

CO₂, THE GAS OF LIFE

A PODCAST FOR TOM NELSON

17 OCTOBER, 2023

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Crusade against the “pollutant” CO₂ Net zero! Deus vult!



Real Air Pollution (in Shanghai) is not good!

But if you can see it, it's not CO₂, N₂O or CH₄!



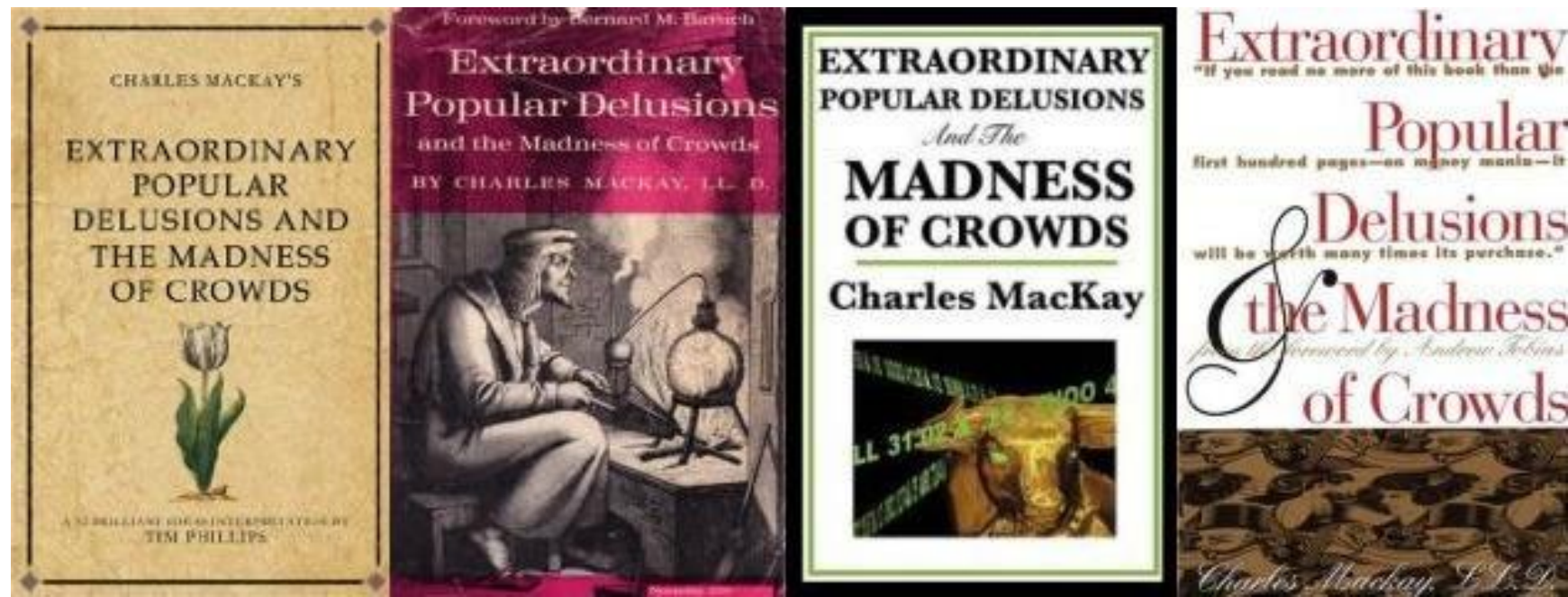
Wind and solar despoil our beautiful world!

(Foreground: Barbara Happer at NJ solar farm)



The World is being misled into Climate Hysteria, a contemporary

“Extraordinary Popular Delusion and a Madness of Crowds”



What has been will be again, what has been done will be done again, there is nothing new under the sun. Ecclesiastes 1:9

Extraordinary Popular Delusions and the Madness of Crowds

“In reading the history of nations, we find that, like individuals, they have their whims and their peculiarities; their seasons of excitement and recklessness, when they care not what they do. We find that whole communities suddenly fix their minds upon one object, and go mad in its pursuit; that millions of people become simultaneously impressed with one delusion, and run after it, till their attention is caught by some new folly, more captivating than the first. “

Qualifications: Will Happer, Climate Scientist, 1982

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THE LONG-TERM IMPACTS OF INCREASING ATMOSPHERIC CARBON DIOXIDE LEVELS

Edited by
GORDON J. MACDONALD

BALLINGER PUBLISHING COMPANY
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From: *The Adaptive Optics Revolution*, by R. W. Duffner

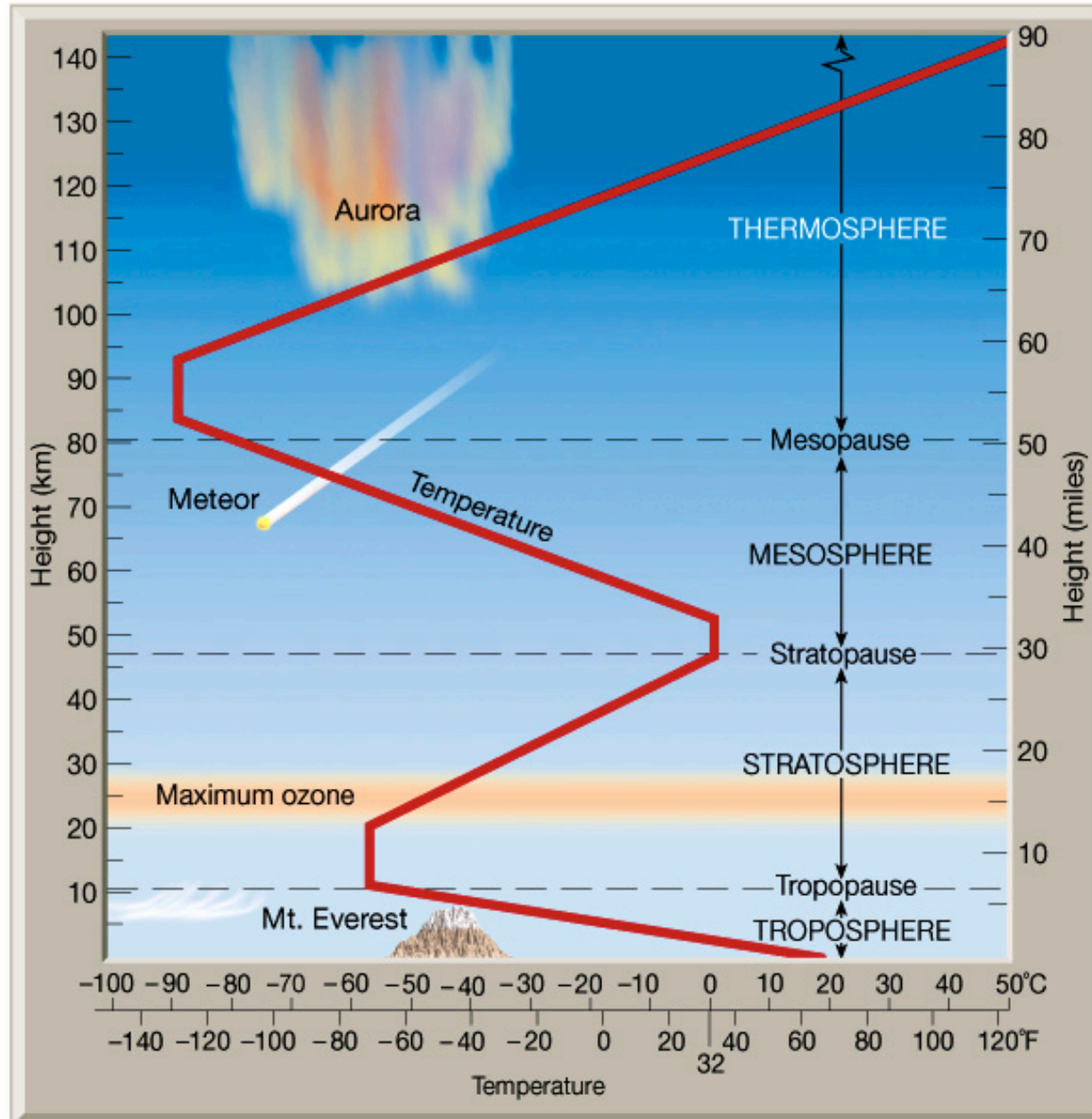
“At the Jasons’ 1982 summer session in La Jolla, Will Happer from Princeton presented the revolutionary concept that the mesospheric sodium layer could be used to generate a high-altitude artificial guide star for use with an adaptive optics telescope. He proposed using a specially tuned yellow laser beam to excite the sodium atoms in the mesosphere to induce resonance fluorescence (glow)—the sodium atom emits a photon at the same wavelength as was absorbed—to create a high-altitude artificial star. The use of this artificial star would make it possible for an adaptive optics system to improve space-object images generated from the collection of light transmitted through the atmosphere by removing the effects of turbulence.”

A sodium guide star laser built by Boeing at Kirtland AFB, NM

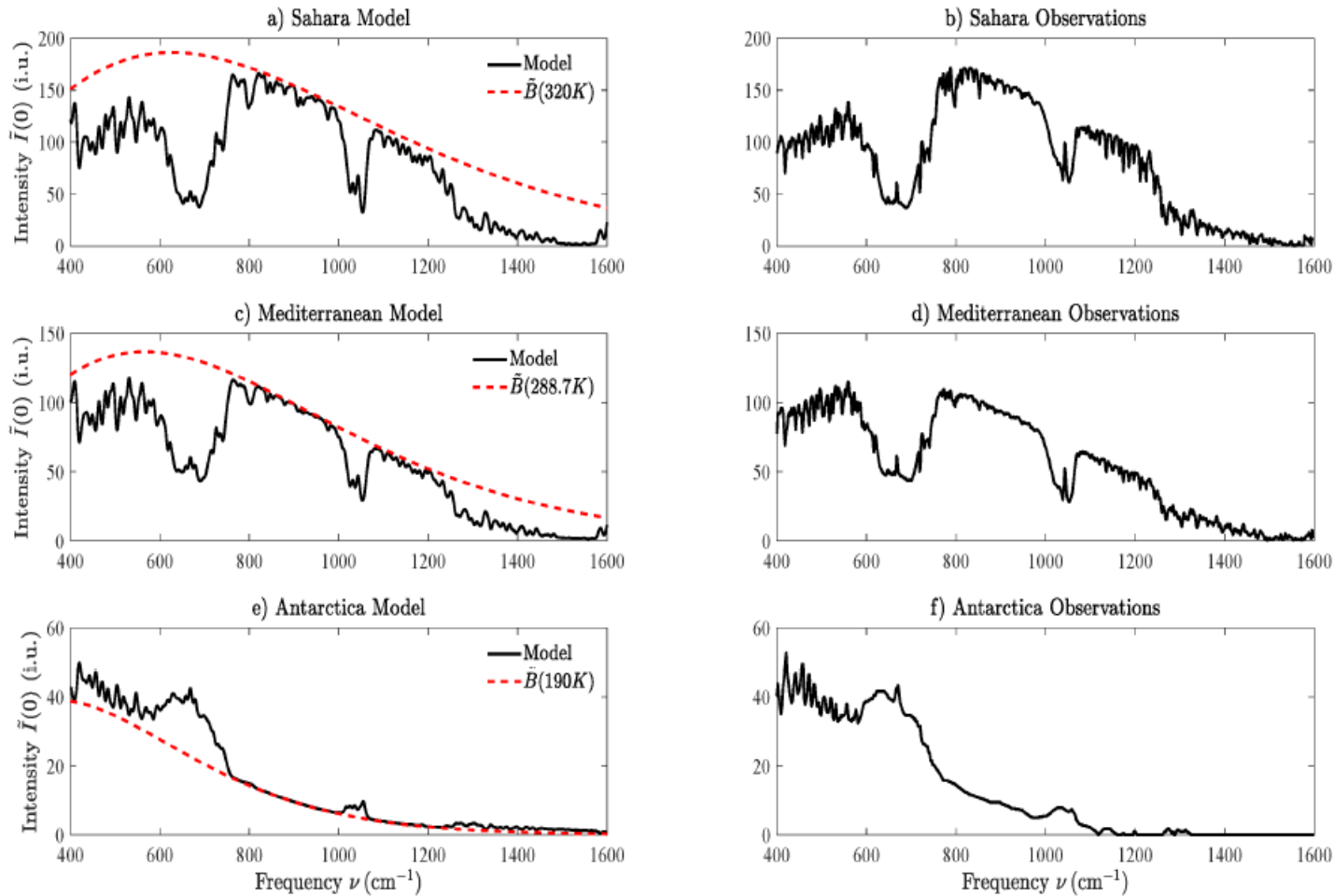


Hotel Kosciuszko at 1.5 km averages about 10 °C colder than Melbourne at 0 km.

Lapse rate = $10\text{ °C} / 1.5\text{ km} = 6.6\text{ °C} / \text{km}$



- The Earth is heated by sunlight.
- Longwave thermal radiation to space keeps the Earth from overheating
- What is the spectrum of the thermal radiation from the Earth to space?



Modelled Spectra Can Hardly Be Distinguished From Measured Spectra.

Dependence of Earth's Thermal Radiation on Five Most Abundant Greenhouse Gases

W. A. van Wijngaarden¹ and W. Happer²

¹Department of Physics and Astronomy, York University, Canada, wlaser@yorku.ca
²Department of Physics, Princeton University, USA, happer@Princeton.edu

June 8, 2020

<https://arxiv.org/pdf/2006.03098>

Figure 15: Vertical intensities $\tilde{I}(0)$ at the top of the atmosphere observed with a Michelson interferometer in a satellite [44], and modeled with (27): over the Sahara desert, the Mediterranean and Antarctica. The intensity unit is $1 \text{ i.u.} = 1 \text{ mW m}^{-2} \text{ cm sr}^{-1}$. Radiative forcing is negative over wintertime Antarctica since the relatively warm greenhouse gases in the troposphere, mostly CO_2 , O_3 and H_2O , radiate more to space than the cold ice surface, at a temperature of $T = 190 \text{ K}$, could radiate through a transparent atmosphere.

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How do you calculate the thermal radiation from Earth to space?

Equation of Transfer

$$\left(\frac{\mu}{\alpha} \frac{\partial}{\partial z} + 1 \right) I(\mu, z) = (1 - \tilde{\omega}) B(z) + \frac{\tilde{\omega}}{2} \int_{-1}^1 d\mu' p(\mu, \mu') I(\mu', z)$$

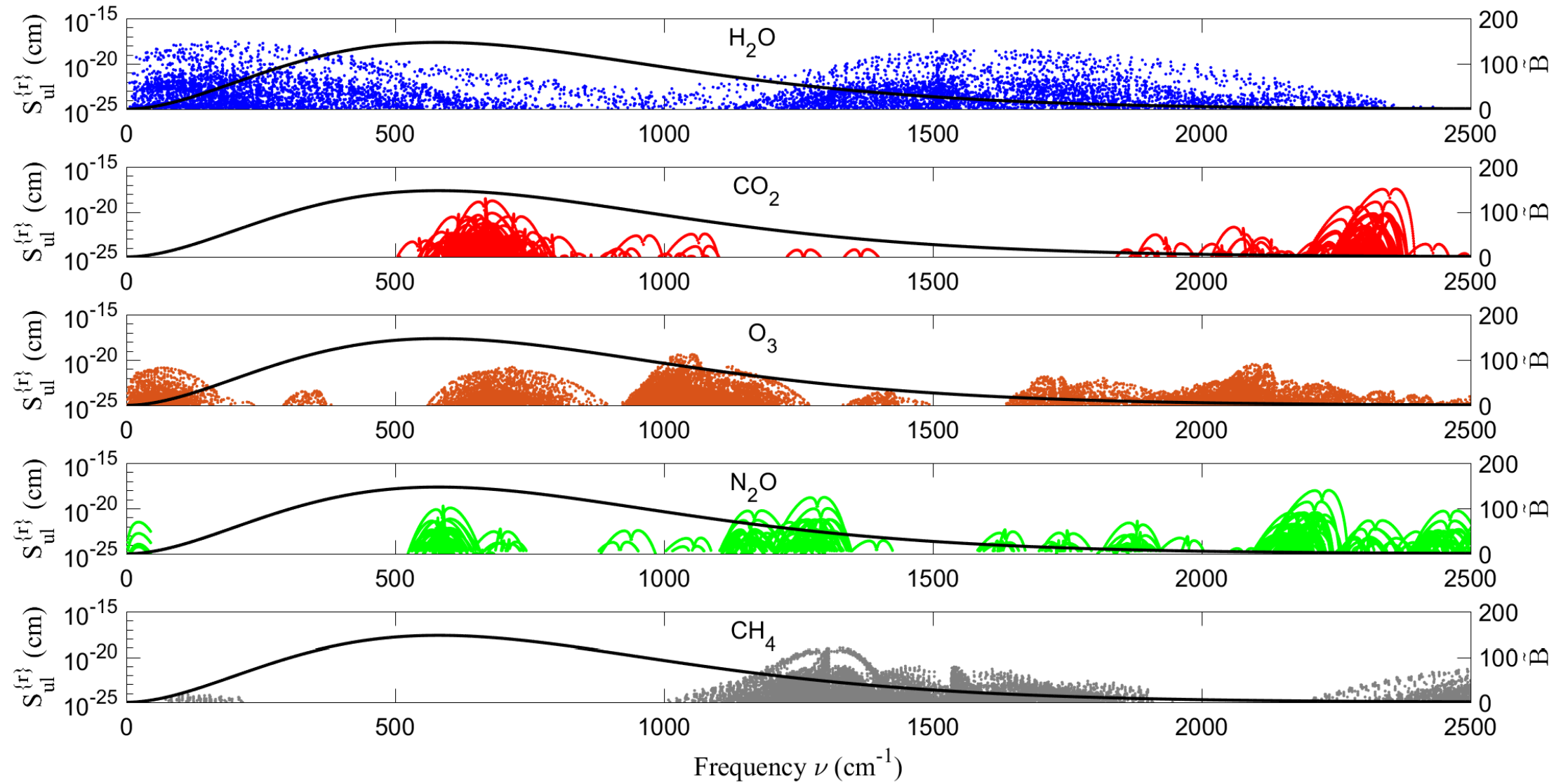
Monochromatic attenuation rate (Need HITRAN data) Direction cosine of radiation Altitude Intensity Single-scattering albedo (= 0 for LWIR with no clouds) Planck intensity Scattering phase function for cloud particulates

$$B = \frac{2h_P c^2 \nu^3}{e^{\nu c h_P / (k_B T)} - 1}$$

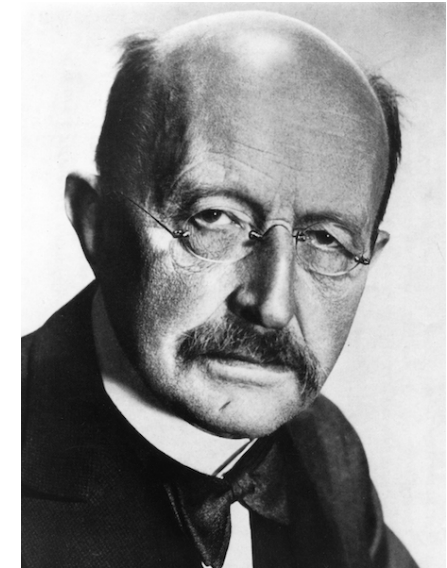
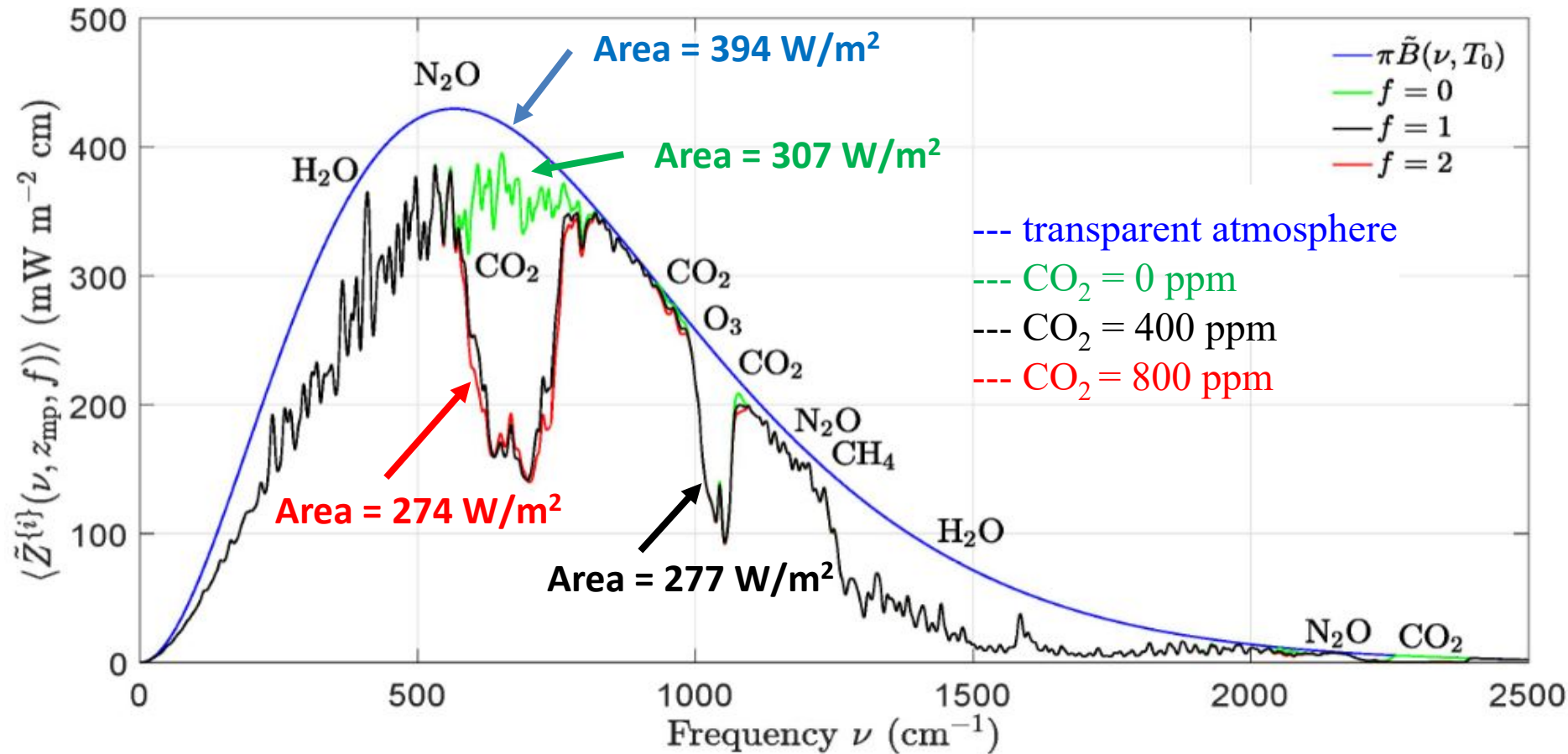
<https://arxiv.org/pdf/2006.03098>

<https://arxiv.org/abs/2205.09713>

HITRAN Data; Reference Line Strengths S_{ul}



Thermal radiation to space from the Earth, with a surface temperature of 15.5 C and with greenhouse gases is the area under the jagged black “Schwarzschild” curve. This is only about 70% of what it would be without greenhouse gases, the area under the smooth blue “Planck” curve. The Sun heats the Earth and greenhouse gases hinder the cooling.



Max Planck
1858-1947



Karl Schwarzschild
1873-1916

Warming by CO₂ is too small to matter

To maintain thermal equilibrium, Earth's infrared radiation flux F to space must equal the absorbed solar flux. One can write the flux as the **Stefan-Boltzman** formula:

$$F = \varepsilon\sigma T^4,$$

where

$$\varepsilon = 0.70 = \text{observed cloud-free emissivity},$$

$$\sigma = 5.67 \times 10^{-8} \text{ W m}^{-2} \text{ K}^{-4} = \text{Stefan-Boltzmann constant},$$

$$T = 288.7 \text{ K} = \text{Representative absolute temperature}.$$

The emissivity $\varepsilon = 0.70$ is less than 1 because of atmospheric greenhouse gases and because of the vertical temperature variation. Doubling CO₂ changes the emissivity by about $\Delta\varepsilon/\varepsilon = -1/100 = -1\%$. To keep F constant, beginner's calculus tells us that the changes $\Delta\varepsilon$ and ΔT must be related by

$$0 = \Delta\varepsilon\sigma T^4 + \varepsilon\sigma 4T^3\Delta T \quad \text{or} \quad \frac{\Delta T}{T} = -\frac{1}{4} \frac{\Delta\varepsilon}{\varepsilon}.$$

Then the temperature increase needed to compensate for doubling CO₂ concentrations is

$$\Delta T = -\frac{T}{4} \frac{\Delta\varepsilon}{\varepsilon} = \frac{288.7}{400} \text{ K} = 0.71 \text{ C}.$$

Joseph Stefan



Ludwig Boltzmann



POSITIVE FEEDBACK

- 0.71 C is not enough warming to justify a climate emergency!
- What to do?
- Invoke huge positive feedbacks from water vapor, clouds, whatever sounds plausible to increase predicted warming to 3 C or more from doubling CO₂.
- Affirmative action for CO₂!

Problem: most natural feedbacks are negative:

Le Chatelier's Principle

When a simple system in thermodynamic equilibrium is subjected to a change in concentration, temperature, volume, or pressure, (1) the system changes to a new equilibrium, and (2) this change partly counteracts the applied change.

Henry Louis Le Chatelier



SATURATION



Atmosphere with 400 ppm CO₂ is like a barn with 1 coat of red paint.



Atmosphere with 800 ppm CO₂ is like a barn with 2 coats of red paint (almost the same).

More CO₂ will be a very significant benefit to agriculture and forestry!



(The weed, Velvetleaf)

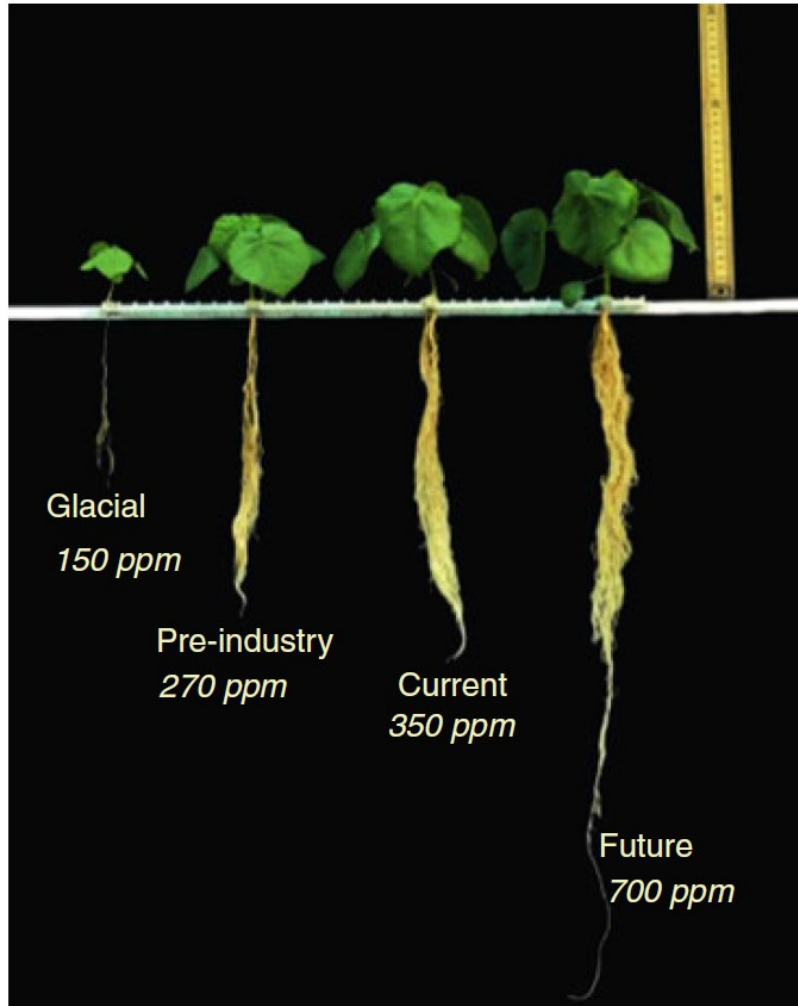


Fig. 2 Representative plants of *Abutilon theophrasti* (C_3) grown at glacial through future $[CO_2]$. All plants were 14 d of age and were grown under similar water, light, and nutrient conditions. These plants were photographed during a study by Dippery *et al.* (1995). (Photograph is courtesy of Anne Hartley, Florida Gulf Coast University.)

Plant responses to low $[CO_2]$ of the past

Laci M. Gerhart and Joy K. Ward

Department of Ecology & Evolutionary Biology, University of Kansas, Lawrence, KS 66045, USA

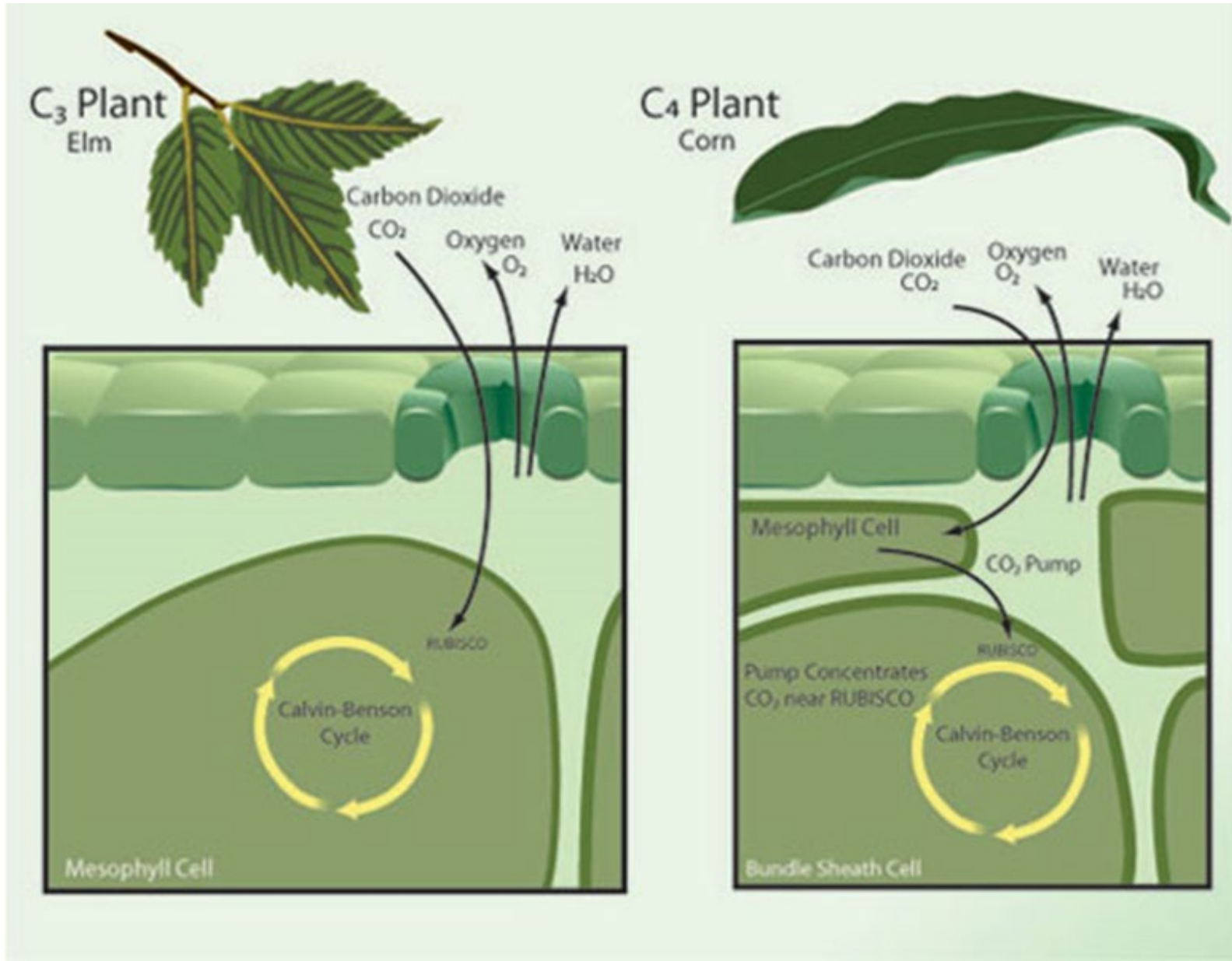
New Phytologist (2010) **188**: 674–695
www.newphytologist.com

All plants grow better with more CO_2 in the air!

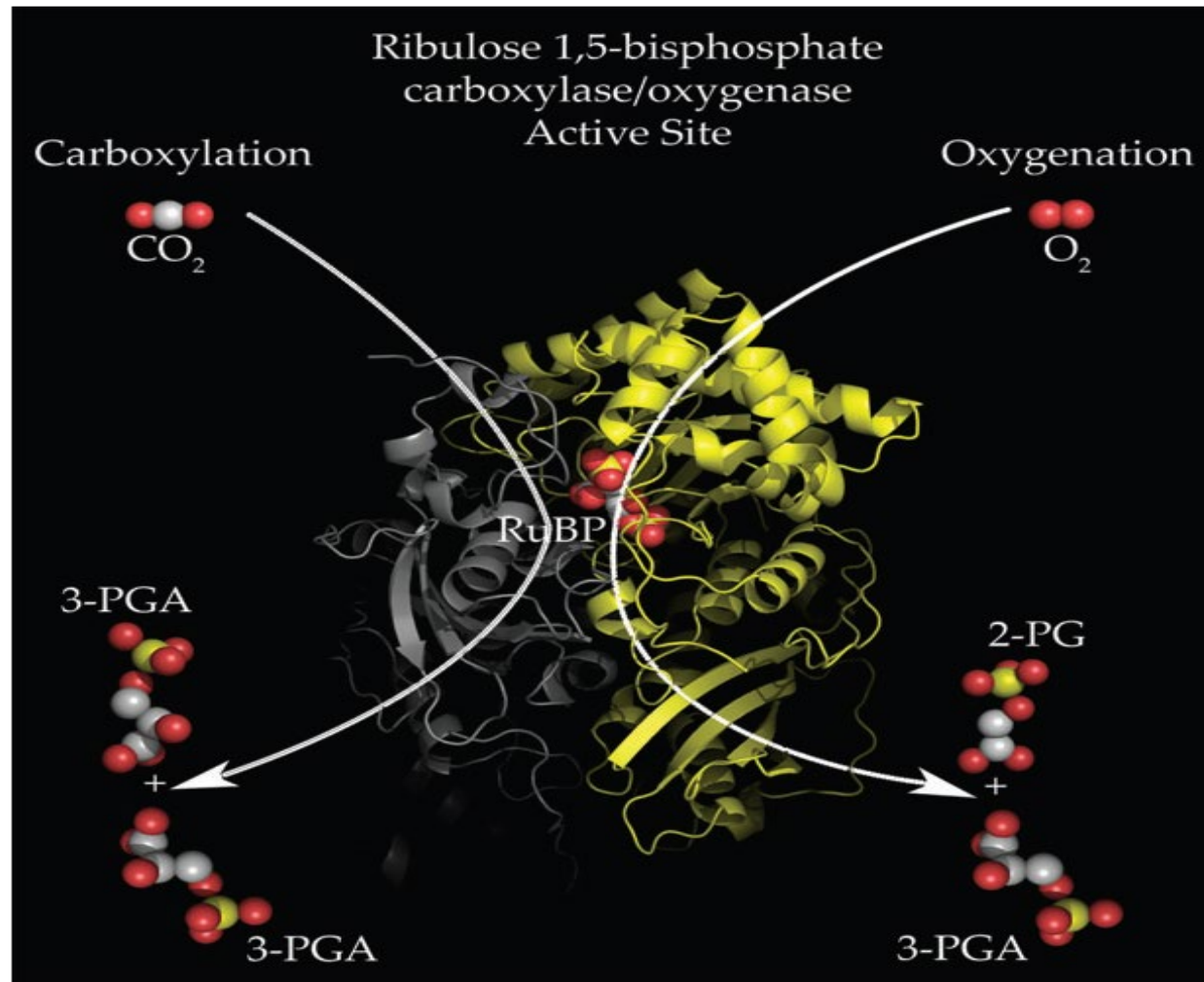
Two main reasons more CO₂ helps plants

- Plants need less water if there is more CO₂
- There is less harmful photorespiration with more CO₂. Today C3 plants lose about 25% of their potential photosynthetic potential due to photorespiration.

The two main photosynthetic pathways



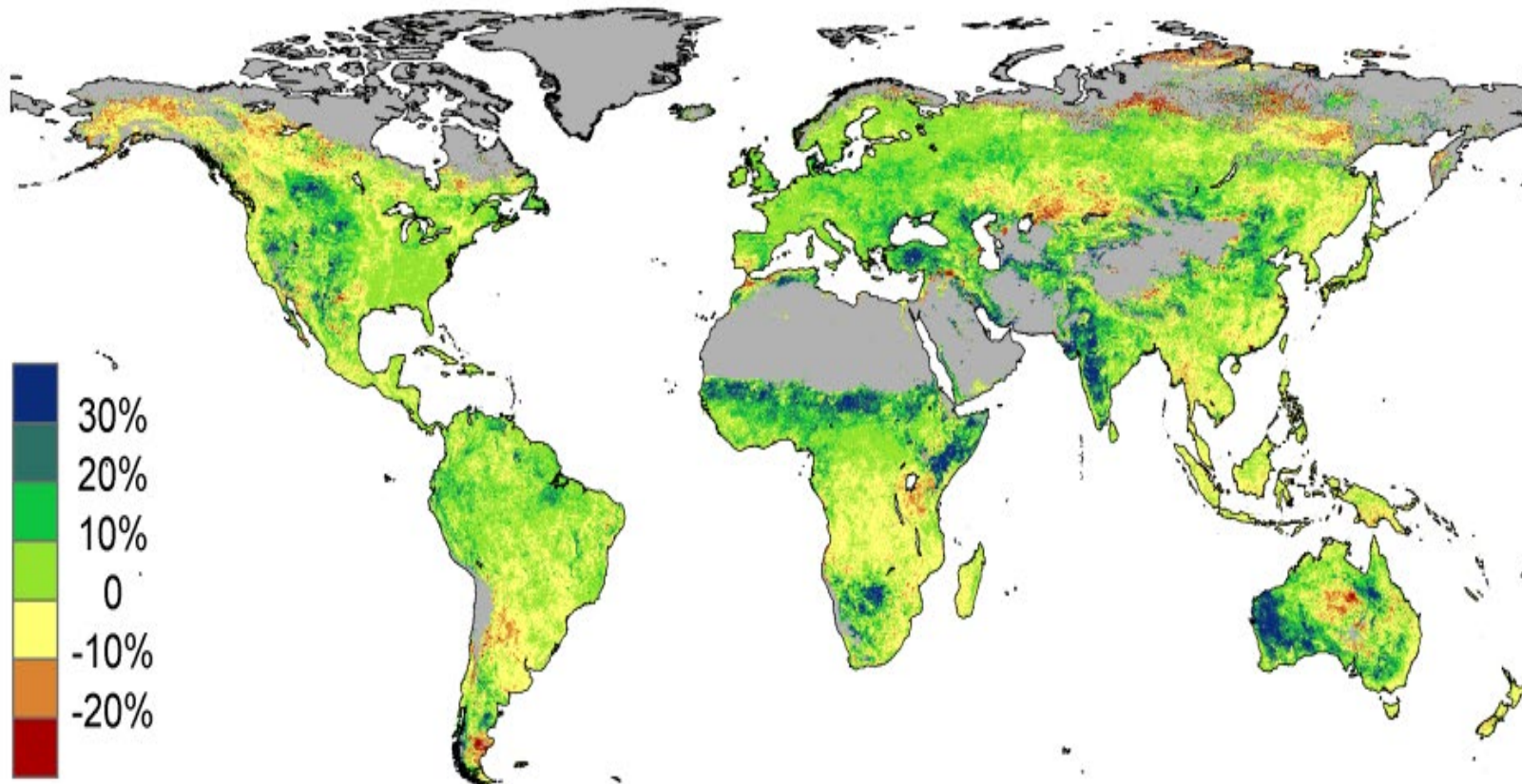
Rubisco, the most abundant protein in the world



Carboxylation: good

Oxygenation: bad

Global Greening From CO2 Fertilization: 1982-2010



Increase = 11% in areas studied

Donohue et al, GRL (June 2013) DOI: 10.1002/grl.50563

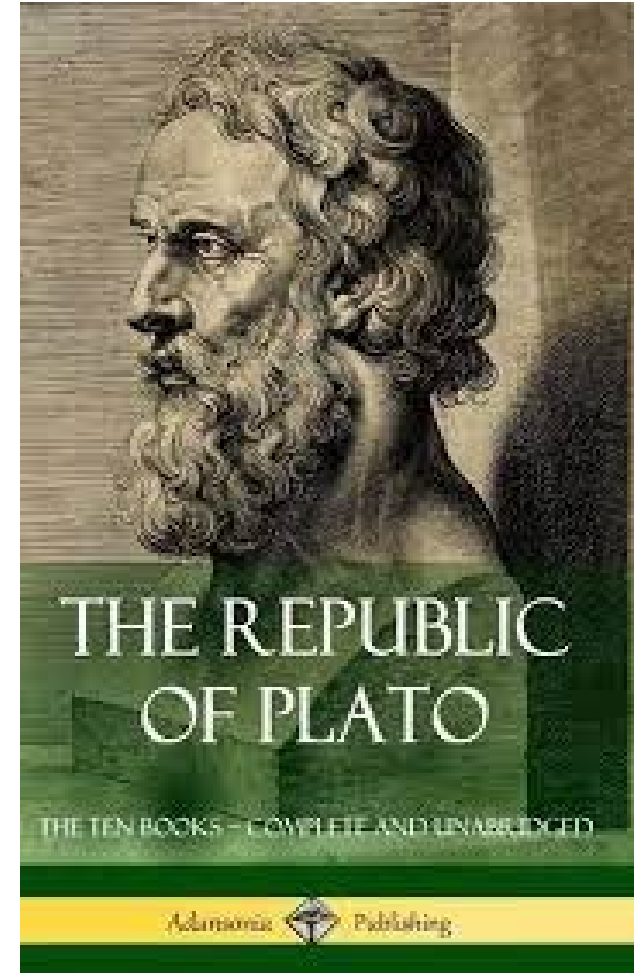
Since more CO₂ has negligible effects on climate and brings major benefits to agriculture and forestry, how has the campaign to demonize CO₂ been so successful? Some causes:

- **Noble Lies**
- **Political Lies**
- **Ignorance**
- **Stupidity**
- **Greed**

Noble Lies

In politics, a noble lie is a myth or untruth, often, but not invariably of a religious nature, knowingly propagated by an elite to maintain social harmony or to advance an agenda. The noble lie is a concept originated by Plato as described in the Republic.

https://en.wikipedia.org/wiki/Noble_lie



Political Lies

“The whole aim of practical politics is to keep the populace alarmed (and hence clamorous to be led to safety) by menacing it with an endless series of hobgoblins, all of them imaginary.”



H. L. Mencken

Ignorance

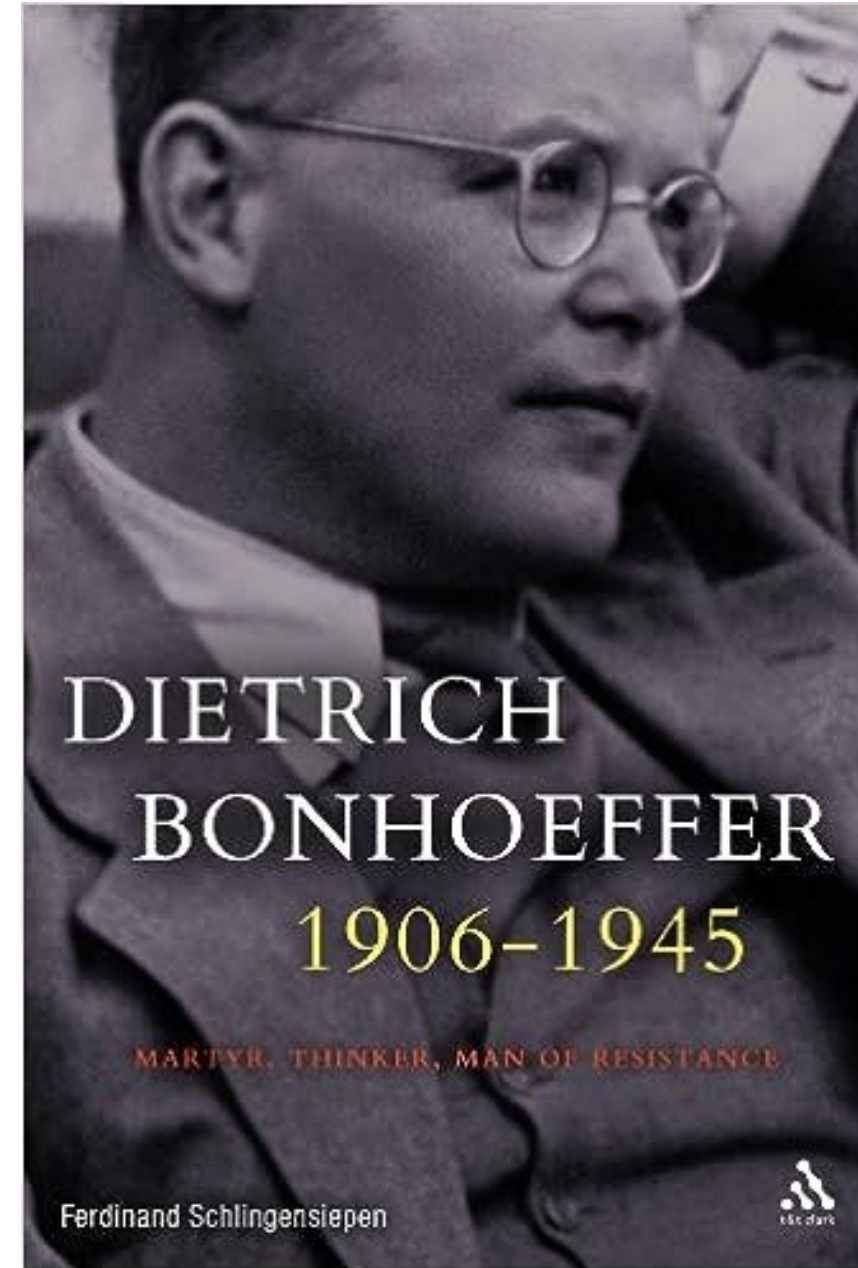


Jan Hus was burnt at the stake in 1415 in Konstanz, Germany.

Seeing a poor, pious old woman throw dry brush on the fire, Hus exclaimed: *Sancta Simplicitas* (Holy innocence)

Bonhoeffer on human stupidity

“Against stupidity we have no defense. Neither protests nor force can touch it. Reasoning is of no use. Facts that contradict personal prejudices can simply be disbelieved — indeed, the fool can counter by criticizing them, and if they are undeniable, they can just be pushed aside as trivial exceptions. So the fool, as distinct from the scoundrel, is completely self-satisfied. In fact, they can easily become dangerous, as it does not take much to make them aggressive. For that reason, greater caution is called for than with a malicious one.”

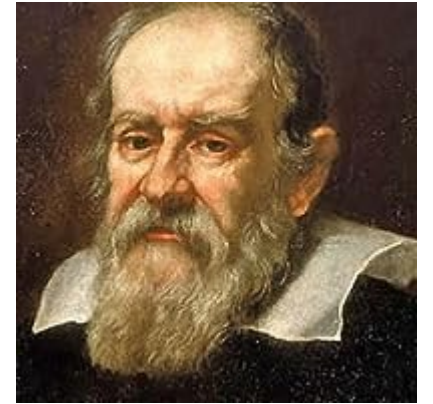


Galileo to Kepler on academic stupidity

“My dear Kepler, I wish that we might laugh at the stupidity of the human herd. What do you have to say about the principal philosophers of this academy who are filled with the stubbornness of an asp and do not want to look at either the planets, the moon or the telescope, even though I have freely and deliberately offered them the opportunity a thousand times? Truly, just as the asp stops its ears, so do these philosophers shut their eyes to the light of truth.”

August 19, 1610

Galileo



Kepler



GREED



было бы корыто,
а свиньи-то будут

A. S. Pushkin, *Dubrovsky*

“If there should happen to be a trough, there will be pigs”

Net Zero Finale



If I see a madman driving a car into a group of innocent bystanders, then I can't simply wait for the catastrophe and then comfort the wounded and bury the dead. I must try to wrestle the steering wheel out of the hands of the driver.

Dietrich Bonhoeffer