) from the observations of the nonlinear atmospheric system.

Would you please do us a favour and give us some suggestions to improve the logic of the ms? Thank you very much.

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May we ask your attention to the key points in our previous replies to your comments respectively?

Comment 1:"In normal meteorological language, the authors are

suggesting that westerly wind bursts create favorable conditions for the formation of tropical cyclones in the equatorial region in both the northern and southern Hemisphere. The cyclonic shear supplied by such events has long been known to provide elevated cyclonic vorticity (above the prevailing planetary vorticity for these latitudes) necessary for the birth of such severe tropical storms in otherwise favorable environmental conditions (low vertical shear, warm SST's moist low- to mid-troposphere, etc.). We needn't look too far for illustrative examples of the importance of westerly wind bursts in tropical cyclone formation in the near equatorial region. This past month or so has provided examples in the south Pacific."

Reply: we try to draw attention to the leading signal of external-force-induced LLEWW ($u>0$) revealed by $dw/dt=2\Omega u>0$ at the Equator for the initiation of severe storms (characterized by upward acceleration $dw/dt>0$, not by the vertical motion ω in isobaric coordinates) from the resting fluid background with $w=0$.

Comment 2:"The authors use the vertical momentum equation in an unorthodox way for a rotating fluid to attempt to provide a theoretical foundation for their particular argument of embryo formation in the equatorial region. They then examine ERA observations and NOAA OLR data to support their interpretation."

Reply: The so-called residual term $2\Omega u$ at the Equator is originally involved in the primitive vertical momentum equation. The magnitude of $2\Omega u$ could be as large as that of the midlatitude Coriolis force $uf=2\Omega u\sin\varphi$ receiving a lot of attention due to its significant contribution to the horizontal momentum equation. In our opinion, neglecting $2\Omega u$ at the Equator for studying the initiation of tropical severe storms could be dangerous.

Comment 3:"Holton 1979, 1992, 2004 (and others) note that some care is required in order to justify the hydrostatic approximation for a moving fluid under rotational influences. Once the background

pressure gradient and gravity forces are subtracted from the vertical force balance there remains a perturbation vertical pressure gradient and buoyancy force defined relative to the resting background in hydrostatic balance. It is generally dangerous to invoke cause and effect arguments in a fluid without accounting for the sign and magnitude of the perturbation pressure and buoyancy forces."

Reply: In the original ms, we have tried to take into account the effect of perturbation of pressure gradient force through the negative buoyancy frequency $N^2 < 0$.

Comment 4:"In a strictly hydrostatic approximation, in which the perturbation pressure gradient and buoyancy forces are assumed to exactly cancel, THE VERTICAL VELOCITY IS NO LONGER OBTAINED FROM THE VERTICAL MOMENTUM EQUATION. Indeed, the vertical motion is then determined from the mass-continuity equation wherein the horizontal motion field is governed by the horizontal momentum equations. The authors have instead used the RESIDUAL TERMS in the vertical momentum equation to infer conditions favorable for embryo formation without a complete consideration of the horizontal momentum balances. For reasons discussed above, this is inconsistent and generally unwise. All of the subsequent arguments and interpretations in this paper are thus highly suspect."

Reply: The focus of our study is the embryo-initiating (for tropical severe storms characterized by $dw/dt > 0$) from a resting fluid background with $w = 0$. So the keyword that we focus on in the ms is "the upward acceleration" ($dw/dt > 0$) of vapour at the sea surface with $w = 0$ (not "the vertical motion" ω in the mass continuity equation $\partial\omega/\partial p = -\nabla_2 \cdot \mathbf{V}$ in isobaric coordinates), while dw/dt only shows up in the vertical momentum equation, not in the mass continuity and the horizontal momentum equations.

Comment 5:"For example, the term embryo is never defined in this paper. Does embryo refer to the pouch as defined in Dunkerton et. al. 2009, or does it refer to a tropical depression as declared by NHC, JTWE or JMA forecaster? If the former is the intended meaning, how do the authors identify the 'embryo' from the best track data for named systems?"

Reply: In our opinion, the embryo is at least characterized by cyclonic vorticity.

Sincerely,

Zhuojian Yuan

Professor