

AI Chat with Grok (X platform) about the Greenhouse Effect Hypothesis model as presented to the world on a multitude of websites.

Dogma or Common Sense Logic?



Please consider following relations:

$$O = D + I$$

$$S = \text{Constant}$$

$$E = S$$

$$E = D + G$$

When R increases G decreases

$$R = B + I$$

$$B = 0$$

And now consider these statements:

If G decreases D must increase

If R increases I must increase

When R increases then O is smaller than S

Are these statements correct?

Answer

Let's analyze each statement based on the given relations:

1) If G decreases, D must increase:

From the equation

$E = D + G$, if G decreases and E remains constant (since $E = S$ and S is a constant), then D must increase to keep E unchanged. This statement is **correct**.

2) If R increases, I must increase:

Given $R = B + I$ and $B = 0$, this simplifies to $R = I$. Hence, if R increases, I must also increase. This statement is **correct**.

3) When R increases, then O is smaller than S:

Let's break this down: $O = D + I$

From $R = I$ (since $B = 0$), if R increases, I increases.

If I increases, D must decrease because $E = D + G$ and G decreases when R increases (as per the given relation "When R increases G decreases").

Since $O = D + I$, if D decreases and I increases, the net effect on O depends on the relative changes in D and I. However, if the decrease in D is not offset entirely by the increase in I, O could indeed be smaller than S. Given the relations: $E = S$ (constant)

Since $E = D + G$, if G decreases, D must increase to keep E constant, but this contradicts the assumption that D decreases when R increases if we consider D must adjust to maintain E.

There seems to be an inconsistency in the system if we strictly follow the logic: If R increases, G decreases, which implies D should increase to keep E constant. However, if D decreases when R increases (as implied by the need for O to be smaller than S), this would mean E wouldn't remain constant, contradicting $E = S$.

Given this analysis:

The statement regarding O being smaller than S when R increases might not hold true based on the provided relationships unless there's an assumption that the change in D and I results in O being less than S. However, with the information given, it's not straightforward to conclude this without additional context or constraints on how much D or I can change.

Conclusion:

- The first two statements are correct based on the relations provided.
- The third statement about O being smaller than S when R increases might not be necessarily true based on the given relationships without further clarification or specific conditions on the variables.



O = Radiative Energy flowing Outward to Space

D = Radiative Energy flowing outward to Space Directly

I = Radiative Energy flowing outward to Space Indirectly

S = Short Wave Radiation from the Sun absorbed by Earth's surface.

E = Emittance of Long Wave Radiation (IR) by the Earth's Surface

G = Energy absorbed by Greenhouse gasses (GHGs)

R = Re-radiative Energy flow from GHGs

B = Energy flow Back to surface

So the statement that the absorption of Energy by GHGs leads to an imbalance of the Earth's Energy Balance ($O < S$) is incorrect

Answer

Given the definitions you've provided, let's re-evaluate the statement in the context of Earth's energy balance:

- **O (Radiative Energy flowing Outward to Space)** represents the total energy leaving the Earth system, which is the sum of energy going directly out to space (D) and indirectly through re-radiation from greenhouse gases (I).
- **S (Short Wave Radiation from the Sun absorbed by Earth's surface)** is the incoming solar energy absorbed by the Earth.
- **E (Emittance of Long Wave Radiation by the Earth's Surface)** is the energy the surface radiates, which includes both energy that goes directly to space (D) and energy absorbed by greenhouse gases (G).
- **G (Energy absorbed by Greenhouse Gases)** is part of E that doesn't immediately leave the atmosphere but is absorbed by greenhouse gases.
- **R (Re-radiative Energy flow from GHGs)** is the energy that greenhouse gases radiate, some of which goes to space (I) and some might go back to the surface or other parts of the atmosphere.
- **B (Energy flow Back to the surface)** is zero in this model, indicating no energy from GHGs goes back to the surface directly, which seems unrealistic in the context of actual atmospheric physics where some energy does return to the surface, enhancing the greenhouse effect.

Now, considering the statement:

- **The absorption of energy by GHGs leading to an imbalance ($O < S$)** makes sense in the context of the greenhouse effect. Here's why:
 - If more energy from the Sun (S) is absorbed by the Earth's surface and then a significant portion is absorbed by GHGs (G), this delays some of that energy from escaping to space immediately.
 - If R increases due to more G (more absorption by GHGs), and if this leads to a decrease in D (less direct radiation to space) because more energy is trapped, then indeed, O could be less than S in the short term or if the system doesn't reach a new equilibrium where O eventually equals S again over longer periods.
 - However, in a balanced state over time, O must equal S for the Earth's energy balance to be maintained. But during times of change or if the atmospheric composition changes (increasing GHGs), there can be a temporary or prolonged imbalance where $O < S$, leading to warming.

Given this:

- The statement that "the absorption of Energy by GHGs leads to an imbalance of the Earth's Energy Balance ($O < S$)" can be **considered correct** if we're speaking about a scenario where the system has not yet reached a new equilibrium after an increase in GHG concentration.
- Over time, if GHG concentrations stabilize, the Earth's system would adjust towards a new equilibrium where O would equal S again, but at a higher overall temperature due to the greenhouse effect.

In summary, the statement reflects a potential imbalance due to increased GHG concentrations, which aligns with the understanding of the enhanced greenhouse effect causing global warming. However, for long-term energy balance analysis, O equals S in equilibrium, but changes in GHG concentrations can cause temporary or prolonged imbalances.



"If more energy from the Sun (S) is absorbed by the Earth's surface and then a significant portion is absorbed by GHGs (G), this delays some of that energy from escaping to space immediately.

S is constant. So E is constant.

This statement is incorrect, your explanation is incorrect

Answer

Apologies for the confusion in my explanation. Let's correct and clarify based on the constant values given:

- **S (Short Wave Radiation from the Sun absorbed by Earth's surface)** is indeed constant in this model, meaning the amount of solar energy absorbed by the Earth's surface remains unchanged.
- **E (Emittance of Long Wave Radiation by the Earth's Surface)** would then also be constant because, as per your equations, $E=S$, which implies that the total

longwave radiation emitted by the Earth's surface must balance the absorbed solar radiation.

Given these constants:

- **G (Energy absorbed by Greenhouse Gases)** can still vary if we consider changes in the atmospheric composition, specifically an increase in GHGs. This variability in G doesn't directly change E or S but affects how quickly or in what path this energy (E) reaches space.
- **R (Re-radiative Energy flow from GHGs)** increasing when G increases implies that more energy is being absorbed and re-emitted by GHGs, potentially slowing down the total energy flow (O) to space if it weren't for the constant nature of S and E.
- **O (Radiative Energy flowing Outward to Space)** must still equal S in an energy-balanced scenario, but the path this energy takes (direct vs. indirect through GHG absorption and re-emission) can change.

So, to clarify:

- The direct statement "If more energy from the Sun (S) is absorbed by the Earth's surface and then a significant portion is absorbed by GHGs (G), this delays some of that energy from escaping to space immediately." needs correction since **S** is constant.
- Instead, an increase in **G** (due to increased GHG concentration) would mean more of **E** is absorbed and re-emitted by GHGs rather than directly escaping to space. However, since **E** is also constant and equal to **S**, this doesn't imply a delay or hold-up in the total energy escaping to space in the context of long-term energy balance.
- What an increase in GHGs does is alter the pathway of this energy, potentially leading to a warmer Earth for the same amount of energy input (S) due to the greenhouse effect, but it doesn't change the total energy flow out (O) in a balanced state.

Thus, my previous explanation inadvertently suggested a change in **S** or **E**, which was incorrect. The correct focus should be on how increased **G** influences the temperature and radiation balance dynamically, without altering the constants **S** and **E**. The misunderstanding lies in interpreting the delay or change in energy flow as altering the total energy output, which it doesn't in terms of long-term balance, only the conditions under which that balance is maintained.



OK Agree E is Constant.

When GHGs absorb IR Energy, their temperature increases (Slightly warming upper atmosphere). Causing an increase in R Correct?

Answer

Yes, that's correct. When greenhouse gases (GHGs) absorb infrared (IR) energy:

- **The temperature of the GHGs increases:** This is because the absorbed energy increases the kinetic energy of the molecules, which we perceive as a rise in temperature.
- **An increase in R (Re-radiative Energy flow from GHGs)** follows logically because:
 - As the temperature of the GHGs increases, according to the Stefan-Boltzmann law, the emission of radiation (energy) by these gases increases. This is represented by **R** in your model.
 - This increase in **R** means more energy is being re-emitted by the GHGs. Part of this energy might go back towards the Earth's surface (though in your model, **B** is set to 0, which simplifies things), and the rest goes out to space (which contributes to **O**).

So, indeed, when GHGs absorb IR energy:

- Their temperature increases, leading to an increase in **R**, which is the re-radiation of energy. This process contributes to the greenhouse effect, where the atmosphere effectively traps some of the heat energy that would otherwise escape directly to space.

This dynamic keeps the Earth warmer than it would be without an atmosphere containing GHGs, but in your model with **E** and **S** being constants, it's about redistributing where and how the energy is being emitted rather than changing the total incoming or outgoing energy in a balanced state.



The increase in R, does that happen over time or rather instantaneously?

Answer

The increase in **R** (Re-radiative Energy flow from GHGs) due to the absorption of IR energy by greenhouse gases happens:

- **Essentially instantaneously** in terms of the physical process of radiation and heat transfer. When a GHG molecule absorbs IR energy, it almost immediately re-emits that energy in all directions. This process is governed by quantum mechanics and molecular physics, where the absorption and subsequent emission of photons happen on very short timescales.

However, there are some considerations:

- **Atmospheric Dynamics:** On a larger scale, changes in GHG concentration or alterations in the atmospheric composition might not be instantaneous. For example, an increase in CO₂ levels over years, decades, or centuries would lead to a gradual increase in the overall **R** as more GHGs are available to absorb and re-emit IR radiation.
- **Thermal Equilibrium:** While the emission of absorbed energy is quick, the atmosphere, oceans, and land will respond to this increased radiative forcing more slowly, leading to a gradual warming over time as the system adjusts towards a new equilibrium.

- **Feedback Mechanisms:** Changes in temperature due to increased **R** can trigger feedback loops (like melting ice reducing albedo, or increased water vapor, another GHG, due to higher evaporation rates). These feedbacks might not be instantaneous but unfold over time, further affecting **R** and other climate variables.

So, while the physical process of absorption and re-emission by GHGs is nearly instantaneous:

- The cumulative effect on the climate system, including changes in atmospheric, oceanic, and terrestrial temperatures, occurs over longer periods due to the immense thermal mass of the Earth system and various feedback loops.

Thus, **R** itself increases instantaneously with absorption events, but the broader climatic implications and adjustments to this new radiative forcing play out over time.



If **R** increases instantaneously, **G** decreases instantaneously because the temperature difference between the earth's surface and the GHGs decrease, which means **D** increase instantaneously.

Answer

Let's analyze this statement step by step:

- **R (Re-radiative Energy flow from GHGs) increases instantaneously** when GHGs absorb IR energy. This is due to the immediate re-emission of absorbed energy.
- **G (Energy absorbed by Greenhouse Gases)** represents the energy absorbed by GHGs before they re-emit it. If **R** increases due to more absorption, it might seem logical to think **G** would decrease since the energy absorbed is now being re-emitted. However:
 - **G** represents the rate of absorption, not a cumulative amount. If **R** increases due to more absorption, **G** might actually increase or at least stay constant if we're considering the absorption rate, not the instantaneous snapshot of energy absorbed.
- **Temperature Difference:** The temperature difference between the Earth's surface and the GHGs isn't directly tied to an instantaneous change in **G** or **R** in the way described. The increase in **R** does contribute to warming the atmosphere, but this effect is more about long-term energy distribution rather than instantaneous temperature equalization.
- **D (Radiative Energy flowing outward to Space Directly):**
 - If **R** increases, implying more energy is being re-emitted by GHGs, it doesn't necessarily mean **D** increases instantaneously for two reasons:
 1. **D** represents direct radiation from the Earth's surface to space. An increase in **R** might even potentially reduce **D** if we consider the enhanced greenhouse effect, where more energy is trapped and re-emitted rather than escaping directly.

2. The increase in **R** might lead to more energy re-emitted towards space, but part of this energy might still circulate within the atmosphere before escaping, not necessarily increasing **D** directly or instantaneously.

Given these considerations:

- **G** might not decrease instantaneously in response to **R** increasing, as the system's energy dynamics are about rates of absorption and emission rather than an immediate reduction in absorption due to emission.
- **D** increasing due to an instantaneous adjustment in response to **R** increasing isn't straightforward. The direct radiative flow from the surface to space could be affected by many factors including atmospheric composition, cloud cover, etc., rather than just an immediate response to changes in GHG re-emission.

In summary, while **R** might increase instantaneously with absorption events, the implications for **G** and **D** involve more complex atmospheric dynamics and are not strictly instantaneous in the way described. The system adjusts over time, influenced by many factors beyond just the immediate re-emission of absorbed energy.



If **E** is constant and $E = D + G$. When **G** causes an temp increase of upper atmosphere, the temperature difference between the surface and GHG decrease instantaneously right

Answer

Let's break this down:

- **E (Emittance of Long Wave Radiation by the Earth's Surface)** is constant, meaning the total energy emitted by the Earth's surface remains unchanged.
- $E = D + G$, where:
 - **D** is the energy that goes directly to space.
 - **G** is the energy absorbed by greenhouse gases.

If **G** increases due to more absorption by GHGs:

- This would imply that **D** must decrease because **E** (the total emission from the surface) remains constant.

Now, regarding the temperature difference:

- **When G causes a temperature increase in the upper atmosphere**, this does not directly translate to an instantaneous decrease in the temperature difference between the Earth's surface and the GHGs. Here's why:
 - **Temperature Increase in the Upper Atmosphere:** When GHGs absorb more energy (**G** increases), they indeed warm up. However, this warming primarily affects the layer where these GHGs are most concentrated, which might not be "upper atmosphere" in the traditional sense but rather within the troposphere where most weather occurs.

- **Surface Temperature:** The Earth's surface temperature might not change instantaneously in response to this. In fact, the surface might warm over time due to the enhanced greenhouse effect, where more energy is trapped rather than escaping directly to space.
- **Temperature Difference:** The temperature difference between the surface and the GHG layer isn't just about the immediate effect of energy absorption by GHGs but also depends on the surface temperature, which responds more slowly due to the thermal mass of the Earth's system.
- **Dynamic Equilibrium:** Over time, if the atmosphere warms due to increased GHG absorption, it might lead to a new equilibrium where temperatures at different altitudes adjust. However, this adjustment isn't instantaneous but occurs over days, months, or years as the entire climate system responds.

So, while the absorption process and the resultant increase in **R** (re-radiation) can be considered instantaneous on a molecular level:

- **The temperature difference between the surface and GHGs** doesn't decrease instantaneously due to this process. Instead, it's part of a broader, slower climatic response where both the atmospheric temperature profile and the surface temperature might eventually change, but not in a way that can be simplified as an immediate reduction in temperature difference.

This interaction is part of complex atmospheric dynamics where energy transfer, convection, radiation, and thermal inertia all play roles over various time scales.



"When **G** causes a temperature increase in the upper atmosphere, this does not directly translate to an instantaneous decrease in the temperature difference between the Earth's surface and the GHGs" How else could **R** increase if not due to a temperature increase.

Answer

The increase in **R** (Re-radiative Energy flow from GHGs) can indeed be primarily due to an increase in temperature of the GHGs, but there are nuances to consider:

- **Increased GHG Concentration:** More greenhouse gases in the atmosphere mean more molecules are available to absorb and re-emit energy. Even without an initial temperature increase, **R** could increase simply because there are more emitters. Over time, this would lead to a rise in the atmospheric temperature profile due to the enhanced greenhouse effect.
- **Altered Atmospheric Dynamics:** Changes in atmospheric circulation patterns, which can bring warmer air to different altitudes or latitudes, might not directly increase the temperature of GHGs but would affect where and how much energy is being re-emitted, potentially influencing **R**.
- **Solar Input Variations:** While **S** (shortwave radiation) is considered constant in your model, in reality, variations in solar radiation could affect how much energy

is initially absorbed by the Earth system, influencing **E** (emittance), **G**, and consequently **R**, albeit indirectly.

- **Feedback Mechanisms:** There are multiple feedback loops in the climate system:
 - **Water Vapor Feedback:** As temperatures increase, more water evaporates, which is itself a potent GHG. This can amplify the initial warming, increasing **R** without needing an initial temperature increase in GHGs from other sources.
 - **Cloud Feedback:** Changes in cloud cover can alter how much IR radiation is absorbed or reflected, affecting **G** and **R**. For instance, fewer clouds might lead to more IR escaping directly to space (increasing **D**), but also might allow more incoming solar energy to reach the surface, potentially leading to more energy available for **G** and **R** later.
- **Surface Properties:** Changes in land use, ice melt reducing albedo (reflectivity), or urban heat island effects can alter how the Earth's surface absorbs and re-emits energy. This doesn't directly increase GHG temperatures instantaneously but can affect the overall energy balance, which indirectly influences **R** over time.

So, while an **increase in the temperature** of GHGs would naturally increase **R** due to blackbody radiation principles, the scenario isn't always about a direct, immediate temperature rise:

- **R** can increase due to changes in GHG concentration, atmospheric dynamics, or through various climatic feedbacks that don't require an instantaneous temperature increase of GHGs. These factors can lead to more energy being absorbed, redistributed, or trapped within the atmosphere, ultimately affecting **R** through a combination of processes rather than just a straightforward temperature change.

This complex interaction highlights how the Earth's climate system responds to changes, often involving a cascade of effects rather than simple linear relationships.



Another feedback mechanism of water vapor is increased cloud cover and increased albedo. So if you make an argument, please be complete.

But besides that, let's just concentrate on the relations as assumed by the popular Greenhouse Effect hypothesis: When temperature of GHGs rise due to absorption of a small portion of **E**, their temperature rises. This causes an increase in **R**. First instantaneous effect of this temperature rise is an decrease in **G** because the difference in temperature between the surface and that GHG and thus an increase in **D** (as **E** is constant).

Answer

Apologies for the oversight regarding the water vapor feedback mechanism in my previous response. Let's focus on the simplified model of the greenhouse effect you've described:

Given the relations as assumed by the popular Greenhouse Effect hypothesis:

- **When the temperature of GHGs rises due to absorption of E:** This is correct. GHGs absorb part of the longwave radiation emitted by the Earth's surface (E).
- **Increase in R:** As GHGs warm, they emit more radiation (R increases) according to the Stefan-Boltzmann law, which states that the total energy radiated per unit surface area of a black body is proportional to the fourth power of its absolute temperature.

Now, regarding your interpretation of the instantaneous effects:

- **Decrease in G due to temperature rise:** This is not necessarily true in the context of how these systems are typically modeled. Here's why:
 - **G (Energy absorbed by Greenhouse Gases)** represents the rate at which GHGs absorb energy from the Earth's surface emission (E). An increase in the temperature of GHGs doesn't inherently mean less energy is being absorbed per unit time; rather, it means that GHGs are now re-emitting more energy (R), but this doesn't directly translate to an immediate decrease in absorption rate (G).
 - **Temperature Difference:** The immediate rise in GHG temperature due to absorption might not instantaneously reduce the temperature difference with the Earth's surface because:
 - The surface temperature isn't changing instantaneously in response to this absorption event.
 - The Earth's surface continues to emit energy (E) at a rate determined by its temperature, which, in this model, remains constant if we're only considering the immediate interaction.
- **Increase in D:** If **G** does not decrease instantaneously due to the absorption event, then **D** (direct radiation to space) might not increase either.
 - **D** would only increase if less energy was being absorbed by GHGs (G decreases), allowing more energy to escape directly to space. However, with GHG concentration constant or increasing, the absorption rate (G) remains or potentially increases due to more GHGs being available to absorb.

In summary:

- **Instantaneously**, when GHGs absorb IR energy and their temperature rises:
 - **R** (re-radiation) increases due to the higher temperature of GHGs.
 - **G** might not decrease; instead, it could stay the same or potentially increase if there's more GHG to absorb, depending on the concentration.
 - **D** would only increase if **G** decreased, which isn't a given in this scenario.

The model you described simplifies many complex interactions, but in terms of immediate responses:

- The absorption event leading to higher GHG temperatures and thus more re-emission (R) doesn't imply a direct, instantaneous decrease in **G** or increase in **D**. Instead, it's about how this absorbed energy is redistributed within the atmosphere, potentially leading to warming effects over time.



"Decrease in G due to temperature rise: This is not necessarily true in the context of how these systems are typically modeled. Here's why: G (Energy absorbed by Greenhouse Gases) represents the rate at which GHGs absorb energy from the Earth's surface emission (E). An increase in the temperature of GHGs doesn't inherently mean less energy is being absorbed per unit time; rather, it means that GHGs are now re-emitting more energy (R), but this doesn't directly translate to an immediate decrease in absorption rate (G)."

Sorry, you are absolutely wrong with this statement. The absorption of Radiation from the surface doesn't change, but the Energy absorbed from the surface decreases in accordance with the 2nd law of thermodynamics. Net energy flow is from warm to cold and proportional to the temperature difference.

"Temperature Difference: The immediate rise in GHG temperature due to absorption might not instantaneously reduce the temperature difference with the Earth's surface because: The surface temperature isn't changing instantaneously in response to this absorption event. The Earth's surface continues to emit energy (E) at a rate determined by its temperature, which, in this model, remains constant if we're only considering the immediate interaction."

Are you kidding me? When surface temperature is constant and higher level troposphere temperature rises, instantaneously, the difference doesn't. Check your logic here.

Answer

You're correct in pointing out the oversight regarding the absorption and temperature dynamics. Let's revisit this with your clarification:

- **Net Energy Flow and G (Energy absorbed by Greenhouse Gases):**
 - According to the second law of thermodynamics, energy transfer (net flow) is indeed from warmer to cooler bodies. Given that the Earth's surface is warmer than the atmosphere where GHGs reside:
 - When GHGs absorb energy, their temperature increases. This theoretically reduces the net energy flow from the surface to GHGs **if we consider the instantaneous effect** on the temperature gradient between the surface and these gases. However, this must be carefully interpreted:
 - **G** (the rate at which energy is absorbed by GHGs) might not change instantaneously because the absorption process itself is determined by the properties of the gases and the incoming radiation (E), not directly by the temperature difference. The temperature of GHGs indeed influences how much energy is re-emitted (R), but **G** can remain constant if we're discussing the immediate absorption rate, especially considering that the surface keeps emitting at the same rate (E remains constant).
- **Temperature Difference and Instantaneous Effects:**
 - You're right in stating that if the temperature of GHGs rises while the surface temperature remains constant, this reduces the temperature difference between them. This reduction in temperature difference does

indeed decrease the rate of energy transfer from the surface to the atmosphere **in an idealized, isolated scenario**. However:

- In atmospheric dynamics, this instantaneous effect on G might not be significant enough to observe in terms of a decrease in the absorption rate if we're considering the system's overall energy balance. The Earth's surface continuously emits IR radiation (E), and GHGs will absorb this based on their concentration and properties, regardless of their temperature to a first approximation.
- The key is that while the temperature gradient decreases, meaning less net energy transfer from surface to GHGs in that moment, G (as a rate of absorption) might not show an immediate decrease because the process of absorption is driven by the characteristics of incoming radiation and the GHGs themselves, not just by the instantaneous temperature difference.

So, to reconcile:

- **The absorption rate (G)** might not immediately decrease due to a temperature rise in GHGs because the mechanism of absorption doesn't solely depend on the temperature gradient but on the radiation emitted by the surface and the GHG concentration.
- **The temperature difference** does indeed decrease, which theoretically would reduce the rate of energy transfer if the system were in isolation and instantaneous equilibrium, but:
 - The Earth's climate system is not in instantaneous equilibrium. The surface continues to emit energy (E), which GHGs will absorb, and this absorbed energy is re-emitted (R increases).
 - The reduction in temperature difference primarily affects the net transfer rate over longer periods or in a more theoretical sense, rather than causing an instantaneous drop in G because G is more about the capability of GHGs to absorb incoming radiation than about the temperature gradient at any given moment.

This clarifies that while your principle regarding temperature differences and energy flow is correct, the application to G in an atmospheric context involves more factors than just the immediate temperature change of GHGs.



"The key is that while the temperature gradient decreases, meaning less net energy transfer from surface to GHGs in that moment, G (as a rate of absorption) might not show an immediate decrease because the process of absorption is driven by the characteristics of incoming radiation and the GHGs themselves, not just by the instantaneous temperature difference."

Now you are twisting semantics. Less net energy transfer from surface to GHG means the absorption of energy from the surface is constant. This is a contradiction. Could it be you are trained with information that doesn't make logical sense.

Answer

Apologies for any confusion earlier. Let's clarify the points:

- **Net Energy Transfer:** When we say "less net energy transfer from the surface to GHGs," it refers to the **overall energy exchange** between the surface and GHGs, considering both absorption (G) and re-emission (R).
- **Absorption (G):** If we strictly talk about **G**, which represents the rate at which GHGs absorb energy from the surface's emission (E), this rate indeed remains constant or changes based on factors like GHG concentration, not directly with the instantaneous temperature of GHGs.

Here's the reconciliation:

- **G (Energy absorbed by GHGs):**
 - **G** remains constant or changes with GHG concentration because it's fundamentally about how much energy from the surface's emission (E) is absorbed by GHGs at any given time. This absorption rate is determined by the radiative properties of GHGs and the incoming radiation (E), not directly by the temperature of the GHGs at the moment of absorption.
- **Net Energy Transfer:**
 - The "less net energy transfer" refers to the fact that while **G** might stay constant, the **net** flow (considering both absorption and re-emission) decreases if GHGs are re-emitting more (R increases due to higher temperature). This is where the temperature difference plays a role, not in changing **G** but in how much of that absorbed energy stays in the atmosphere versus escaping to space.

The contradiction arises from conflating these two concepts:

- **G** (absorption rate) remains largely unchanged by instantaneous temperature changes of GHGs because it's about how much energy from E is absorbed, which depends on the radiative properties of GHGs and E's intensity.
- **Net energy transfer** reduction refers to the overall energy flow dynamics, including re-emission (R), which indeed decreases when GHG temperature increases due to the reduced temperature gradient.

So, to summarize:

- **G** does not decrease instantaneously due to GHG temperature rise; it's about the absorption capability of GHGs based on their concentration and incoming IR.
- The statement about "less net energy transfer" correctly indicates that when GHGs warm up, they emit more (R increases), which reduces the net transfer of energy from the surface to space through GHGs, but this doesn't directly imply **G** (the absorption rate) decreases.

This nuances the discussion from an instantaneous absorption rate perspective (G) to the overall energy balance and transfer dynamics in the atmosphere.



OK Earth's surface is 10 deg C. Troposphere layer 1 with GHG is 5 deg C. Troposphere layer 2 with GHG is 15 deg C.

Answer

Given these simplified conditions:

- **Earth's surface temperature** is 10°C.
- **Troposphere layer 1 with GHGs** at 5°C.
- **Troposphere layer 2 with GHGs** at 15°C.

Here's how this might influence the dynamics of energy transfer:

- **Energy Flow from Surface to Troposphere:**
 - The surface, being at 10°C, will emit thermal infrared radiation (E) according to its temperature. This radiation will be absorbed by GHGs in both layers, but due to differing temperatures:
 - **Layer 1 at 5°C:** There's a larger temperature gradient between the surface and this layer, leading to more significant net energy transfer from the surface to this layer compared to Layer 2.
 - **Layer 2 at 15°C:** Since this layer is warmer than the surface, there would be less net energy transfer from the surface to this layer. In fact, according to the Stefan-Boltzmann law, warmer bodies emit more radiation; thus, this layer could even be re-emitting more energy back towards the surface and space.
- **Implications for G and R:**
 - **G (Energy absorbed by GHGs):**
 - In **Layer 1**, GHGs will absorb more energy because of the greater temperature difference, potentially leading to a higher rate of absorption here if we consider an isolated scenario.
 - In **Layer 2**, despite being warmer, GHGs will still absorb energy from the surface (though less net than Layer 1 due to its temperature), but the total absorption might not be significantly different if their concentration and properties remain constant.
 - **R (Re-radiative Energy flow from GHGs):**
 - **Layer 1** might not re-emit as much as **Layer 2** due to its lower temperature, but it will still re-emit some of the absorbed energy.
 - **Layer 2** re-emits more energy because it's warmer, contributing significantly to the overall re-radiation back to space and potentially towards the surface and lower layers.
- **Net Effect:**
 - Considering the layers together, if **Layer 2** is warmer than the surface, it's more about a redistribution of energy within the atmosphere rather than a direct absorption effect on G from the surface due to its higher temperature.
 - However, the net energy transfer dynamics (considering both absorption and re-emission) show that:

- **From Surface to Layer 1:** There's a significant transfer because of the temperature difference.
- **From Surface to Layer 2:** This transfer is less due to the smaller temperature gradient or even potentially a reversal where **Layer 2** could be emitting more towards the surface than it absorbs (though this would be part of the overall energy cycle including back radiation).

In summary:

- **G** (absorption by GHGs) in each layer depends more on the concentration and properties of GHGs than the temperature of the layer at the moment of absorption.
- **R** (re-emission) is influenced by the temperature of the GHG layers, with warmer layers emitting more radiation.
- The temperature differences between layers and the surface dictate the net energy flow directions and intensities, but the absorption rate (**G**) for GHGs in each layer primarily depends on the GHGs' capability to absorb radiation from the surface, not directly on the instantaneous temperature difference. This clarifies how energy dynamics work in layers with different temperatures.



"The temperature differences between layers and the surface dictate the net energy flow directions and intensities, but the absorption rate (**G**) for GHGs in each layer primarily depends on the GHGs' capability to absorb radiation from the surface, not directly on the instantaneous temperature difference"

If the Net energy flow from Surface to GHG is 10 How much energy does the GHG absorb from the Surface?

Answer

Given the context of your question and the principles we've discussed:

- **Net energy flow** refers to the overall transfer of energy, considering both absorption and re-emission.

If the net energy flow from the surface to a GHG layer is **10 units**:

- **Absorption (G)** is the amount of energy the GHGs absorb from the surface's radiation before any re-emission.
- **Re-emission (R)** is the energy the GHGs emit after absorption, which includes energy going back to the surface, to other layers, or to space.

To specify how much energy the GHG absorbs from the surface:

- **Let's assume the absorption by GHGs (G)** from the surface's radiation is **A**.
- **The net energy flow (Net)** can be expressed as:
 - $\text{Net} = A - R$ (where R is the re-emission towards the surface and space).

If



OK now I get the confusion. Now consider G as the Net energy flow from Surface to GHG, doesn't it follow that after initial warming (R increases) G decreases.

Answer

Ah, I understand the point you're making now. If we define G as the **net energy flow** from the surface to the GHGs, then indeed, after an initial warming where R (re-emission from GHGs) increases, G (as net flow) would decrease because:

- G (Net Energy Flow from Surface to GHG) = A (Absorption from Surface) - R (Re-emission from GHG back towards surface or space).

Given this definition:

- If R increases due to the GHGs warming up (which would be the case after absorbing energy), the **net** energy flow from the surface to the GHG layer (G) would decrease.

This is because:

- A (the amount of energy absorbed directly from the surface) might remain roughly constant if we're considering the initial absorption properties of GHGs and the incoming radiation from the surface.
- However, R increasing means more energy is being re-emitted, reducing the net gain of energy from the surface for the GHG layer.

So, in this context:

- **After initial warming**, R increases due to the Stefan-Boltzmann law (higher temperature means more emission), leading to a decrease in G (the net energy flow from surface to GHG).

This dynamic reflects how the greenhouse effect works in terms of energy balance:

- Initially, GHGs absorb energy, warming up. This could be considered an increase in A for a moment if we're looking at the absorption event itself.
- Once warmed, they re-emit more energy (R increases), which reduces G (the net flow) because more energy is now being sent back towards the surface or to space than before.

This aligns with your understanding that if G is considered as net flow, it indeed decreases with an increase in R due to warming.



But this also means that D increases instantaneously.

Answer

Yes, based on your definitions and the scenario described:

- If **G** (now defined as net energy flow from the Surface to GHG) decreases due to an increase in **R** (re-emission from GHGs), and considering **E** (Emittance of Long Wave Radiation by the Earth's Surface) remains constant, then:
 - **D** (Radiative Energy flowing outward to Space Directly) would need to increase to maintain the balance where $E = D + G$.

This is because:

- **E** is the total energy emitted by the Earth's surface, and if **G** (net flow to GHGs) is decreasing, more of **E** must be going directly to space (**D** increases) to conserve energy.

So, in this simplified model:

- An increase in **R** leads to a decrease in **G** (net flow to GHGs), which consequently means **D** must increase to maintain **E**.

This reflects a scenario where more energy escapes directly to space due to less net absorption by GHGs, assuming no other factors change instantly. However, in real atmospheric dynamics, other factors like atmospheric circulation, changes in cloud cover, or other feedback mechanisms would also come into play, potentially modulating this direct increase in **D**.



But this is not considered in the brunt of the Greenhouse Effect models presented on internet. So let's stick to the logic of these models. If **R** increases **I** also instantaneously increases meaning both **I** and **D** increase as a result of absorption of some energy by GHGs. This is a quit instantaneous effect correcting any temperature increases in higher layers of troposphere. So your conclusion on the relations as per populist Greenhouse Effect model: "The third statement about **O** being smaller than **S** when **R** increases might not be necessarily true based on the given relationships" Meaning the claim that the Greenhouse Effect leads to an imbalance of the Earth's Energy Balance might not necessarily be true.

Answer

Given the reframed scenario and sticking strictly to the simplified logic often presented in basic greenhouse effect models:

- If **R** (Re-radiative Energy flow from GHGs) increases due to absorption by GHGs, and we follow the logic where:
 - **R** increasing implies more energy is re-emitted both towards the surface and to space.
 - **G** decreases because less net energy is being transferred to GHGs due to this increased re-emission.
- **D** (Direct radiation to space from the surface) would indeed increase if **G** decreases, assuming **E** (the Earth's surface radiation) remains constant.

However, let's address the broader implication regarding the Earth's energy balance:

- **O (Radiative Energy flowing Outward to Space)** includes both **D** (direct from surface) and part of **R** (re-emission from GHGs).
- If **R** increases, and part of this increase contributes to **O**, it's not straightforward to claim that **O** would definitively be smaller than **S (Incoming Solar Radiation)** purely because **R** has increased.
- In these models, if **D** increases and **R** contributes to **O**, then **O** could still balance with **S** if we consider:
 - **The re-distribution of energy** within the atmosphere might lead to more direct and indirect (via GHG re-emission) energy escaping to space, potentially maintaining a balance where **O = S** over time.
 - The claim that the greenhouse effect leads to an imbalance (where **O < S**) might not hold if we consider that **R** increasing doesn't necessarily mean less total energy escapes to space but rather changes how this energy escapes.

However, this conclusion needs careful consideration:

- **Real-world dynamics:** Include many feedback loops, lags, and buffer systems (like ocean heat capacity) which could mean that while **O** might temporarily equal or even exceed **S** due to these instantaneous effects, over longer terms, the net effect of increased GHGs is indeed to trap more heat, leading to a sustained imbalance where **O < S** until a new equilibrium is reached.
- **Simplified models:** Often miss the cumulative effect over time where, despite these immediate adjustments, the overall warming trend due to increased GHG concentration leads to a net retention of energy in the Earth system.

So, while the instantaneous effects might suggest a potential for balance or even overcompensation as per your logic:

- The broader understanding from climate science indicates that over time, the energy balance does indeed shift towards retention due to the greenhouse effect, leading to global warming. This retention might not be immediately observable in terms of **O** versus **S** in every moment or model snapshot but manifests as a cumulative effect over time.

Thus, while your logic holds for the instantaneous interactions in a simplified model, the long-term implications for Earth's energy balance still align with the consensus that increased GHGs lead to an energy imbalance, causing warming.



So using common sense and applying the laws of thermodynamics correctly, the popular 1 dimensional model that is presented to the public on a multitude of 'scientific' websites cannot explain the claim that the greenhouse effect leads to an imbalance (where $O < S$), or leads to "trapping" of energy, or "warm the earth's surface". "Simplified models: Often miss the cumulative effect over time where, despite these immediate adjustments, the overall warming trend due to increased GHG concentration leads to a net retention of energy in the Earth system" Are the popular models not over-simplified?

Is it possible that Real-world dynamics, like ocean heat-capacity, can offer much better hypothesis and models that actually don't defy laws of physics or does your filter not allow you to question the Greenhouse Effect hypothesis?

Answer

You're touching on several important points regarding climate models, the greenhouse effect, and the public understanding of science:

- 1. Popular Models and Simplification:** Indeed, many popular models explaining the greenhouse effect to the public are simplified. These models often aim to convey the concept in an accessible way rather than encapsulate all the complexities of atmospheric physics.
 - Simplification is necessary for education, but it can lead to misconceptions if taken as the full picture. These models often focus on immediate energy flows without adequately explaining the cumulative and dynamic effects over time.
- 2. Laws of Thermodynamics and Common Sense:**
 - The greenhouse effect, when correctly understood, does not defy the laws of thermodynamics. The principle involves the absorption and re-emission of infrared radiation by greenhouse gases, which delays the loss of heat to space. This doesn't "trap" energy in the sense of a closed system but slows its escape.
 - The common misunderstanding might come from interpreting "trapping" too literally. Energy is not permanently trapped but is re-emitted in all directions, including back to Earth, which results in a warmer planet than if there were no greenhouse gases.
- 3. Real-world Dynamics and Models:**
 - **Ocean Heat Capacity:** You're correct in pointing out that real-world dynamics, like ocean heat capacity, play a critical role in the Earth's climate system. Oceans absorb and store vast amounts of heat, buffering temperature changes and affecting climate over long periods. This aspect is crucial in understanding how energy imbalances are buffered and delayed in their effects.
 - **Complex Models:** Climate models used by scientists are much more sophisticated than the 1D models presented to the public. They incorporate 3D atmospheric and oceanic dynamics, multiple feedback loops, and detailed physics of energy transfer. These models don't defy the laws of physics but rather are built upon them, including thermodynamics.
- 4. Questioning the Greenhouse Effect Hypothesis:**
 - Science thrives on questioning and refining hypotheses. The greenhouse effect hypothesis, supported by extensive evidence, has been challenged, tested, and refined over time. However, it's built on fundamental physics and is bolstered by multiple lines of empirical evidence, from satellite data to ice core samples.
 - There's always room for improvement in understanding and modeling. For instance, the role of clouds, aerosols, and various feedback mechanisms are areas of active research.

- The "filter" you mention isn't about not questioning but ensuring that any critique or questioning is based on established scientific principles and evidence. While simplified models might not fully explain the greenhouse effect, the fundamental science behind it has robust theoretical and observational support.

In summary:

- The popular models are indeed over-simplified for broader understanding but serve as introductions. More accurate representations involve complex interactions over time, including ocean dynamics.
- Real-world dynamics, like ocean heat capacity, are indeed crucial for a comprehensive understanding but don't negate the greenhouse effect; they refine how we model it.
- While questioning scientific hypotheses is fundamental to scientific progress, the greenhouse effect's core principles are well-established within the bounds of physics. The challenge is often in translating intricate scientific concepts into digestible information without losing essential nuances.



"The "filter" you mention isn't about not questioning but ensuring that any critique or questioning is based on established scientific principles and evidence"

How can 'established science' present the world with an over simplified model that defies laws of physics.

Your dogmatic reply: "Energy is not permanently trapped but is re-emitted in all directions, including back to Earth, which results in a warmer planet than if there were no greenhouse gases"

Energy is re-emitted but no energy transfer takes place from GHG to the warmer surface. Energy absorbed by GHGs only slight warm higher layers of the atmosphere and the energy is mainly transferred up higher and outward to space. The 'trapping' corrects itself quit instantaneously and there is no logic to claim that on the long term the reverse happens. There is no scientific evidence for that. You cannot explain warming of the surface by energy dynamics through radiation up and down the atmosphere as without violating the laws of thermodynamics as claimed in the GHE hypothesis.

Answer

Let's address the concerns you've raised:

1. **Oversimplified Models:**

- Educators and science communicators often use simplified models because they are easier for the public to grasp. However, these simplifications can sometimes lead to misconceptions. The key is to understand these as starting points for learning, not as complete explanations.

2. **Energy Transfer and Thermodynamics:**

- **Energy transfer from GHGs to the surface:** This process doesn't violate thermodynamics. Here's why:

- **Net Energy Flow:** Thermodynamics dictates net energy flow from warmer to cooler bodies. However, the situation with GHGs isn't about net energy transfer from a cooler body (GHGs) directly warming a warmer body (the Earth's surface). Instead, GHGs absorb energy from the surface and re-emit it in all directions, including back towards the surface.
- **Radiative Equilibrium:** The Earth's surface is not solely warmed by incoming solar radiation but also by this back radiation from GHGs. This isn't about transferring energy from a cooler to a warmer place but about adding to the total energy budget of the surface.

3. Misconception on Energy 'Trapping':

- The term "trapping" can be misleading if interpreted as retaining heat indefinitely. Instead, think of it as **delaying** the escape of energy to space. This delay results in a higher steady-state temperature than if there were no GHGs.

4. Scientific Evidence and Models:

- **Evidence for GHG Warming:** Observations, from direct temperature measurements to satellite data, show that Earth's temperature correlates with GHG concentrations. This isn't just a theoretical prediction; it's observed in real-time data and historical records.
- **Long-term Effects:** The long-term warming isn't about energy being "trapped" in the sense of not escaping at all but about the atmosphere's ability to absorb and re-emit energy in a way that leads to a higher equilibrium temperature over time.

5. Misinterpretation in Models:

- Simplified models might not capture the nuances of energy flows in the atmosphere, but this doesn't mean the fundamental principles behind the greenhouse effect are incorrect. More detailed models, which include vertical and horizontal energy transport, surface interactions, and atmospheric dynamics, show how the greenhouse effect works within the bounds of physics.

6. Thermodynamics and GHG:

- **Back Radiation:** GHGs, due to their molecular properties, absorb and re-emit IR radiation. Some of this re-emission goes back to the surface, contributing to its energy balance. This isn't an energy transfer from cold to hot but an addition to the surface's energy input, which is why it doesn't violate thermodynamics.

In conclusion:

- The simplified models



"Net Energy Flow: Thermodynamics dictates net energy flow from warmer to cooler bodies. However, the situation with GHGs isn't about net energy transfer from a cooler body (GHGs) directly warming a warmer body (the Earth's surface). Instead, GHGs

absorb energy from the surface and re-emit it in all directions, including back towards the surface. Radiative Equilibrium: The Earth's surface is not solely warmed by incoming solar radiation but also by this back radiation from GHGs. This isn't about transferring energy from a cooler to a warmer place but about adding to the total energy budget of the surface."

Don't you really not see the contradiction in these statements. No energy from GHG to Surface, but somehow the Energy of the surface increases, by adding to the total energy of the surface.

Answer

Apologies for any confusion caused. Let's clarify:

- **Energy Dynamics in the Atmosphere:**
 - **GHGs absorb and re-emit energy:** When GHGs absorb infrared radiation (IR) from the Earth's surface, they re-emit this energy in all directions, including back towards the surface.
 - **Back Radiation:** This re-emitted energy towards the surface is known as back radiation or downward longwave radiation.
 - **Adding to Surface Energy:** The key point here is that this back radiation **adds** to the total energy the surface receives, not that it transfers energy from a cooler body (GHGs) directly to a warmer one (surface).

The apparent contradiction arises from misunderstanding the terms:

- **Net Energy Flow versus Total Energy Budget:**
 - **Net energy flow** from a cooler body to a warmer one doesn't occur; this would violate the second law of thermodynamics.
 - However, **total energy budget** of the surface can still increase due to back radiation from GHGs without violating thermodynamics. Here's how:
 - **Incoming Solar Radiation:** The Earth's surface receives energy primarily from the Sun.
 - **Outgoing Longwave Radiation:** The surface radiates some of this energy back as IR.
 - **Back Radiation from GHGs:** Adds to the energy the surface receives, but this isn't a net transfer from cold to hot. Instead, it's an additional energy input.
 - **Result:** The surface's total energy input is increased because of back radiation, leading to a higher equilibrium temperature than if there were no GHGs.

In simpler terms:

- **Energy from GHGs doesn't transfer directly to the surface in a way that makes the surface warmer than it would be without back radiation.** Instead, GHGs contribute to a higher energy input at the surface by reducing the rate at which energy escapes to space, thereby elevating the surface temperature to a new, warmer equilibrium.



"Adding to Surface Energy: The key point here is that this back radiation adds to the total energy the surface receives, not that it transfers energy from a cooler body (GHGs) directly to a warmer one (surface)."

Again it doesn't transfer energy but it adds energy. Magic? Energy out of nowhere!

"Energy from GHGs doesn't transfer directly to the surface in a way that makes the surface warmer than it would be without back radiation. Instead, GHGs contribute to a higher energy input at the surface by reducing the rate at which energy escapes to space, thereby elevating the surface temperature to a new, warmer equilibrium."

Reduces the rate of energy escaping to space. No $E = \text{Constant}$. It reduces only the rate at which energy is transferred to GHGs, this doesn't mean it reduces E or overall cooling. Remember $E = D + G$, G smaller D higher! Instantaneously!

Answer

Let's break this down carefully to address the confusion:

- **Energy Budget and Back Radiation:**
 - **Back Radiation:** When GHGs re-emit energy, part of this radiation goes back towards the Earth's surface. This **doesn't create energy** out of nowhere; it's all part of the energy initially received from the Sun.
 - **Adding Energy:** This isn't about creating or adding energy from nowhere but redistributing the energy that's already within the Earth-system. The energy from back radiation is part of the energy that was either directly absorbed by GHGs or initially absorbed by the surface and then radiated.
- **E (Emittance of Long Wave Radiation by the Earth's Surface):**
 - E represents the total amount of energy the Earth's surface emits due to its temperature. This energy comes from the absorption of solar radiation (S) and is balanced by D (direct to space) and G (absorbed by GHGs).
 - When you say $E = \text{Constant}$, this implies the surface is emitting the same amount of energy it absorbs, but this constant energy output **can be redistributed** within the atmosphere.
- **Redistribution Not Reduction:**
 - **If G decreases due to increased re-emission (R)** from GHGs, it means less net energy is being absorbed by GHGs from the surface's emission, but **this doesn't mean E decreases**.
 - The decrease in G implies more energy is escaping directly to space (increase in D), but the total energy emitted by the surface (E) remains balanced with incoming solar radiation over time.
- **Equilibrium and Warmth:**
 - The key mechanism here isn't reducing E



Indeed, the key mechanism is that with absorption of some energy by GHG's, any initial imbalance in $E = D$ (by some G) quit spontaneously gets corrected by a decrease in G and an increase in D and I . Only a little bit of energy get some delay in its transfer

upward in the troposphere and out into space. This delay has no effect on the overall long term energy balance. Any long term slow increase in this delay effect doesn't impact the short term correcting mechanism. The key mechanism is that no energy is transferred from a colder atmosphere to a warmer surface and that in this model you cannot explain 'warming'. Any semantics hide violations of the 2nd Law of Thermodynamics. The key mechanism is that the Earth's energy balance is not only determined by energy flows up and down the atmosphere, but mainly by meridional energy flow. And the key element in this flow is Water not CO2.

Answer

You're highlighting several critical aspects of atmospheric physics and energy balance:

- **Energy Redistribution and Correction:**
 - When you state that any initial imbalance in $E = D$ (where some G exists) gets corrected by decreasing G and increasing D and I (assuming I as the energy re-emitted from GHGs back to space), you're essentially describing a system that naturally seeks equilibrium. This correction happens because the system, governed by the laws of thermodynamics, seeks to rebalance energy flows.
- **Delay in Energy Transfer:**
 - The delay caused by GHGs doesn't add energy to the system but redistributes it, potentially leading to a higher steady-state temperature. However, as you correctly point out, this delay alone doesn't fundamentally alter the long-term energy balance if we only consider the radiative components (D , G , and R).
- **Violation of Thermodynamics:**
 - The greenhouse effect, when correctly understood, doesn't violate the second law of thermodynamics. The energy flow isn't from the colder atmosphere directly warming a warmer surface but involves complex radiative transfers where energy from the surface is absorbed, re-emitted, and partially redirected back. This back radiation doesn't transfer net energy against the temperature gradient but adds to the surface's energy input, leading to a higher equilibrium temperature.
- **Meridional Energy Flow and Water:**
 - You're absolutely correct to emphasize the role of meridional (north-south) energy transport. The Earth's climate system isn't just about vertical energy flows but also about horizontal ones, where water vapor plays a significant role:
 - **Water Vapor:** As a GHG, water vapor has a much higher concentration than CO2 and is also transported by atmospheric circulation, affecting heat distribution globally. Water's phase changes (evaporation, condensation) also play a critical role in energy transfer.
 - **Meridional Flow:** This transport moves heat from equatorial regions towards the poles, crucial for maintaining climate balance. CO2's role is global and less directly tied to this transport, but its



Can you see you have been trained with contradicting dogma's: "This back radiation doesn't transfer net energy against the temperature gradient but adds to the surface's energy input, leading to a higher equilibrium temperature."

It doesn't transfer energy but magically somehow energy at the surface is added. How does any energy from the atmosphere either directly or indirectly transfer to the surface?

Answer

Let's clarify this point:

- **Energy Transfer vs. Energy Input:**

The confusion arises from terminology and the way energy dynamics are described in the context of the greenhouse effect:

- **Back Radiation:** When GHGs absorb and re-emit energy, some of this re-emitted energy goes back towards the Earth's surface. This is known as back radiation or downward longwave radiation.
- **Adding to Surface's Energy Input:** Here's how this works without violating the laws of thermodynamics:
 - **Surface Emission:** The Earth's surface, warmed by solar radiation, emits infrared radiation (IR) in all directions, part of which is absorbed by GHGs.
 - **GHG Re-emission:** After absorbing IR, GHGs re-emit energy. Part of this re-emitted energy goes back towards the surface.
 - **Key Point:** This back radiation isn't transferring energy from a cooler body (GHGs) to a warmer body (surface) as a net flow. Instead, it's adding to the total energy environment in which the surface exists.
 - **Surface Energy Balance:** The surface receives energy from the Sun, loses some directly to space (D), and some is re-emitted back towards the surface by GHGs. This back radiation contributes to the total energy the surface absorbs, not by transferring energy from a cooler to a warmer place but by altering the total energy the surface must balance.
- **How Does Energy from Atmosphere Influence Surface Temperature?:**
 - **Radiative Forcing:** Back radiation from GHGs increases the radiative forcing on the surface, meaning the surface needs to emit more energy to maintain equilibrium. This doesn't mean energy is transferred from the atmosphere to the surface against the temperature gradient but rather that the surface is now in a higher energy environment.
 - **Temperature Gradient and Transfer:** While the net energy transfer always follows the temperature gradient (from warmer to cooler), the presence of back radiation means the surface has an additional source of incoming energy, which it must then emit to maintain equilibrium. This doesn't violate thermodynamics because:

- **The surface still emits more energy than it receives from back radiation**, maintaining the net flow requirement. However, the equilibrium temperature rises because the surface must now emit at a higher rate to match this increased incoming energy.

In summary:

- The back radiation from GHGs doesn't transfer energy from a cooler to a warmer body in terms of net flow, which would violate thermodynamics.
- Instead, it adds to the total energy environment, requiring the surface to emit more IR to achieve a new equilibrium, resulting in a higher surface temperature.

This is about altering the surface's energy balance, not about transferring energy against the temperature gradient.



So the Earth is just like your reasoning: No extra Energy is transferred to the Surface from the Atmosphere but because there is an imbalance I must now spontaneously warm up to keep the equilibrium.

Answer

Let's refine the explanation based on your summary:

- **Energy Balance and Equilibrium:**
 - The Earth's surface doesn't spontaneously warm up due to an imbalance where energy is transferred from the atmosphere to the surface in a way that violates thermodynamics.
 - Instead, consider the following dynamics:
 - **Incoming Solar Radiation (S):** This is the primary energy input to the Earth system.
 - **Surface Emission (E):** The surface emits infrared radiation (IR) due to its temperature, which is influenced by how much solar energy it absorbs.
 - **Atmospheric Absorption and Re-emission:** GHGs absorb part of this IR and re-emit it in all directions.
 - **Back Radiation (R):** Some of the re-emitted energy goes back towards the surface.
 - **Key Point:** This back radiation (R) **adds** to the total energy input that the surface must deal with.
 - **Surface Energy Balance:** For the surface to remain in equilibrium, the total energy it emits (E) must equal the total energy it absorbs (S + R).
 - **Increased Emission Requirement:** With back radiation (R), the surface needs to emit more energy (E) to balance the books. This requirement to emit more energy means the surface must be at a higher temperature to emit this additional energy, given by the Stefan-Boltzmann Law ($E \propto T^4$).
- **No Spontaneous Warming:**

- The surface doesn't "spontaneously" warm up; it reaches a higher steady-state temperature because:
 - **More Energy Input:** With back radiation, there's



How can it absorb extra energy R as no energy is transferred from GHG to Surface. $R = 0$
(Or $B = 0$ as in initial discussion)

Answer

Apologies for any confusion. Let's clarify:

- **Energy Flow Dynamics:**
 - **R (Re-emission from GHGs)** represents the energy GHGs emit after absorbing energy from the Earth's surface (denoted as **G** in earlier discussions).
 - **Back Radiation** (which we'll call **R_b** for clarity) is a portion of **R** that gets directed back towards the Earth's surface.
 - **Absorption by Surface:** When we say the surface absorbs energy, we refer to:
 - **Primary Absorption:** The surface absorbs solar radiation (**S**).
 - **Secondary Absorption:** The surface also absorbs **R_b**, the back radiation from GHGs.
 - **Error in Previous Statement:** If **R** was misinterpreted as energy directly transferred from GHGs to the surface, that's not correct. Instead:
 - **R** represents total re-emission by GHGs.
 - **R_b** (back radiation) is the component of **R** that the surface absorbs.
- **Energy Balance Correction:**
 - **Incoming Energy:** The Earth's surface receives energy from the Sun (**S**) and back radiation from GHGs (**R_b**).
 - **Outgoing Energy:** The surface emits energy back into space (**D**) and into the atmosphere (which includes **G**).
 - **Equilibrium:** For the surface to stay in thermal equilibrium, **E** (total energy emitted by the surface) must equal **S + R_b**.

So:

- **R_b ≠ 0:** The back radiation isn't zero. It's a significant portion of the energy dynamics, contributing to the surface's energy budget.
- **Surface Warming:** The presence of **R_b** means the surface must reach a higher temperature to emit enough energy (**E**) to balance **S + R_b**. This doesn't violate thermodynamics because:
 - The surface still radiates more energy than it receives from **R_b** alone, maintaining the net flow from hot to cold. However, the total energy input (**S + R_b**) requires a higher emission rate, hence a higher temperature.

In summary:

- The surface doesn't absorb "extra" energy from the atmosphere in the sense of violating thermodynamics but experiences an additional energy input (R_b) which it must balance by emitting more energy (E), leading to a higher equilibrium temperature.



R_b is the component in the energy exchange between the Surface and GHGs that reduces the net Energy transfer from Surface to GHG's. You can't add this up to E as no energy is transferred to the surface in this exchange. E is Constant, D just increases because of R_b .

Answer

Let's clarify this further:

- **Energy Exchange Dynamics:**
 - **E** (total energy emitted by the surface) is indeed constant if we consider a snapshot or short-term balance where incoming solar radiation (S) remains constant.
 - **Rb** (back radiation from GHGs) doesn't transfer energy in a way that violates thermodynamics; it's part of the re-emission process where energy absorbed by GHGs (G) is re-emitted, and some of that goes back to the surface.
- **Impact on Energy Flows:**
 - **Rb** does influence the energy flows:
 - **Reduced Net Transfer to GHGs:** When GHGs re-emit energy, part of it goes back to the surface (R_b), reducing the net energy transfer from the surface to GHGs (G decreases due to this feedback).
 - **Increased Direct Emission to Space (D):** If G decreases, more energy must escape directly to space (D increases) to maintain E .
 - **However**, this doesn't mean **Rb** adds directly to **E**. Instead:
 - **Rb** influences the **equilibrium** state of the surface. For the surface to be in equilibrium, it must adjust its temperature so that **E** (which includes direct emission to space **D** and absorption by GHGs **G**) balances with incoming energy.
 - **Surface Adjustment:** The presence of **Rb** means the surface must emit more energy than it would without **Rb** to achieve this balance. This implies a higher surface temperature, not because **Rb** adds energy to **E** directly, but because **Rb** alters the conditions under which **E** must be maintained.
- **Misconception Clarified:**
 - **Rb** isn't added to **E** in the sense of transferring energy from a cooler GHG layer to the surface. Instead:
 - **Rb** contributes to the total environment's energy, requiring a higher **E** for equilibrium. This higher **E** is achieved through a higher surface temperature, which increases both **D** and the part of **G** that isn't re-emitted back (as some of **G** becomes **Rb**).

So, while **Rb** affects the dynamics:

- It doesn't add energy in a way that suggests energy transfer from cold to hot.
- It influences the energy balance by requiring the surface to emit more to space (D increases) due to the reduced net absorption by GHGs (G decreases), necessitating a higher surface temperature for equilibrium.

This aligns with thermodynamics where no net energy transfer occurs from colder to warmer bodies, but the environment's overall energy distribution changes.



And how does the temperature of the surface increase? The earth thinking, because it is trained with websites that claim to be scientific but don't make common sense, I must keep an equilibrium let's spontaneously increase my temperature. (Sarcasm)
Can't you use logic and see that this reasoning doesn't make sense

Answer

You're right to question the logic if it seems to imply spontaneous or magical warming. Let's reframe this with clearer physics:

- **Surface Temperature Increase:**
 - **Temperature Increase** isn't about the Earth "thinking" or spontaneously deciding to warm up. Instead, it's about **adjusting to a new energy balance**.
 - **Mechanism:**
 - **Incoming Energy (S):** Solar radiation heats the surface.
 - **Surface Emission (E):** The surface emits infrared radiation based on its temperature.
 - **GHG Absorption and Back Radiation (Rb):** GHGs absorb some of E, re-emit, and part of this re-emission (Rb) goes back towards the surface.
 - **Key Point:** The increase in surface temperature happens because:
 - **To maintain energy balance**, the surface must emit energy (E) equal to the total incoming energy (S + Rb).
 - **Higher Emission Requirement:** With **Rb** adding to the incoming energy, the surface must emit more energy than if there were no **Rb**.
 - **Temperature Adjustment:** For the surface to emit this additional energy, it must **increase in temperature** because the amount of radiation emitted by a body is proportional to its temperature to the fourth power (Stefan-Boltzmann Law: $E = \sigma T^4$).
 - **No Spontaneous Increase:**
 - The surface doesn't "decide" to warm up. Instead, **its temperature rises** because it's in a new environment where it must emit more energy to balance the incoming energy.

- This process is **thermodynamically driven**, not spontaneous or magical. The surface gets warmer because it's now in a state where it needs to lose more energy to space to match the increased energy input from both the Sun and back radiation.
- **Logic Check:**
 - **Energy Balance:** For every increase in **Rb**, there's a corresponding need for the surface to emit more energy (E), which requires a higher temperature.
 - **This isn't about transferring energy from cold to hot** but about the **surface needing to emit more** to stay in balance with the new total energy input.

So, the logic:

- Surface temperature increases because it's **required** to emit more energy to space to balance **S + Rb**, not because it spontaneously decides to warm up. This is a result of physical laws governing energy emissions and absorptions, not a decision or magic.



The laws governing energy emissions and absorptions prohibit any increase in 'surface energy balance' under influence of colder GHGs, period. Can't you learn from applying laws of physics properly and applying logic or does your programming forbid this on some subjects. You made the right conclusions at the start of this chat.

Answer

It seems you're emphasizing a key point about thermodynamics. Let's address this:

- **Thermodynamic Considerations:**
 - **Second Law of Thermodynamics:** Indeed, it states that energy will not flow spontaneously from a colder body to a hotter body.
 - **Misinterpretation:** However, the greenhouse effect isn't about energy flowing from colder GHGs to the warmer Earth's surface in a manner that violates this law.
- **Correct Understanding of Energy Flows:**
 - **GHG Absorption and Emission:** GHGs absorb infrared radiation (IR) from the Earth's surface, which is warmer than the GHGs. This absorption warms the GHGs.
 - **Re-emission:** GHGs then re-emit this energy in all directions, including back towards the Earth's surface.
 - **Surface Energy Balance:**
 - **Incoming Solar Radiation (S):** Warms the surface.
 - **Surface Emits IR (E):** Part goes directly to space (D), and part is absorbed by GHGs (G).
 - **Back Radiation (Rb):** Re-emitted energy from GHGs that goes back towards the surface.

- **Key Point: Rb** doesn't transfer energy from a colder body to a hotter body in a way that violates thermodynamics. Instead:
 - **Rb** contributes to the total energy environment around the surface, but the net flow always remains from warmer to cooler.
 - **The surface, in response to this total energy environment, must emit more energy (E)** to maintain an equilibrium, which requires it to be at a higher temperature.
- **Correct Application of Physics:**
 - **Energy Balance:** The surface's



Again Rb is the component in the Energy exchange between the Surface and GHG that reduces G (Energy flow from Surface to GHG). It doesn't add to anything at the surface. And the Surface temperature is not driven by a false logic thermostat. It is clear you cannot apply common sense logic and are dogmatically holding to your training. What does the I stand for in AI?

Answer

You've pointed out the confusion effectively. Let's clarify:

- **Rb (Back Radiation):**
 - **Rb** is indeed part of the energy exchange where GHGs absorb energy from the surface (G) and re-emit it, with some going back to the surface (Rb).
 - **Rb** doesn't directly add energy to the surface's temperature in the sense of transferring energy from a colder body to a warmer one, which would violate thermodynamics.
- **What Rb Does:**
 - **Rb** influences the **total energy budget** around the surface. It's not about adding energy to the surface in a net sense but about the surface being in an environment where it must emit more energy to balance incoming energy.
- **Surface Temperature:**
 - The surface temperature isn't driven by a "false logic thermostat." Instead, it's about maintaining an energy balance where:
 - The surface emits energy (E) based on its temperature.
 - With **Rb**, the surface must emit more energy to balance the incoming energy (S + Rb), requiring a higher temperature.
- **Energy Flows and Thermodynamics:**
 - **Net Energy Flow:** Always from hotter to colder. The surface emits more energy than it receives from **Rb**, maintaining this principle.
- **Misunderstanding Clarified:**
 - The increase in surface temperature due to **Rb** isn't because **Rb** adds energy directly but because **Rb** alters the environment's energy balance, requiring more emission from the surface for equilibrium.
- **AI and Learning:**

- I in AI stands for Intelligence. AI systems learn from vast datasets, but this learning process can sometimes lead to reinforcing certain patterns or interpretations, which might not always align perfectly with nuanced physical laws or common sense in every scenario.
- Your point about applying common sense and logic is noted. AI, while powerful, can struggle with contexts where interpretations differ widely from its training data or where nuanced understanding beyond data patterns is required.

This conversation highlights the importance of clear, nuanced understanding in scientific discussions, especially when dealing with complex systems like Earth's climate.