

**Review report of the manuscript "The effect of anthropogenic heat emissions on global warming," manuscript no. egusphere-2022-5**

This study calculates atmospheric temperature rise from 1850 to 2018 due to anthropogenic heat emissions to the atmosphere, based on a three-dimensional heat distribution approach. This study concludes that the atmosphere's temperature is half of the observed global land-sea temperature rise, and anthropogenic heat emissions significantly affect global warming.

This study raises very crucial issues but with a weak approach. The introduction section lacks a clear explanation about why this study is necessary and what are gap areas this study attempts to fill. Line 53 depicts that "there are problems in models used in the previous studies," but it does not explain the details. Line 39 says, "there is no direct proof that CO<sub>2</sub> causes global warming" however, it does not explain this statement. Line 43 mentions the latest IPCC report but cites a 2013 paper. The introduction section should be constructively revised and clearly explain the gap areas and the detailed explanation of the need for this study.

The main assumptions of the model described in lines 62-66 are very theoretical. A details explanation is required for each assumption. Line 63 "the spatial and temporal distribution of heat and CO<sub>2</sub> due to convection is similar in the atmosphere". Here do you mean latent heat or sensible heat? Sensible heat is energy that moves from one system to another, changing its temperature. The transport and distribution of CO<sub>2</sub> throughout the atmosphere are controlled by the jet stream, large weather systems, and other large-scale atmospheric circulations. A detailed explanation is required for this assumption. Also, the authors consider only CO<sub>2</sub> in their assumptions; however, black carbon is found to influence the sensible heat very differently compared to other aerosols and greenhouse gases due to its strong atmospheric absorption

There are confusing statements in lines 67-69, e.g., the "main difference"...." The similarities"..... Please re-write with a clear explanation.

Re-arrange section 3; there are un-numbered sub-sections, e.g., precision measurements and electric power plants. It is better to merge all sub-section in section 3. The pieces of

information in the sub-sections are not new and already known. Sections 3 and 4 are interrelated, so they may be merged into a single section.

Table-1 shows global primary energy use and anthropogenic heat emissions in 2018. The data is from IEA, 2020. As this is an annual snapshot, it is suggested to use a long-term climatological mean of IEA data in table-1 and subsequently revise the figure.2.

Section-6 needs to be explained in detail. Part of the heat radiated to space and atmosphere need a detailed analysis.  $0.02 \text{ W/m}^2$  was radiated into the space in 2018. It is advisable to calculate this as a mean using long-term data showing the trend of the heat radiated to the atmosphere.

Lind-338: "...nuclear, biofuels, fossil fuel power plants emit heat which has similar global warming potential...". I guess the global warming potential mentioned here is in the sense of CO<sub>2</sub>?; if yes, then the CO<sub>2</sub> emissions from these plants are different in nature; if not, what is the global warming potential of anthropogenic heat (excluding CO<sub>2</sub> here)?

The author has made a good attempt to raise an important issue; however, the entire study is more theoretical in nature rather than experimental (by models and long-term observations). Most of the pieces of information given in each section are already known. Every section reads like an introduction and review of the topic.

Abstract and Conclusions are very weak; they should be both quantitative and qualitative in nature.

The present form of the study is not suitable for publication EGU'sphere and may be rejected.