

## ***Interactive comment on “On the validity of representing hurricanes as Carnot heat engine” by A. M. Makarieva et al.***

### **Anonymous Referee #3**

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I find this paper to be incoherent at best. The authors repeatedly claim that Emanuel’s hurricane theory is fundamentally wrong in very gross respects, violates the first law of thermodynamics, etc. Such strong claims need to be defended with clear arguments. However much of the argument here I cannot follow, and what I can follow is just plain wrong. This paper is not worthy of publication in any respectable journal. It is possible that the authors have some insights which would be publishable if explained more clearly but I cannot see evidence of that.

As an example the authors repeatedly claim that in Emanuel’s theory the efficiency is 1. The argument for this claims that the quantity  $\Delta Q_0=0$ , but I don’t understand the latter claim. On top of p. 17429 they say that quantity is  $T_0 \Delta S$ , and then claim it is zero without justification that I can see. They refer to section 3.4, but I don’t see the

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claim defended there. What is really needed is to step through Emanuel's arguments and show specifically where the errors (supposedly) are, rather than making another argument which is wrong and claiming that Emanuel's is the same as that without clear defense of that claim.

What section 3.4 does argue is pure fallacy, namely that Emanuel's theory somehow implies that a significant fraction of the latent heat flux should be turned into mechanical energy, dissipated, and locally radiated to space. I see no basis for that, and none is given.

The argument that there need to be "independent physical determinants of oceanic heat input" I just don't understand at all.

Finally, it is pretty hard to imagine what the hurricane is if it isn't a heat engine of some type (whether or not it holds perfectly to the Carnot model). What other plausible source of energy is there. The claim that hurricanes and tornadoes should for some reason be similar makes no sense to me. If the authors have a unified theory for hurricanes and tornadoes they should present that, rather than this scattershot and incoherent critique of Emanuel.

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Interactive comment on Atmos. Chem. Phys. Discuss., 8, 17423, 2008.

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