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Atmospheric Chemistry and Physics Discussions

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

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It is surprising that Dr. Meesters (S8916) noted that the dissipative heat engine point is "subtle". In my opinion, this concept is so vividly in conflict with physics fundamentals that its discussion should take no more than a few lines. I sympathize with the authors' repeated efforts to explain what (to my mind) is the obvious. Perhaps this note could be of some further help.

In this engine work A is related to heat input Q_s as $A = \varepsilon/(1-\varepsilon)Q_s$, where $\varepsilon \leq 1$. At ε close to unity, $\varepsilon \sim 1$, a practically infinite amount of mechanical work A is performed by the engine compared to the negligibly small external heat input. Work A is practically unrelated to heat input. Another remarkable feature of this engine is that it does not receive any net flux of energy from the environment ($Q_s = Q_0$, Q_0 is energy lost by the

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engine to heat sink).

So we have an engine within which kinetic energy A continuously recirculates. Can one think of a physical analogy? A ball jumping elastically on a smooth surface continuously recirculates its kinetic energy into potential one and vice versa. If one pushes the ball slightly up as it touches the surface, the very small friction losses can be compensated by an equally small input of kinetic energy. If A is kinetic energy of the ball in the jumping cycle and Q_s is this small input of kinetic energy (equal to energy Q_0 lost by the ball to friction), one can formally write $A = \varepsilon_1 Q_s$ ($\varepsilon_1 \leq \infty$). It is especially clear in this case that work A is unrelated to external energy input Q_s and can take ANY arbitrary value depending, for example, on the force with which one initially throws the ball up. Equation $A = \varepsilon_1 Q_s$ represents therefore a formal mathematical DEFINITION of ε_1 (which is equivalent to $\varepsilon/(1-\varepsilon)$ in the dissipative engine), $\varepsilon_1 \equiv A/Q_s$. Unlike the fundamental Carnot efficiency, the value of ε_1 has no physical meaning; it does not in any way mean any *efficiency*.

Now, while the kinetic energy of the ball can be converted to potential energy and back, the dissipative heat engine was invented to recirculate between equal amounts of mechanical work and dissipated heat. THIS is physically impossible and contradicts the second law of thermodynamics and makes the engine a perpetuum mobile of the second type.

I find it remarkable that the author(s) of the criticized concept make no whatsoever effort towards admitting their errors, which should be a normal scientific procedure in the current situation.

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

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