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Solar Radiation Imbalance Preliminary Analysis

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Abstract:- Aim of this work is to understand the new concept of Solar Radiation Imbalance unveiled in Copernicus-Ocean State Report, in order to evaluate the relationship with Anthropic Heat Emissions up to 2022.

Keywords:- *Albedo, Heat, Imbalance, Limit, Tolerance.*

I. INTRODUCTION

In September 2024, was issued the report [1], where after a recalculation of data, indicates the values of the Solar Radiation Imbalance (SRI from now on) attributed to the Green House Gas effect (GHG from now on).

This first Publication of SRI, at list for my level of knowledge, represent new fundamental data to understand the complexity of Global Warming process.

In last publications, I came to a conclusion that the Anthropic Heat Emission (AHE from now on), is the main cause of Global Warming.

These new unveiled data, make necessary to verify if the conclusions are to be considered still valid, keeping into account these new data.

II. METHOD

First of all, I tried to understand the definition of "Long-term variation of (0.58) W/m²sec for the period 1960÷1992", and the "Energy imbalance of 0.29 W/m²sec per decade" for the period 1993÷2022, in order to acquire knowledge of the scientific implication.

The Solar Radiation outside the Earth's atmosphere at a distance of 1 AU from the Sun, or Astronomical Unit (~149.6 •10⁶ km), I found to be expressed in values between (1,361W/m²sec).

If we move our observation point to the center of the Solar System, this Radiation constantly arrives every second on the Apparent Surface of Earth, expressed by the formula:($\pi \cdot r^2$).

If instead we consider our point of view on the Earth, the energy flow become (340W/m²sec), equivalent to the same Solar Radiation applied to the Spherical Surface of the Earth, expressed by the formula: ($4 \cdot \pi \cdot r^2$).

Respecting the Equality $1{,}361 \cdot (\pi \cdot r^2) = 340 \cdot (4 \cdot \pi \cdot r^2)$, I referred the values of the indicated Imbalance, to the Earth's Spherical Surface, i.e. ($4 \cdot \pi \cdot r^2$).

Considering the Earth's Mean Radius equal to 6,371km, the Earth's Spherical Surface corresponds to: $(4 \cdot \pi \cdot (6{,}371 \cdot 10^3)^2) = 510.06 \cdot 10^{12}$ m².

The Annual Exposure Time expressed in seconds is: $(60 \cdot 60' \cdot 24h \cdot 365.25d) = 31.56 \cdot 10^6$ seconds.

The product of the Earth's Spherical Surface by the Annual Exposure Time is currently a constant "K" whose numerical value corresponds to: $K = (510.06 \cdot 10^{12}) \cdot (31.56 \cdot 10^6) = 16.1 \cdot 10^{21}$ m²sec.

That is what I have Understood, and must be considered only a first attempt of the process of comprehension and awareness of the Scientific results: it is necessary to specify that is only my Interpretation of the meaning of the data.

III. RESULTS

Since in the first publication I used the unit of measurement (1Gtoe = $42 \cdot 10^{18}$ J or W), I need to stay in connection to something that is related to direct contact experience: this value, visually represent a Volume into my mind.

In the period (1960÷1992, 33 years), I have considered the long-term variation, that according to [1], become equivalent to:

(0.58• 33)/2 = 9.57 W/m²sec, that allows to calculate the relative Imbalance equivalent to:
$(16.1 \cdot 10^{21}) \cdot (9.57) = 154.1 \cdot 10^{21}$ W or J, or $(154.1 \cdot 10^{21})/(42 \cdot 10^{18}) = 3{,}669$Gtoe.

In the period (1993÷2022, three decades), always according to [1], I obtained the vale equivalent to (0.29•3) = 0.87 [W/m²sec], equivalent to (0.87• 30)/2 = 13.05 W/m²sec, that allows to calculate the relative Imbalance equivalent to:

$(16.1 \cdot 10^{21}) \cdot (13.05) = 210.1 \cdot 10^{21}$ W or J, or $(210.1 \cdot 10^{21})/(42 \cdot 10^{18}) = 5{,}002$Gtoe.

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The Total SRI from 1960÷2022 is:
(3,669+5,002) = 8,671Gtoe, or (154.1+210.1) •10^{21} = 364.2•10^{21} W or J, and are closed to data 351•10^{21}, reported in [4].

With regard to the AHE, the total amount of Heat Emission in the period 1712÷2022, can be expressed in: (685+58) = 743Gtoe, or 31.21•10^{21} [W or J] [2] [3].

IV. DISCUSSION

It is the first time that I have to keep into account of something completely unknown until know, and in the same time so Essential to be considered for a correct Interpretation of SRI reported in [1].

Difference (8,671-743) = 7,928Gtoe or 333•10^{21} W or J, should represent the influence of GHG effects, according to [1].

Comparing the two values with respect to the total (8,671Gtoe), we can obtain the percentage:
91% referred to the SRI and 9% referred to AHE.

Starting from links in the Copernicus Report [1], which refers to further publications [4], that showed a recalculation energy imbalance of: (291÷410.8) •10^{21}J or 351•10^{21}J (-/+tolerance 59.8•10^{21}J), the values of Energy embodied in the oceans represents an order of magnitude between 9÷13 times greater referred to AHE.

Considering other source of information, like 'The Climate Reality Project' presented at COP29, showing the amount of Energy embodied in the Oceans equal to 525•10^{21}J, this magnitude become 17 times greater referred to AHE.

These two big discrepancies, represent a range of 9÷17 times the amount referred to AHE.

The goal is to reach what is masterfully summarized in [5] into the concept:
"What is measured is managed".

To reach this point, I believe it is necessary to make some basic considerations.

Mainly from1960, additional aspects should be considered, other than GHG effects.

We have to consider the increase in desertification and deforestation, the total amount surfaces related to always more frequent fires, the decrease in both terrestrial and marine ice surfaces, which all together, can be interpretated in the modification of the Global Earth's Albedo effect.

The incoming Solar Radiation has been constant for Millennia and should remain stable for many Millennia to come, according to Astronomers.

In my opinion we have to reach a point of convergence where the deviation of the results can depend exclusively on the sum of the "global common reasonable tolerances" appliable to the values themselves.

I believe that the margins of tolerance in statistical consideration had been already reduced, because fundamental factors have drastically reduced the uncertainties.

One factor can be represented in the recalculation with the Official value relating to the correct interpretation of "Quadrillions British Thermal Unit": 1Quad BTU = 10^{15} BTU [3], that represents the fundamental and most important Global Keystone.

Another factor is the publication of the SRI data [1].

Looking at magnitude of tolerances present in sensible data of this publication, I tried to find out if it is possible to find a globally recognized and acceptable approach to reduce them, with the target to reduce the margin of error ed uncertainties, beyond any reasonable doubt.

That is what I have found. I started from available and measurable data like:

- Earth Aphelion (EA) = 152,097,597 km
- Earth Perihelion (EP) = 147,098,450 km
- Earth Semi-Major Axis (ESMA) = 1AU = 149,598,023 km
- Solar Radiation measured at distance 1AU = 1,361 W/m²sec.
- Spherical Surface ESMA = 281.23•10^{21} m².
- Constant Global Solar Radiation Emission = 1,361•281.23•10^{21} = 382,750•10^{21} W/sec.
- Spherical Surface EA = 290.71•10^{21} m².
- Solar Radiation EA = 382,750•10^{21} / 290.71•10^{21} = 1,316.6 W/m²sec.
- Spherical Surface EP = 271.91•10^{21} m².
- Solar Radiation EP = 382,750•10^{21} / 271.91•10^{21} = 1,407.6 W/m²sec.
- During 1 year time, Natural Solar Radiation change from 1,316.6÷1,407.6 W/m²sec, or
- 1,361 (-46.6÷ +46.6) W/m²sec, or 1,361 (-3.4% ÷ +3.4%) W/m²sec.

I think this Tolerance (-3.4% ÷ +3.4%) should be considered the limit that can be used to identify the difference existing from Hypothesis and Reality results.

In relation to the Radiation on the entire surface of the Earth, this value become equal to 340 (-11.56÷ +11.56), global tolerance = 23.12 W/m²sec.

If we calculate the overall RSI in 1960÷2022, we obtain: ((0.58• 33) + (0.29•3•30))/2=22.62 W/m²sec.

At this point it is necessary to consider the contribution due to AHE, which translated into the same Unit of

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Measurement, W/m²sec, is equivalent to: $(743 \cdot 42 \cdot 10^{18})/(16.1 \cdot 10^{21}) = 1.94$ W/m²sec.

The sum SRI+AHE: 22.62+1.94=24.56 W/m²sec, represent the

"Total Energy Imbalance" (TEI from now on), up to 2022.

Looking at these results, I think we have exceeded what can be define as the

"Natural Objective Limit of the Earth System, belonging to the Solar System",

and equivalent to: 23.12 W/m²sec, errors and omissions excepted.

By interpolation of the SRI and AHE data, at the moment beyond my calculation capabilities, it is possible to identify the moment in which this exceeding occurred.

From limited observations made on the rise in Ocean Temperatures, it should have happened between 2015÷2020, and could also explain the origin of the increase in the speed of melting of the ice, detected by the researchers.

Additional aspects are related to the question of Ocean Circulation and Sea level variation.

My starting reference point is represented by the Global situation up to 1712: there were limited global temperatures variations, because there were masses (volumes) of Terrestrial Glaciers an Ocean Glaciers, that during Millennium have reached an equilibrium point that in our today concept, we can say an "Optimum Thermoregulation Design System".

Besides there were different proportional relationships between extension of surfaces like forest and desert, and other Atmosphere parameters like GHG, that were in Harmony with a possibility of Global Life Evolution.

In this condition, the sea level was relative stable, because a fraction of total ice, was in the condition of floating ice, that from Archimede's principle when changing from solid/liquid state and vice versa, does not produce sea level modification.

To be more precise, the quantity of Ice involved in the sea level increase, is only that Above Zero Sea Level and considered attached to the ground, that taking into account the Specific Weight of Ice, should be about 5÷10% less of its global volume.

Even if we do not see the Latent Heat, we know his presence looking at temperature stability, for instance from 1712 up to 1910, and from 1940 to 1960/65, showed in the diagram of Ocean temperature variations, that can be directly associated to this phenomenon.

A very particular situation is referred to water condition, sweet and salt water: the change of state from liquid to solid, in sweet water happens at 0°C (32°F), in salt water happens at -1.8°C (28.76°F).

In the process of liquefaction instead, happens always at 0°C (32°F), because the ice is composed Only of Sweet Water: this is the main reason why is Vital to keep the Ocean Temperature variation below that limit, better at -1.5 °C (29.7°F), like was indicated in Paris Agreements.

I think that starting from 1712 and up to 1910, the amount of water volume involved in the annual cycle (580,000 km³), and liquefaction of ice, were in Harmony between them, representing the highest power of AMOC.

From 1910 on, the Floating Ice global mass, started to decrease, causing a tendency of reducing the power of AMOC.

Now that we are closed to the almost disappearing floating ice, we start to perceive the reduction of AMOC, because there is not enough floating ice to be melted directly in the sea water to maintain activate the global circulation level.

V. CONCLUSION

With the introductions of SRI impact, the heart of the problem become evident that it is represented from TEI, that starting in 1712 with AHE, represented the "spark that activated the fire": all the other aspects connected to SRI, can be reasonably connected to global modification of Albedo efficiency, not yet numerically evaluated as far as I know, where GHG represent only one of the multiple factors involved.

The results of this analysis, make me confirm the validity of the conclusions and proposed solution contained in the publication [6].

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