

PREPRINT

Letter: Errors in Lightfoot & Ratzer (2024), Reliable Physics Demand Revision of the IPCC Global Warming Potentials.
[doi: 10.29169/1927-5129.2024.20.05](https://doi.org/10.29169/1927-5129.2024.20.05)

Abstract: [Lightfoot & Ratzer \(2024\)](#) purports to deduce Global Warming Potentials of greenhouse gases (GHGs) from their heat content. That is a fundamental error, because the heat content of GHGs is irrelevant to the radiative processes which cause warming. I recommended retraction of the paper.

On October 28, 2024 the publisher notified me that they will not publish this letter.

Keywords: climate, greenhouse gas, global warming potential, radiative forcing, climate sensitivity

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To the editors of the Journal of Basic & Applied Sciences:

The title and abstract of Lightfoot & Ratzer (2024)¹ sound reasonable. I do not doubt that "*IPCC Global Warming Potentials... are inaccurate.*" But the rest is not correct.

Unfortunately, Lightfoot & Ratzer apparently misunderstand how so-called "greenhouse gases" (GHGs) cause warming.

At the most basic level, GHGs are colorants. They tint the atmosphere, though in the far infrared, where the Earth emits strongly, rather than in the visible part of the spectrum. That causes the air to absorb radiation which otherwise would have passed through the atmosphere and escaped to space. Absorbing that radiation warms the air. (That's very simplified.)

But Lightfoot & Ratzer did not consider those processes at all. Instead, they compared the (irrelevant) heat content of the various gases. They completely ignored the radiative effects (which are what cause warming).

That is a fundamental error.

The consequence of that error is that they calculated wildly inaccurate estimates of the warming effects of the three GHGs which they considered. For instance, their abstract says, "*the contribution of CO2 to warming at Amsterdam is 0.0083°C out of a difference of 26°C.*"

Elsewhere in the paper we learn that the "difference" they refer to is the difference in temperatures between two locations at different latitudes, which obviously has nothing to do with global warming.

The "0.0083°C" figure they reported is wrong by about two orders of magnitude!

The anthropogenic CO2 rise from about 280 ppmv (circa 1780) to 422 ppmv (now) is a 51% increase, but it yields $\log_2(422/280) = 59\%$ of the radiative forcing (warming effect) that we'd get from a full doubling of CO2. So if equilibrium climate sensitivity (ECS) is 1.5°C (a low-end estimate), and if transient climate response (TCR) is 2/3 of ECS, and if the realized fraction of warming from CO2 is about halfway between TCR & ECS ($\cong 83\%$ of ECS), that would mean CO2 has contributed 59% of 83% of ECS $\cong 0.7^\circ\text{C}$ of the estimated 1.0 to 1.3 °C of warming² seen so far. That's consistent with CO2 and associated feedbacks being responsible for about two-thirds of the observed warming trend,³ but it is 89× higher than Lightfoot & Ratzer's figure.

Unfortunately, it is not possible to correct fundamental errors in methodology by merely publishing errata, so I recommend retracting the paper.

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The author is the creator of the sealevel.info website.

Supplemental files:

Supplemental information can be found on the author's website:

[https://sealevel.info/Lightfoot and Ratzer 2024/](https://sealevel.info/Lightfoot_and_Ratzer_2024/)

Conflicts of interest

The author declares no conflicts of interest.

¹ Lightfoot, H. D., & Ratzer, G. (2024). Reliable Physics Demand Revision of the IPCC Global Warming Potentials. *Journal of Basic & Applied Sciences*, **20**, 54–58. [doi:10.29169/1927-5129.2024.20.05](https://doi.org/10.29169/1927-5129.2024.20.05)

² World Meteorological Organization (WMO) (2023). State of the global climate 2022. WMO-No. 1316, Geneva, Switzerland. <https://library.wmo.int/records/item/66214-state-of-the-global-climate-2022>

³ Kiehl, J. T., and K. E. Trenberth (1997). Earth's Annual Global Mean Energy Budget. *Bull. Amer. Meteor. Soc.*, **78**, 197–208. [doi:10.1175/1520-0477\(1997\)078<0197:EAGMEB>2.0.CO;2](https://doi.org/10.1175/1520-0477(1997)078<0197:EAGMEB>2.0.CO;2)