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To "The role of greenhouse gases in radiative equilibrium–Thermodynamic evaluation" and "Zur Physikalischen Chemie des Treibhaus-Effekts" by H. Ullmann and M. Bülow (Rebuttal)

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Abstract: We reject the opinion of the commented paper that the climate change does not depend mainly on antropogenic CO_2 and other trace gases.

Keywords: climate change; carbon dioxide; greenhouse gases; IR absorbtion; heat/radiation transmitter

Abstract: Wir weisen die Meinung in den kommentierten Arbeiten zurück, dass der Klimatwechsel nicht haupsächlich von antropogenem CO_2 und anderen Spurengasen abhängt.

Schlagwörter: Klimawechsel; Carbon Dioxid; Treibhausgase; IR Absorbtion; Wärme/Strahlung Überträger

1 The trace gases

The main error in the commented papers [1, 2] lies in the fact that differences in heat storage capacity of the various atmospheric gases are not the primary problem. The trace gases are indeed traces and they cannot store significant amounts of heat. This is correct. However, they absorb additional IR radiation at their corresponding normal mode frequencies, which would otherwise be radiated into space [3]. They are additional 'filters' for portions of the IR radiation energy. The normal modes of gaseous molecules depend on the chemical bonds and on the masses of the atoms, thus they are different for different molecules [4]. Consequently, different trace gases filter out different frequency lines. The

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main components, N_2 and O_2, do not absorb IR frequencies. The continuum of IR radiation would escape into space. The incompetent ansatz of refs.[1, 2] is not improved by repetition, compare ref. [5] and others. The situation for IR is similar to that with visible sunlight: Some of the light is scattered in the air, which is why we see a bright sky. However, the majority of the sunlight directly comes to Earth's surface, that is why we see a clear, defined solar disc.

Following additional IR absorbtion by the trace gases, the corresponding molecules usually relax their vibrational-rotational energy into impact to other gases, thereby increasing the heat of the atmosphere. A fraction of the excitation energy is re-emitted. This radiation is not mainly directed to space, however, it is directed into the atmosphere, or even back to Earth. Thus it also enforces the greenhouse effect. Emission usually takes place at higher temperatures, see for example refs.[6, 7]. There is no equality between absorbtion and emission; in the contrary case, absorbtion spectroscopy of gases would not be possible [8].

Note that the corresponding incoming IR radiation from the sun is also absorbed by trace gases and partly converted into heat, not only the more important back radiated IR from the heated Earth's surface. So these trace gases act twice, what is somewhat misleading described in the refuted papers [1, 2].

The relation of different clima gases is as follows: The first place has gaseous water with ∼70% of the IR absorption. However, there is an equilibrium; excess water in the atmosphere immediately rains back to Earth. Important are the other gases: CO_2 makes the next large proportion, and there is no return rain to Earth. A today emitted CO_2 molecule remains in the air for about 120 years. Other dangerous trace gases are Methan CH_4, Distickstoffoxid N_2O, and fluorinated synthetic gases. Note that the absorption bands of the different molecules are different, in the most cases. Corresponding precise data can be found in the IPCC report [9] and earlier reports which are cited by authors HU and MB, but misinterpreted by them.

2 Radiation Equilibrium

Paper [2] discusses the energy balances of the global Earth system. It points to the small ratio of human energy production related to the energy input of the Sun. Again, while this is true, however, it is not the main problem. More precisely, it hits the main problem: climate gases emerge under the human energy production. These gases intervent into the 'natural' radiation exchange processes. They cause the amplification of the natural greenhouse effect (see above). Under the current CO_2 concentration in the atmosphere, a main band

of CO_2 shows a saturation effect, which is discussed in refs. [1, 2]. However, for the current and for higher concentrations, there are other bands which still absorb. It means that higher man-made CO_2 concentrations still lead to a higher warming [10]. The fact is missing in refs. [1, 2].

The Earth is an open system with a current flow equilibrium, however, the man-made climate gases disrupt it to another level. This is not understood in refs. [1, 2] where the authors declaire that, in contrast, a number of questions remain unresolved and are probably not accessible experimentally.

3 CO2 Capture

Paper [2] also examines the methods of Carbon Capture and Storage (CCS) and Carbon Capture and Utilization (CCU). It is correctly cited following [11] that these methods require significantly more energy than the combustion gains of fossile coal and gas, especially since CCS or CCU cause an enormous entropy increase, see ref. [12]. We additionally remark that the 'orchestrated lies' of politics, media, and industry regarding these methods obscure the second major problem: nature's reaction to the climate change, the extinction of many species, and the loss of biodiversity. A far more important part of the work of mankind should therefor be directed to improving renatured ecosystems and organic farming.

4 Summary

We rebut the work of Helmut Ullmann and Martin Bülow [1, 2]. It contains false statements about the influence of trace gases on the antropogenic climate change, in contrast to the known climate science [13, 14, 15]. They do not accept the knowledge of about 200 years of climate science [3]. Contrary, we find in refs. [1, 2] many questionable stetements without citations.

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