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Greenhouse Effect on Rocky Planets

What is the reason for the fact that the greenhouse effect on the Mars is 10 times less than on the Earth, while there is 30 times more carbon dioxide in its atmosphere?

What is the reason for the fact that on the Venus the greenhouse effect is only 15 times higher than on the Earth, while there is 160 000 times more carbon dioxide in its atmosphere?

And what is the reason of the world wide propaganda stigmatizing the carbon dioxide as the number one public enemy being responsible for all the climate changes?

What could be the main sin of the colourless, odourless, invisible, harmless carbon dioxide, against which international steps are requested?

The carbon dioxide is not harmful to plants and vegetables. Quite on the contrary! Carbon dioxide is the main nourishment for plants. If we extracted all the carbon dioxide from the air, all the plants would be destroyed, and after that, mankind and animals would be killed by starvation.

The carbon dioxide is absolutely harmless to human beings as well. If it were harmful, all the drinks contained carbon dioxide would be prohibited, like mineral water, coca-cola, beer, champagne, etc.

What kind of political and/or economical intentions are behind all that?

In our solar system there are three rocky planets having solid surface and an atmosphere causing greenhouse effect.

The table on next page shows the main data of those planets.

From that table you can easily calculate how much carbon dioxide can be found in the atmosphere per one square meter surface.

On the Earth it is approximately 6.3 kg, on the Mars 194 kg, and on the Venus 998 000 kg.

As for the greenhouse effect, at the Earth it is approximately 33 degrees, at the Mars 3 degrees, and at the Venus 483 degrees.

There is the question:

Why must we believe that the main factor in the greenhouse effect on Earth is carbon dioxide alone?

And another question:

Why must we believe, that the change of greenhouse effect alone is responsible for all the climate changes?

Main data of rocky planets with atmosphere

parameters	Earth	Mars	Venus
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input data from technical literature

Average air pressure on the surface	1.013 Bar = 101 300 Newton/m ²	0.0075 Bar = 7.500 Newton/m ²	92 Bar = 9 200 000 Newton/m ²
Gravitation	9.81 m/sec ²	3.69 m/sec ²	8.87 m/sec ²
Average distance from the Sun, in million km	149.6	227.9	108.2
Solar irradiation above atmosphere (E)	1368 Watt/m ²	549 Watt/m ²	2615 Watt/m ²
Albedo (reflexion coefficient, A)	0.30	0.15	0.65
Air density on the surface	1.293 kg/m ³	0.0145 kg/m ³	8.4 kg/m ³
Average temperature on the surface (T1)	288 Kelvin	213 Kelvin	735 Kelvin
CO ₂ content of the air (R)	0.04 %	95.6 %	96.5 %
Free water surface on the surface	71 %	none	none
Shadowing of the surface by clouds	66 %	none	no exact data

calculated data

1	Average absorption of the total surface [E*(1-A)/4]	239.4 Watt/m ²	116.7 Watt/m ²	228.8 Watt/m ²
2	Equivalent air density converted into normal terrestrial pressure and temperature (S)	1.293 kg/m ³	1.968 kg/m ³	1.973 kg/m ³
3	Total mass of air column over 1 m ² surface (M)	10 326 kg	203 kg	1 037 200 kg
4	Equivalent layer thickness of the whole atmosphere converted into normal terrestrial pressure and temperature (L=M/S)	7 986 meter	103 meter	525 700 meter
5	Equivalent layer thickness of carbon dioxide in the atmosphere converted into normal terrestrial pressure and temperature (L*R)	3.2 meter	98.5 meter	507 300 meter
6	Wavelength of maximum thermal emission of the surface	10.06 micron	13.80 micron	3.94 micron
7	Global emission temperature of the planet (T2)	255 Kelvin	210 Kelvin	252 Kelvin
8	Wavelength of maximum global thermal emission of the planet	11.36 micron	13.54 micron	11.50 micron
9	Greenhouse effect on the planet (T1-T2)	33 Kelvin	3 Kelvin	483 Kelvin

Explanations to the table

- 1) If the diameter of the planet is D , then its effective cross-section is $D^2\pi/4$ and its surface is 4 times of the cross-section, that is $D^2\pi$
Absorbed from the solar irradiation in cross-section: $E*(1-A)$
Distributed the absorbed energy on total surface: $E*(1-A)/4$
- 2) The density of air in terrestrial normal state is proportional to the average molecular mass of the air, which is on the Earth 28.9 on the Mars 44.0 and on the Venus 44.1
- 3) The air pressure on the surface is just as high that is able to carry the weight of the atmospheric air over the surface. So the pressure is equivalent to the mass of the atmospheric air column per square meter multiplied by gravitation.
From that the mass of air column on one quadrate meter can be calculated.
- 4) The effective layer thickness is the mass of the air column divided by air density converted to terrestrial normal state.
- 5) The effective layer thickness of carbon dioxide is the total atmospheric effective layer thickness multiplied by the volume ratio of carbon dioxide in the air.
- 6) In accordance with **Wien's displacement law**, the wavelength of the maximal emission intensity of a black body is:
$$\lambda_{\max} = 2898/T \text{ [micron]}$$
where T is its temperature in Kelvin.
Therefore the wavelength of maximal surface emission can be calculated from the average surface temperature.
- 7) Planets are – on the average – in thermal balance, which means that in a whole year the absorbed energy from solar irradiation is equivalent to the emitted energy. According to the **Stefan–Boltzmann law** the emission of a black body is:
$$E = (T/100)^4 * 5.672 \text{ [Watt/m}^2\text{]}$$
where T is its temperature.
From that, if we know the E emission, we can calculate the T global emission temperature.
- 8) Just like item nr. 6, the wavelength of maximum global emission can be calculated from the global emission temperature.
- 9) The greenhouse effect is equivalent to the difference between the average surface temperature and the global emission temperature.