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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Intensification of tropical cyclones in the GFS model" *by* J. C. Marín et al.

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This is an interesting paper that describes circulation and moist entropy budgets of several tropical cyclones simulated by the NCEP global forecasting system (GFS). These budgets provide insight into why the model storms did or did not intensify. There was a consistency in the results, especially with regard to the roles of ventilation, surface fluxes and mass fluxes that provides confidence in the results.

The results in this paper suggest a number of follow-on studies the authors may want to pursue in the future. It would be interesting to see if the results from the five storms hold up with a larger sample. Also, none of the modeled storms appeared to undergo extra-tropical transition. I wonder how the contributions to the circulation and moist entropy budgets change for that type of case.

Ventilation in this study refers to low moist entropy air replacing higher entropy air over

a fairly large volume around the storm center (surface to tropopause over a 4 by 4 deg lat/lon area). In the original study referenced in this paper (Simpson and Riehl 1958) they were referring to dry (low entropy) air being entrained into the eyewall of tropical cyclones in environments with vertical wind shear, which occurs on much smaller scales and directly involve the convective evolution. This process is not represented very well (if at all) by the global model. The authors may want to elaborate on the difference between what they mean by ventilation and in the original Simpson and Riehl study. In future work it would be worthwhile to apply similar budgets to a regional hurricane model with resolved convection to see if the results hold up in that type of system.

Finally, the results in this paper have some implications for statistical intensity forecast models such as the Statistical Hurricane Intensity Prediction Scheme (SHIPS) that is used operationally by the National Hurricane Center. Vertical shear is used as a predictor of intensity changes, but this paper suggests that it is the combination of vertical shear and the environmental moisture profile that determine the ventilation effect. Perhaps statistical intensity models could be improved by using a ventilation-type predictor instead of just the value of the environmental vertical shear.

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Interactive Comment