

***Interactive comment on “Greenhouse effect dependence on atmospheric concentrations of greenhouse substances and the nature of climate stability on Earth” by V. G. Gorshkov and A. M. Makarieva***

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The authors construct a linear, analytical, radiation transfer model, in one dimension, which contains empirical coefficients that they evaluate by comparison with more exact radiation-transfer equations and a planetary heat balance. They then explore the stability of their model and conclude that the earth's climate is not stable without additional negative feedbacks to compensate for the strongly positive feedback of water vapor. They suggest that this may be accomplished by the biota.

It is hard for me to credit the usefulness of one-dimensional models that neglect clouds,

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oceans, the polar caps, and advection by the oceans and winds.

The authors assert that "According to the second law of thermodynamics, thermal energy is transported from the hotter medium to the cooler." This is not the 2nd law, as it was taught to me. Something like it is sometimes referred to as the "0th law", i.e: "Thermal heat flows down a temperature gradient." The 2nd law .. in one of its forms .. states that the intergral of  $dq/T$  over a closed cycle is greater than zero, for any real process. That is, entropy is produced. The authors' assertion that the  $\alpha(k)$  sum to unity sounds like the 1st law, [not the 2nd], but their "alfa-theorem" is not exact [or lasers wouldn't work].

The authors state that ".. the fact that the convection itself arises only due to the presence of a non-zero greenhouse effect." I don't think this is true. Convection may also arise from latent heat release and from heat-transfer from eddy-diffusive effects. This is one example, of several, where the authors not only neglect, but actually reject, any physics that their model does not accommodate.

The authors assert that water vapor and clouds are "under control" of the global biota. This seems an overstatement. Transpirational effects are certainly important, but do not dominate, except locally. Certainly, the planet would be very different without life, but in the present planet, with life, transpiration effects of the biota, though significant, are 2nd order.

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