

Global Warming: Carbon Footprint and Footprint of Heat

Roberto Brusa
High School Diploma

Mechanical Expert Chief Technician
Olgiate Olona, Varese, ITALY

Abstract:- The research wants to complete basic ideas in [4], with the aim to verify the Degree of Reliability of results through a deeper consciousness and use of measurable parameters related to the overheating process.

Keywords:- electricity; water state diagram; latent heat; ice pack; carbon footprint; footprint of heat.

I. INTRODUCTION

Combustion processes have two aspects, like two sides of the same coin, that are the following:

- Carbon Dioxide Emission
- Heat Emission

The results of [4] put in evidence the effects of Heat Emission that was not presents in the general speeches and discussions, available in scientific literature.

I am aware of this general situation and for this reason I would like to give evidence of the concepts used, with the only purpose to present the Scientific/Mathematic method of the overheating processes in a more comprehensive manner for a further analysis, available for everybody considerations and modifications.

For this reason, I want to proceed in a deeper analysis of both these two aspects.

II. METHOD

A. Carbon Dioxide Emission

According to the latest information contained in [10], in 2018 the energy production was 14Gtoe, with a consequent emission of carbon dioxide of about 36Gton.

I deduce that the ratio between emissions and energy corresponds to $36/14 =$ approximately 2.5.

In [1] the total carbon dioxide emission referred to 2020 has a value of 51Gton, which roughly corresponds to the following distribution:

70% Carbon Dioxide produced in combustion processes for energy production (36Gton)

30% Carbon Dioxide naturally produced by all living organisms ($51-36 = 15$ Gton)

From [8], the increase in carbon dioxide in the last 5000 years has gone from 250ppm (parts per million or 0.02%) to 400ppm (0.04%).

That is, an increase of 150ppm (0.015%), corresponding to approximately 772Gton of the total weight of the atmosphere.

The amount of energy calculated in [4], 685Gtoe, multiplied by the ratio of 2.5, provides the theoretical amount equivalent to 1712Gton.

The resulting difference between the total emission of 1712Gton, and that relating to the increase of 772Gton (150ppm), i.e., 940Gton, has been reabsorbed by the totality of terrestrial and marine ecosystems.

This until today.

For example, if we used hydrogen, considered clean and renewable energy, having only water and zero carbon dioxide emissions as a combustion residue, we would still have a production of heat for which overheating would continue to grow.

There is only one way to lower the Earth's temperature, reduce combustion as much as possible, to NEVER exceed the Earth's ability to dissipate heat into Space.

B. Heat Emission [6]

In [4], having considered the totality of the ice concentrated in the polar caps, in the presence of salt water, freezing begins at a temperature below 0°C .

Directly from [9] in the chapter on the polar ice formation process:

"It is therefore formed by freezing the ocean water which, being salty, freezes at about -1.8°C : the resulting ice is in any case tasteless, consisting of unsalted water, as during the freezing process the salts minerals remain in solution, leaving just pure water to freeze. "

At 0°C , I could not consider the Latent Heat of Liquefaction / Solidification, but I had to consider the Specific Heat of the water when calculating the quantities involved.

But terrestrial ice, or in the presence of fresh water, solidifying at 0°C , needs to consider the Latent Heat of Melting / Solidification for the definition of quantities, but I am not able to quantify, now.

The only idea I have is that of the analogy of the temperature measurement diagram with that of the water state diagram.

In fact, in the trend of the measured temperatures made available by [2] we can see a linear increase in temperature starting approximately from the postwar period (year 1950).

Before that date, the relative stability of the temperature was guaranteed precisely by the Latent Heat of Melting / Solidification.

The intersection of the two lines depicting the temperature trend indicates, starting from the year 1950, a linear increase which in my opinion represents the general turning point, valid in all conditions, ice in fresh water or salt water, in when we have entered the phase in which it becomes legitimate in all respects to use the Specific Heat i.e. 4.2kJ/kgC° in the calculation of temperature variations, having the Latent Heat i.e. 333kJ/kgC° ceased to have a further effect of stabilizing the temperature.

For this reason, I decided to recalculate the total energy starting from 1950, using the reference [3], obtaining 521Gtoe.

Of course, the energy from 1712 to 1950 equivalent to: $685-521=164\text{Gtoe}$, consider the Latent Heat.

The ratio between Specific Heat and Latent Heat is:

$$4.2\text{k} / 333\text{k} = 1/80.$$

Considering this ratio, it is like to have $164/80 = 2\text{Gtoe}$, that can be taken as valid using Specific Heat in calculation.

I have also calculated the equivalent ice mass related to Specific Heat, using the same formula in [4] obtaining 560k cubic kilometer, very near to the annual water cycle value 580k cubic kilometer: in my opinion this is another unexpected confirms of the coherence between theoretical assumption and real measurement.

In the final note in [5], relating to TES (Total Energy Supply) it is specified that those relating to the use of electricity and the related heat produced are not included in the data.

From [9] I found data relating to electricity starting from 1973, managing to calculate its value, equivalent to 66Gtoe, again starting from 1950, not from the beginning of the discovery of electricity, datable to 1890.

Adding the three values, we get: $521+2+66 = 589\text{Gtoe}$.

Since electricity is also transformed into heat, I have not subtracted from this value the data relating to the Hydraulic, Wind and Photovoltaic processes, as I had previously done.

Furthermore, considering that to these values all the heat inputs due to nuclear or other experiments, such as fusion, plasma, hydrogen etc., to atomic weapons used in the Second World War, of which we are all sadly aware, should be added, that the negative effect due to greenhouse gases is increasing, the variation of the terrestrial albedo, the fires that destroy vegetation, all factors that tend to worsen the situation, I have not considered further reductions to this

value because I am not able to quantify these variables: I therefore kept the value found by 589Gtoe.

Basically, the values reported in [4], i.e., 590Gtoe, can be considered verified, and therefore, until proven otherwise, reliable.

As a last point of reflection, I wanted to point out that the value of the ice volume of 4.32Mkm^3 reported in [4], does not yet represent the maximum.

In fact, to reach the thermodynamic equilibrium point between the atmosphere and water, it is necessary to introduce the time factor, due to what we can define as "terrestrial thermal inertia".

The value 4.32Mkm^3 considers a time factor equivalent to 2.2 years, a multiplicative factor to be applied to the quantity of Atmosphere considered.

If by hypothesis, therefore, we immediately reduce the emission of heat to zero, we could not expect improvements at least until this point of thermodynamic equilibrium is reached, and only subsequently could we expect an effective cooling.

III. CONCLUSION

I am perfectly aware of the disorientation faced with these problems, on the other hand, it would be the first time that we find ourselves looking for solutions to a vital problem of this magnitude, and we are looking, proceeding across the board and simultaneously, trying to unite instinct, scientific theory, experimentation, practical measurement and certification of results almost simultaneously, and therefore we must consider and accept errors: "today I correct yesterday's errors, tomorrow I will correct today's errors".

The method and scientific evolution have allowed us to reach these results, providing us with the appropriate theoretical and practical tools, to be able to consciously decide which path to follow.

I wanted to mention a fundamental concept indicated in [7]:

"What is measured is managed"

Intuitively, I believe that 1.8°C increase in water temperature represents the feared point of no return, as we would find ourselves in the condition in which the formation of the Polar Banks would no longer be possible, with all the negative consequences that would derive from it.

My final opinion is that the priority and urgent aspect to be considered in reducing global warming is represented from the reduction of HEAT Emission, from 14Gtoe in 2018 at least at the 1950 value, corresponding to 2.4Gtoe, approximately six times less: AS SOON AS POSSIBLE.

Up to now, 2022, we have not changed our behaviors.

Future is the result of action taken before, collectively.

Let me conclude with an aphorism from Raimon Panikkar:

"We are, all of us, the legitimate heirs of the sum total of human wisdom".

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