



EGUsphere, author comment AC1
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Reply on CC1

Dimitre Karamanev

Author comment on "The effect of anthropogenic heat emissions on global warming" by
Dimitre Karamanev, EGU Sphere, <https://doi.org/10.5194/egusphere-2022-5-AC1>, 2022

Dear Dr. Rosen,

Thank you for providing your opinion on my paper. Here I would like to reply to your criticism.

"The science underlying this article is all wrong."

Reply: I don't agree.

"You cannot determine the increase in temperature of the air due to the heat released by burning fossil fuels using concepts such as the heat capacity of the air as is done on line 259. First of all, the heat released by burning fossil fuels over 100 years will disipate fairly quickly out into space during each year in the form of long-wave radiation, which the author acknowledges."

Reply: While the paper shows all the input data in numerical form, plus clear equations for the treatment of the numerical data, your comments lack any specificity such as numbers, models or references.

"Then why does he add up all the energy released over 100 years and calculate temperature changes as if the energy was all released at once (or in a short period of time)."

Reply: Both heat released to the atmosphere and long-wave radiation take place *simultaneously*. During any period of time a certain amount of sensible heat (dQ_{in} in Eq. 8) is released to the atmosphere. Both dQ_{in} and dT are based on an annual change. The only way to convert Q_{in} to radiation is by increasing the air temperature above that of the previous year *due to the heat capacity of air*. Therefore, it is impossible to avoid the effect of temperature increase due to sensible heat transfer; the big question here is by how much, and I believe my paper answers that question. In my view, so far it was not possible to determine correctly the effect of anthropogenic heat on temperature change, because no data was available on the heat emitted by human society *directly* to the atmosphere. The latter was determined in my paper. The process of temperature decrease due to the outgoing radiation by anthropogenic heat input is asymptotic, and therefore, theoretically never reaches zero over time. At the end of any given year the amount of anthropogenic heat remaining in the form of sensible heat will "overflow" to the next year. Thus, there will be an accumulation of sensible heat in the atmosphere over time. Eq. 10

is obtained by the integration of Eq. 9 (the annual data), and therefore, it does not assume all 170 years worth of energy emissions to be released at once.

"Secondly, over a long period of time the energy escapes via complex radiative transfers between the different kinds of molecules comprising the atmosphere and the surface of the earth, including CO₂, and the concept of the heat capacity of the air is only appropriate for very short term effects, before the heat can escape to space."

Reply: In the paper it is assumed that heat transfer to land and ocean is not affected by anthropogenic emissions to the atmosphere and the only loss is due to radiation to space. That is the main postulate behind Eqs. 3 and 4.

"In fact, if CO₂ were not increasing in the atmosphere due to the combustion of fossil fuels, and if only heat were released due to their combustion, there would probably be no yearly average incremental heating of the air at all, since the incremental heat would be radiated out into space very quickly, on a daily basis."

Reply: I believe I answered that point above.

"It is the incremental amount of CO₂ released into the atmosphere each year that fundamentally changes the radiation balance for a very long time, as long as the CO₂ remains in the atmosphere. Thus, it is the CO₂ which "traps" more and more radiation on a daily basis (especially at night) that causes the long term trend towards the higher average global temperature that we clearly see."

Reply: The greenhouse effect of CO₂ will actually amplify the air warming effect of anthropogenic heat emission by blocking some of its long-wave radiation to space.

"This article has no scientific basis and must be rejected."

Reply: I don't agree on the basis of the above discussion.