

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

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Astronomy has gone from Ptolemy's earth-central description of orbital motions, to Copernicus Helios system, to Kepler's relations, to Newton's gravitation...

Making a parallel to what astronomy went through centuries ago, this manuscript, today, is re-discovering that "the Sun does not orbit around the Earth..."

This manuscript revisits the framework of hurricane formation as a thermal engine and proposes an alternative, nouveau framework to explain such intense atmospheric phenomena, based on the unaccounted role of the partial pressure of the water vapor extinction during phase change from vapor to liquid water.

The authors go through a detailed sequence of steps to demonstrate that current views

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of hurricanes as carnot cycle engines are flawed, as they violate both the first and second laws of thermodynamics.

Yet, the beauty of this work is less on showing that hurricanes can not be explained by the thermal transfer of heat from the ocean surface, but rather in the proposition that the pressure deficit due to water vapor extinction is the driving force behind atmospheric disturbances such as hurricanes and tornadoes. In the authors' words: "The driving force of all hurricane processes is a rapid release, as in compressed spring, of potential energy previously accumulated in the form of saturated water vapor in the atmospheric column during a prolonged period of water vapor evaporation under the action of the absorbed solar radiation."

The question to be posed, then, is to understand why hurricanes do not develop over tropical rainforests, like the Amazon, where the supply of water vapor by the forest and its extinction in the form of tropical rain is so abundant (yet, distributed over very large areas, perhaps not generating the necessary horizontal pressure gradients characteristic of strong wind disturbances?).

On my opinion, the elegance and comprehensiveness of the manuscript, as well as the authors stunning clarity and objectivity on their replies to the anonymous reviewers concerns make this manuscript a turning point for the atmospheric sciences as we have known it since the revolutionary concepts of conservation of potential vorticity and Chaos in the 1960s.

I strongly recommend that the authors incorporate parts of their replies on the original manuscript and that its revised version is accepted for publication.

Then there will be lots of work for generations of young scientists to incorporate the consequences of this new knowledge into their minds and models.

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

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