SETTLED OR UNSETTLED CLIMATE KNOWLEDGE

By

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"Science is the belief in the ignorance of experts"
Richard Feynman

Abstract.
The IPCC assumption, atmospheric CO_2 regulates the climate, is said to be based on "settled science". As science is a process eternally in motion, which never settles, it is likely that the spokesman only suggests: "this knowledge is reliable". Successive IPCC reports restrict this to: CO_2 adds some 33 °C to an otherwise stable average surface temperature. And more CO_2 makes it hotter.
The present article argues: that there is 131 °C scientifically unexplained in this knowledge, which makes the said assumption thorough bogus. It misses some Earthly thermodynamics.

1. Introduction.

The interaction between parallel incoming solar radiation and a medium (a mass of molecules) is threefold:

1. Transmission: a part passes, possibly after deflection, undisturbed; for example a layer of air or water.
2. Absorption: a portion is absorbed and changes the medium. For example, it becomes warmer or the energy is physically and chemically retained for a short or long period of time.
3. Reflection: a third part is reflected; for example, by clouds, water, rocks, you, and me[(1)]. After which it disappears into space, leaving the medium unchanged.

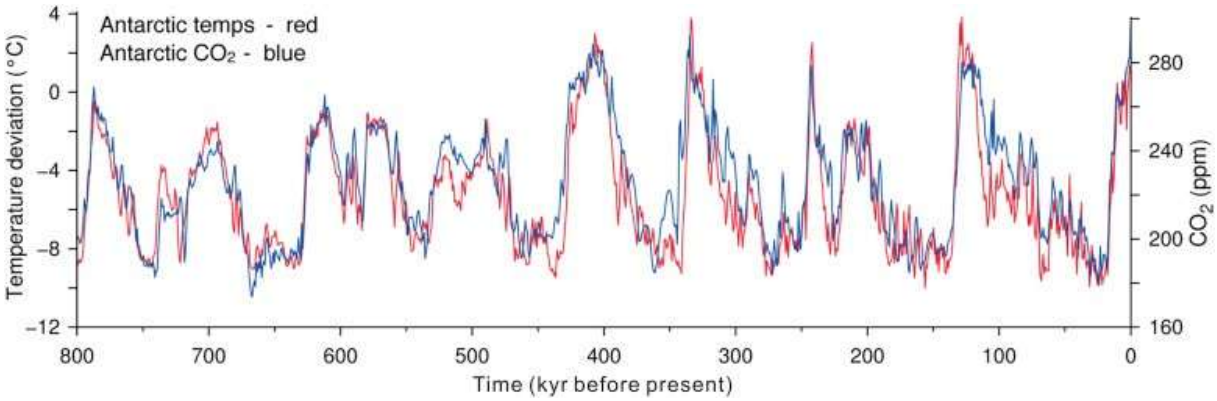
Only the absorbed energy changes the medium. In the system "medium Earth" and "radiant energy flux Sun," both are fundamentally variable. The changes are partly periodic, partly incidental, and partly long-term, i.e., more or less permanent. Moreover, the three interactions are not necessarily constant.
Besides, there is the system's Entropy. Knowledge of the energy flow through a medium is dominant to its condition and the change thereof. However, it is insufficient to inform us about its temperature; or to its temperature distribution. If we designate entropy by S and temperature by T, measured in K(elvin) than only TS = E(nergy), measured in (J)oule.
Think of a well-known experiment. In a weak winter sun, scarcely strong enough to warm your hand, the use of a small magnifying glass, through which only a pinch of the Sun's flux passes, may enable you to produce a high enough temperature to light a straw and ignite a campfire. Although the magnifying glass doesn't add any energy to your system. It just changed the entropy.
The Earth sports many entropy changing machines.

2. The Sun.

The Sun itself is not a constant source of energy for the Earth. Time-dependent processes are occurring there. The Sun-Earth distance is not constant. The flux decreases with the square of the distance.

- The Earth's orbit around the Sun is an ellipse. Outside Earth's atmosphere, an energy flux perpendicular to the Sun's direction is measured on an annual cycle. A minimum of ~1312 W/m² in July and a maximum of ~1412 W/m² in January. So, a 7% difference between summer and winter. Typically, I_z = ~1361 W/m² is used as the annual average[2].
- Besides this annual variation, the sun itself also shows a cycle of about 11 years. This is connected to the so-called sunspots. The associated difference between maximum and minimum of the radiant energy is 0.07%[3], or ~1 W/m².
- The day and night cycle resulting from the Earth's rotation means for the half of the Earth (atmosphere including solid and oceanic Earth) with a diameter of 13,400 km (12,800 km for the Earth without atmosphere) a variation in irradiance between 1361 W/m² perpendicular to the direction of the Sun. And for the half turned away from the Sun 0 W/m².
- Ice core measurements, among other things, teach us something about the effect of changes in the solar flux due to the influence of other planets on the Earth-Sun constellation over the past million years. These so-called Milankovitch cycles explain the Ice Ages with a periodicity of about 100,000 years. This is most evident in the last five, see Fig. 1. During a million years there was evidence of temperatures and atmospheric CO_2 going up and down, *where the temperature change preceded the CO_2 change on average some 700 yr,* seemingly[9] contradicting the IPCC assumption summarized in the above abstract.
- There are other variations in the sun's energy flux, as it is not a constant. For example, we know that since 1900, a component of solar magnetism has changed by some 50%. The measured changes in the Sun-Earth particle fluxes also indicate this. Their impact on the energy flux has not been experimentally determined.

Figure 1.



Ice core measurements of temperature and CO_2; period: last 800,000 years.
(According to IPCC wg.I publication.)

3. Theory of two black spheres in the Sun.

The simplest radiation-medium system, about which there is no physical uncertainty, is that of an opaque black sphere in a parallel beam of radiation. The theory for this is impeccable. To remain unchanged, it radiates as much energy to space as it receives from the Sun. A black sphere is an ideal radiation receiver and emitter. It converts 100% of the radiation into heat and is the best possible radiator. It radiates energy to space according to Stefan-Boltzmann's law:

$$I = \sigma\varepsilon\, T^4\ W/m^2$$

In which $\sigma = 5{,}6703 \times 10^{-8}\ Wm^{-2}K^{-4}$, a natural constant, result of Planck's more general radiation law. And emissivity $\varepsilon = 1$ for a black opaque body. (Which the Earth is certainly not; thus $\varepsilon_{Earth} < 1$.)

Such a sphere with radius R receives parallel solar radiation of 1361 $W/m^2 \times \pi R^2$ over a year. And in order not to change in a year, it must radiate the same amount over its surface, which is $4\pi R^2$. This sphere specification is not complete. It also should include, what the sphere does with the absorbed energy before it is radiated. An unchanging black sphere converts 100% of the radiant energy into heat energy. The shadow side receives no radiant energy and the sunny side receives $1361.\cos \phi$ W/m^2. Where ø is the angle between the sun's direction and the normal at the spherical surface.
If the sphere would be an ideal heat conductor, able to redistribute all the incoming solar energy instantaneously over it's surface, i.e. equalizing its temperature, it's overall temperature would need to be:

$$T = \langle T \rangle = (0{,}25 \times 1361/\sigma)^{0{,}25} = 278\ K \qquad (1)$$

In order to re-emit all incoming solar energy[4].

As we know that the temperature of the radiative parts of Earth certainly are not all the same, we rather should look for comparison to a theoretical black sphere, which does not distribute the incoming energy equally, but as the other extreme: not at all. Then we know that for the sphere to remain unhanged, each square meter should emit at any moment exactly the same amount of energy as it receives and absorbs from the Sun.
One singular square meter of the sphere, therefore should have a temperature T equal to:

$$T_{max} = (1361/\sigma)^{0{,}25} = 394\ K \qquad (2)$$

One half of the sphere should have a temperature:

$$T_{min} = 0\ K^{(5)} \qquad (3)$$

And at the sunnyside zones ϕ with this angle between zenith and Sun's direction should have T_ϕ:

$$T_\phi = (1361 \times \cos \phi/\sigma)^{0{,}25}\ K \qquad (4)$$

In that case too, an average temperature over the entire surface can be calculated (5), although this is of little physical meaning, except perhaps for dumb politicians, their leaders and affiliated young global predators:

$$\langle T \rangle = \{ \sum T_\phi \,.\, O_{\phi,} + 0 \} / O \qquad (5)$$

Where O is the total spherical surface area and O_ϕ is the area of the surface where the temperature is T_ϕ. Or[6]:

$$\langle T \rangle = \tfrac{1}{2} \,.\, \{I_z/\sigma\}^{0{,}25} \,.\, \int (\cos \phi)^{0{,}25}). \sin \phi.\, d\phi \qquad \text{(with } \int\text{-bounds 0 to } \pi/2) \qquad (6)$$

Or:

$$\langle T \rangle = 2/5\{I_z)/\sigma\}^{0{,}25} \qquad (7)$$

i.e.:

$$\langle T \rangle = 157\ K \qquad (8)$$

We see, therefore, that a simple system with the same irradiance, 1361 Wm^{-2}, and without its own energy transport would have a vastly different temperature pattern and a significantly different average temperature, 157 K compared to 278 K for a black sphere with ideal heat transport.

Climate researchers usually calculate with such a sphere that perfectly uniforms its temperature. They then assume I_z = ~1000 Wm^{-2}, because they subtract 361 Wm^{-2} as the supposed total average reflectance (albedo). This reasoning followed by the IPCC results in 255 K, from which greenhouse gasses make an average "Earth surface temperature" of allegedly 288 K.
The crucial question, however, remains:
What does the Earth do to enhance a black sphere's average solar temperature of 157 K to an average "surface temperature" allegedly to 288 K?
The answer to this question is nowhere to be found in present climate literature.

4. The Earth.

We also consider the Earth medium a sphere and part of the Earth-Sun system. But it is significantly more complicated than the two black spheres above. It reflects and absorbs incoming radiation and is partially semi-transparent. At the same time, it transports absorbed energy, including that in its semi-transparent parts, albeit not ideally. It uniforms the temperature only partly to some extent. Nobody knows, how much. Some absorbed energy is stored for an indefinite period like by separating Carbon and Oxygen (photosynthesis), or into potential energy by water storage in mountain lakes.

The radius of the solid and liquid Earth is R = 6400 km, and including 300 km of atmosphere, R = 6700 km. The 300 km thick, semi-transparent air layer receives 8.75% of the parallel incoming radiation energy. This energy is partly absorbed, partly reflected, and the remainder is transmitted without affecting the Earth, albeit deflected. A lunar eclipse teaches us that this portion is not negligible. It is enough, for example, to still see a red moon. Its redness is due to the absorption in Earth's air. It is less for long-wavelength light than for short-wavelength light. Even though, the air contains greenhouse gasses (!).

91.25% of solar irradiation meets the air between the sun and the solid and liquid Earth, which partly absorbs it, partly reflects it, and transmits the rest. The remainder is only reflected and absorbed by the opaque Earth. We should realize, the Sun's 1361 Wm^{-2} flux, before it reaches the Earth's ocean and solid surface, has to pass most everywhere through more than 10.000 kg of air.

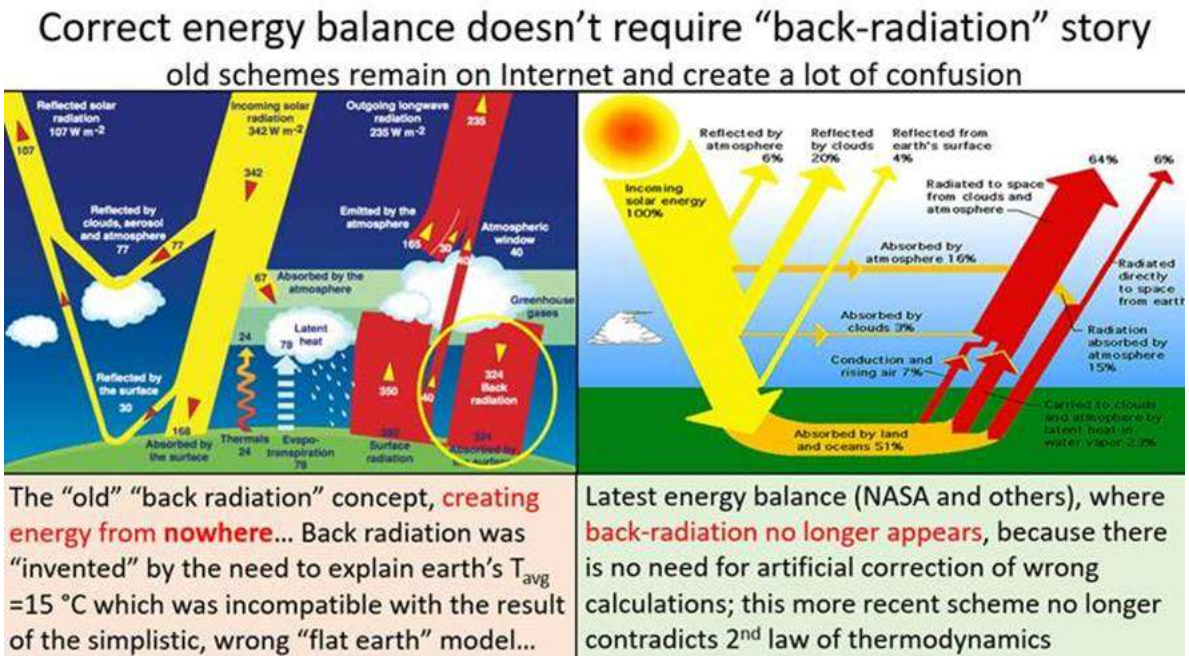
The surface of the opaque Earth doesn't just receive solar energy. The primordial Earth was incandescent, and some of that remains. The Earth's core, mantle, and crust also contain nuclear energy, which is converted into thermal energy and ultimately dissipated through the surface via conduction and material transport. There is considerable uncertainty about the strength of this flux. Textbook wisdom[(7)], for example, puts it at 0,05 to 0,12 Wm-2. I even consider 0,015% of the solar irradiance, with a rough albedo correction of 30% → 0.021% of the average solar radiation delivered to the surface, negligible. At least for understanding the weather and climate conditions in our living environment.

The figures mentioned so far are annual averages. Solar flares and major volcanic eruptions can last longer or shorter than a year. A volcanic eruption, which lasts 3,5 days and during that time gives our living environment a 10% higher total energy influx, would therefore have only generated 0.1% more energy input that year. Introduced aerosols have a longer-lasting effect. The Krakatoa eruption in 1883 caused the Earth's living environment temperature to drop by 1,2°C a year later. The associated effect of the short-lived geothermal energy burst was then more than offset. On the slopes of Etna, on some slopes of the Andes, and here and there in Yellowstone, it's too hot for our bare feet. In Iceland, houses are heated with geothermal energy without prior amplification. And under the

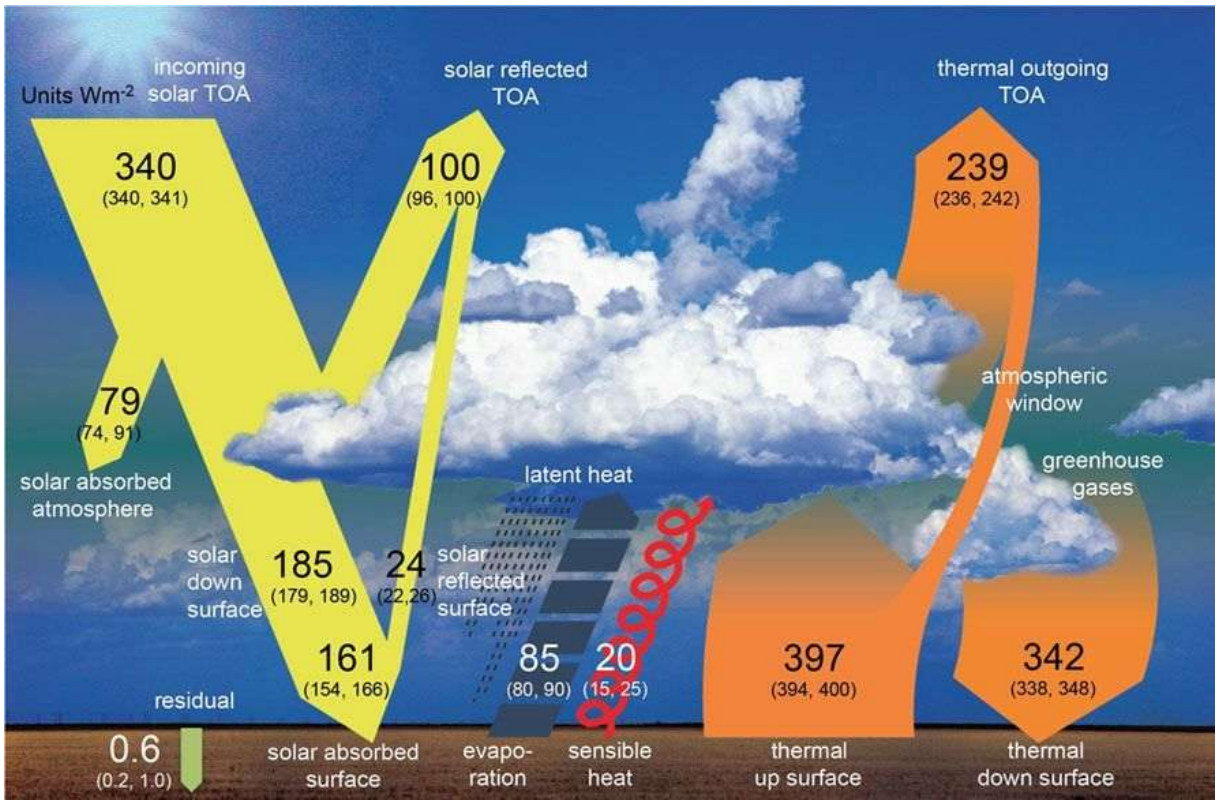
oceans, there are countless volcanoes, just as there are under Antarctica. All of this energy must be released into space via the Earth's surface.

Over the years, a great deal of knowledge about the Earth and its energy flow has been gathered through observation. However, much of this knowledge has been challenged and later changed. Publications often conflate various observational results with those from other methods, or have been obtained by averaging samples that were not proven to be representative. Figures 2 and 3 show examples from recent decades, using Earth and satellite data. This knowledge, therefore, appears to be constantly evolving. Note that both pictures date back to the era when climate was presented as "settled science."

Figuur 2.



Figuur 3



Where conclusions were drawn about the corresponding temperatures from the aforementioned energy flows, the Stefan-Boltzman law was used, without regard to its validity conditions. And usually, the emissivity is considered to equal 1 which is only true for a black Earth. Semi-transparent media, such as air and water, radiate from inward and are highly density-dependent for gasses. The law only applies to radiation from opaque surfaces into empty space and, as we saw with the black spheres, is unusable when using averaged values as input data. The Sun does not supply energy smeared out over the Eath's surface as both figures depict. The Earth is a sphere and its irradiation varies from 0 to 1361 Wm^{-2}. It isn't 0,25 * 1361 Wm^{-2} everywhere!
In order to circumvent the inapplicability of the Stefan-Boltzmann law, backward radiation was invented to suggest the validity of SB-results. Its results could not be measured, or calculated from first principles, but were chosen to fit as desired with observed temperatures. After the removal of the backradiation there still remained the fact that the Sun delivers its energy far from uniform and time dependent. The pictures still ignore this and calculations are based on a globe receiving a uniform energy supply allover equal to $0{,}25I_z$.
The mechanism of how the Earth redistributes the solar energy remains terra incognita. There are only vague notions of energy storage and rotation and polar and lateral transports.
In short faulty physics used on dubious data.

5. Transmission.

Transmission and reflection determine how much of the 1361 Wm^2 of I_z reaches the ground and the oceans. This energy must first pass through >10.000 kg of air. This is a soup of all sorts of different molecules, aerosols, water droplets, and other floating debris that reflects, absorbs, and allows it to pass through unhindered. Moreover, the radiation is always 0 on half the surface; and 1361 x cos ø

W/m² on the other half. Even if we knew this time- and location-dependent irradiance, we still don't know how much of it is converted into heat energy. The surface reflects part, and what the medium absorbs is only partly converted into heat and partly into chemical long term storage. The heat must be added to the yearly solar radiative influx. The second best known is the storage by separating Carbon from Oxygen (photosynthesis). It's potentially long term storage is counteracted by natural fires, the rotting of dying plants and by human use of stored chemical energy. The latter, both temporarily or indefinitely. Only what is released that year through the "burning" of stored energy must be added to the annual solar influx as heat energy.
8,75 % of the solar energy reaching the Earth, is semi transmitted, without affecting the solid and oceanic segment. Neither does the reflected part of it. Or the fraction absorbed but re-emitted to space.

6. Conclusion.

The statement "climate science is 'settled' likely means: *our knowledge of the influence of atmospheric CO_2 on the temperature in our living environment is reliable enough to base policy on.* Something like: Newton's mechanics is reliable for machine builders and billiard players, for example. While we know that this knowledge has long been falsified in absolute terms. But those mentioned can continue to use it safely and successfully.

The assumed knowledge may be summarized as: the Solar energy flux reaching the Earth is reliably known, through measurements of astronomers and satellites. The Earth may be treated as a black sphere which uniformizes the temperature and Stefan-Boltzmann tells us, the surface temperature should be 255 K. Observations by stations spread over the surface and also done by satellites show an average surface temperature of 288 K. The difference, 33 ◦C is bridged by mainly greenhouse gasses H_2O and CO_2. And from this we derive the CO_2 influence on the surface temperature. This leads to **the IPCC's policy alarm: Stop adding CO_2 to the atmosphere.**

The 288 K has been criticized. Stations are not sufficiently spread; many are disturbed by environmental circumstances like the urban heat island effect and others. But still I think it is safe to assume it is about reliable to +/- 3 °C. This throws some doubt on the precision of the relation dT/dCO_2, but not enough to call it 'thorough bogus' as I did in the abstract. There is a heated discussion in the climate literature varying between + 8 °C/2CO_2 to -3 °C/2CO_2. This is highly relevant to the policy on what to do about CO_2.

However, there is a much more serious objection. For a black sphere in space in a precisely known energy flux, we know exactly its temperature in two extreme situations. As described in § 3. A uniform temperature T = <T> = 278 K (1) or seriously varying temperatures between 0 K (3) for half its surface and $T_\phi = (1361 \times \cos \phi/\sigma)^{0,25}$ K (4) at sunny places. In the latter case the sphere's average temperature would be 157 K (8) not 255 as the 'science is settled' community poses for the Earth. This justifies to ask: What does the Earth do to modify this wild temperature variation, averaging 157 K to 288 K as our habitat's average temperature?
We know for sure that Earthly temperatures are not uniform. The surface shows temperatures ranging between – 60 and + 60 °C. Atmospheric temperatures between – 70 and + 60 °C are observed between 0 and 12 km height. Moreover all contact between Earth and universe is through air, a semi transparent medium to which the S-B law may not be applied. Earth's emissivity $\epsilon \neq 1$ and reflection changes locally and every minute. So:
WHERE IS THE SETTLED SCIENCE THAT BRIDGES THE 131 °C GAP BETWEEN AN EXACTLY KNOWN BLACK SPHERE AVERAGE TEMPERATURE AND A REASONABLE WELL KNOWN HABITAT AVERAGE TEPERATURE OF 288 K?

As long as a numerical explanation based on solid knowledge of Earthly processes is lacking, the qualification **thorough bogus** for IPCC's reliable knowledge applies. And the term "settled science" ought to be buried. The same holds for the story of greenhouse gasses doing 33 °C and the like. The 'settlers' must brake up and perform an unwholy amount of work[8] to ever be able to pronounce a valuable advice about the almost negligeable influence of CO_2 on climate among the hundreds of other insufficient known factors in the energy flow through system Earth. After sorting out, how much solar energy is absorbed by separate parts of the Earth, we know how much energy must be exported to keep the Earth unchanged. Then our former settlers can start the search about which temperatures the relevant parts must have to overcome the outgoing resistance toward the 0 K universe. Which I consider to be a mission impossible[5].

Cha-am, Thailand
2026 02 09.

Notes.

1. You and I see each other through reflection. We don't see each other radiating ourselves. We'd have to be considerably warmer than 37°C for that. An infrared camera works better than our eyes. Parallel irradiation isn't necessary to see each other. Fortunately, omnidirectional irradiation is also fine. Reflection does not affect the condition of the system.
2. Wikipedia 2025 08 27: https://nl.wikipedia.org/wiki/Zonlicht; about which, there is virtually no disagreement.
3. Wikipedia 2025 08 27: https://nl.wikipedia.org/wiki/Zonnemaximum. About this there exist some dissension, but in view of the size of it compared to 1361 W/m², this is not relevant for the present argument. Although it might be relevant for the discussion about climate change.
4. The IPCC, in order to assume the Earth's radiational equilibrium temperature to be 255 K, which greenhouse gasses enhance to 288 K as average surface temperature, does just that. Supposing that Earth's average albedo (reflection) reduces the solar irradiation about 30%.
5. The omnidirectional radiation temperature is 3 K, but the energy impact at 3 K is negligible for this article's subject.
6. The arithmetic is shown in § B of https://www.clepair.net/Appendix(KST-2).pdf . In which we used I_z =1350 W/m^2 and showed the results in table 4 for various values of albedo (α) and emissivity (ϵ). Getting for α = 0,3 and ϵ = 1: 154 K.
7. (0.05 W/m² till 0.12 W/m²) https://www.smartgeotherm.be/documents/2012/12/soa-hfdst-1.pdf/
   My own scratchbook estimate, some time ago arrived at 0,03 Wm^{-2} with an appreciable uncertainty: § A van https://www.clepair.net/Appendix(KST-2).pdf
8. Complexity, Climate, CO2 and engineers; https://www.clepair.net/complexity.html
9. Glacial and interglacial ice core data justify dCO_2/dT = 10 ppM/K. A.Huijser and C. le Pair calculated the same undisturbed rate during the period from year 1880 till the period between1960-2020. The "natural" process has been disturbed by human fossil fuel use, causing a geological sudden excess concentration. This excess has a half-life of 37 yr. https://www.clepair.net/oceaanCO2-4.html .