



# Methane

## the Irrelevant GreenHouse Gas

ICSF and CLINTEL presentation

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# Essential Clarification

- Methane (CH<sub>4</sub>) DOES meet the definition of a GHG
- However, it is *irrelevant* because of:
  - the physical properties of the *real* atmosphere
  - The numerical realities of infrared absorption
  - The amount and type of radiation emitted from the surface
- It is urgent that this reality becomes widely known
  - Otherwise, money is poured down the drain

# Outline: Two Parts

## 1. Review achievements of van Wijngaarden & Happer

particularly regarding CH<sub>4</sub> and N<sub>2</sub>O

They Got it Right -- agrees with data

Their method is valid

Their projections are trustworthy

## 2. Explain why *Global Warming Potential* numbers are useless

oversimplified concept

applied incorrectly

**Bottom Line:** tighter regulations are pointless and unnecessary

# Acknowledgements

The science reported here is based on the accomplishments of William van Wijngaarden & Will Happer & co-workers.

I'm just the chronicler.

But as a member of the *CO<sub>2</sub> Coalition*, I'm proud to proclaim the significance of their work.

And I hope this will lead to government policy revisions.

# Will Happer's presentation of June 2021

several graphs that you saw last year

Wm. Van Wijngaarden & Will Happer on greenhouse gases:  
They used the HITRAN data base to calculate the intensities of  
spectral lines across the infrared

Their model atmosphere was *real*

Included H<sub>2</sub>O

Not the “US Standard atmosphere” which contains no H<sub>2</sub>O

remember: a laboratory gas is NOT the real atmosphere !

That is an enduring flaw in all the IPCC calculations

They “Got It Right”

Exceptionally good quantitative agreement with satellite observations

# What is “Forcing” ?

Term “Forcing” refers to radiation that carries energy

Customary unit is Watts per square meter

340 W/m<sup>2</sup> reaches earth from sun constantly ( $\pm 3\%$ )

Earth responds:

100 W/m<sup>2</sup> reflected back into space (30%).  $\alpha = 0.3$

239 W/m<sup>2</sup> enter earth’s atmosphere or surface

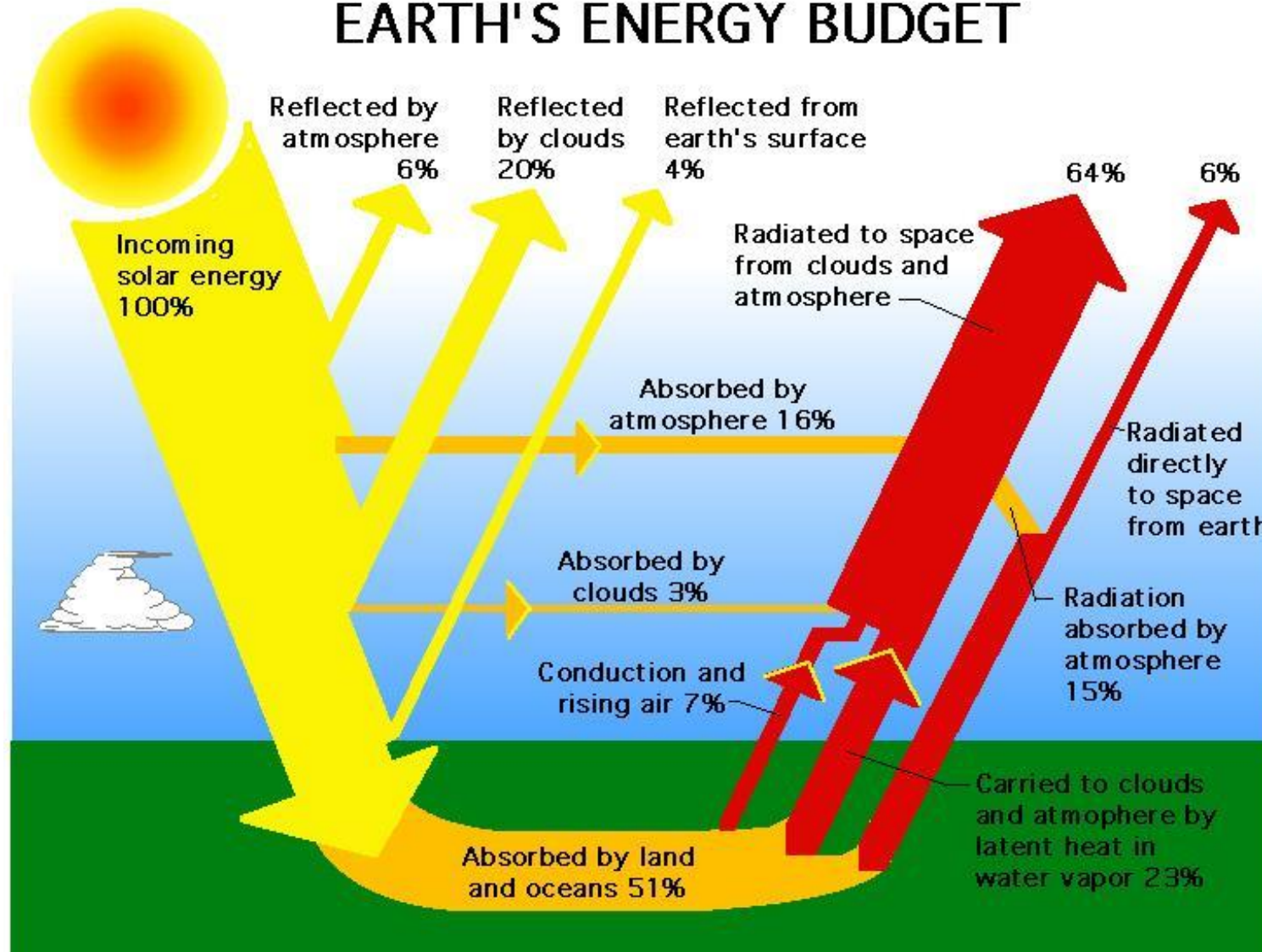
Several mechanisms of energy transfer and disposal

239 W/m<sup>2</sup> emitted back out into space

Forcing is pertinent to greenhouse calculations

# Radiation Input and Output

## EARTH'S ENERGY BUDGET



**Reflected**  
 $6\% + 20\% + 4\% = 30\%$

**Radiated to Space**  
 $64\% + 6\% = 70\%$

# GHG Properties, Per-Molecule

- From a paper by van Wijngaarden & Happer in 2019:

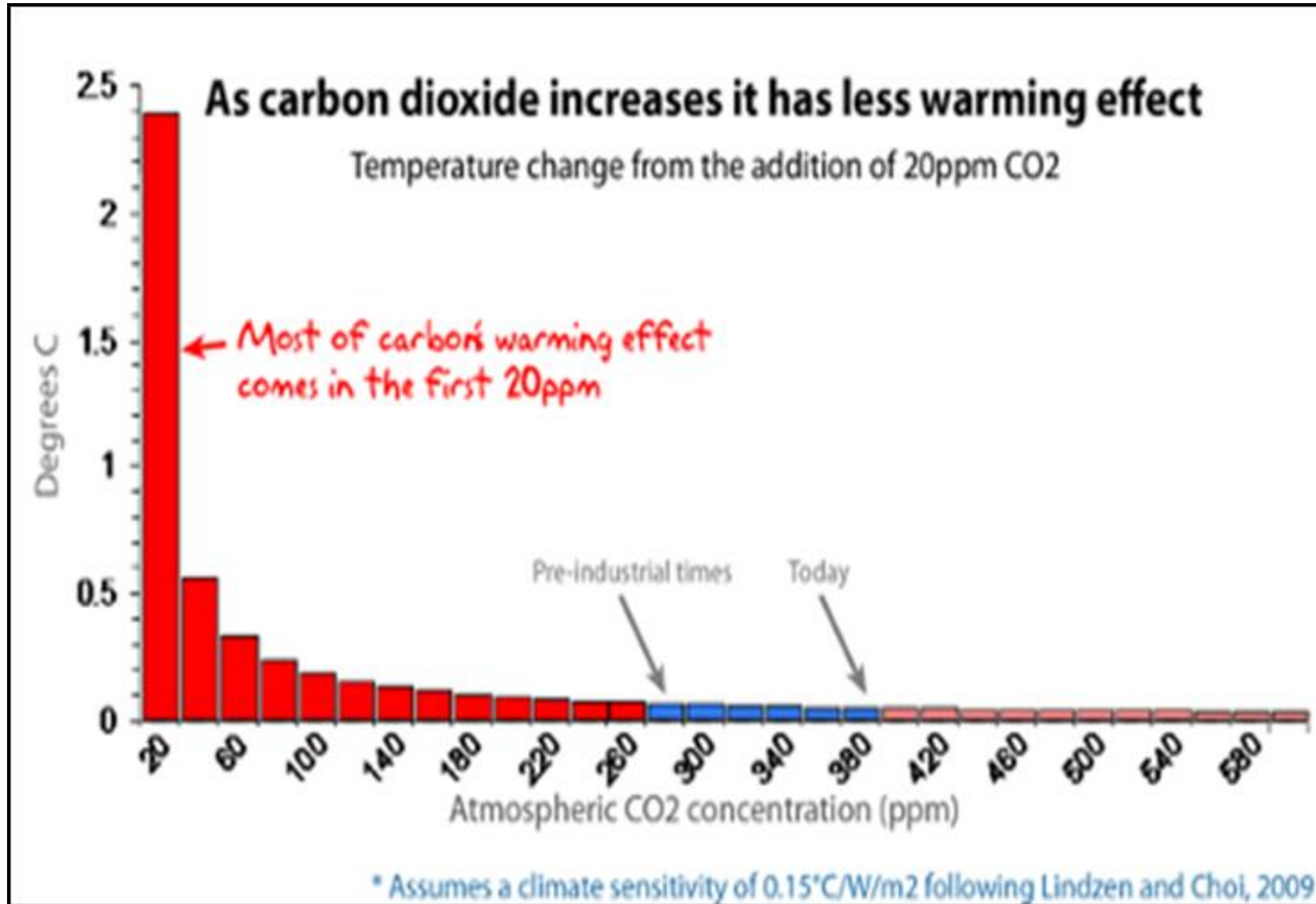
Also calculated are per-molecule forcings in a hypothetical, *optically thin* atmosphere, where there is *negligible saturation* of the absorption bands, or *interference* of one type of greenhouse gas with others. For an optically thin atmosphere, the per-molecule forcings at the tropopause are largest for CO<sub>2</sub>, with lesser but *comparable* forcings by O<sub>3</sub>, H<sub>2</sub>O, N<sub>2</sub>O and CH<sub>4</sub>.



# “saturation” of a spectrum

- Molecular energy levels include vibrational and rotational energy
- A molecular spectrum contains thousands of lines
- Center of the band absorbs/emits most intensely
- As density increases, the “wings” of the band participate
- Progression of active states grows logarithmically
- Absorption curve falls off exponentially

# CO<sub>2</sub> saturation curve

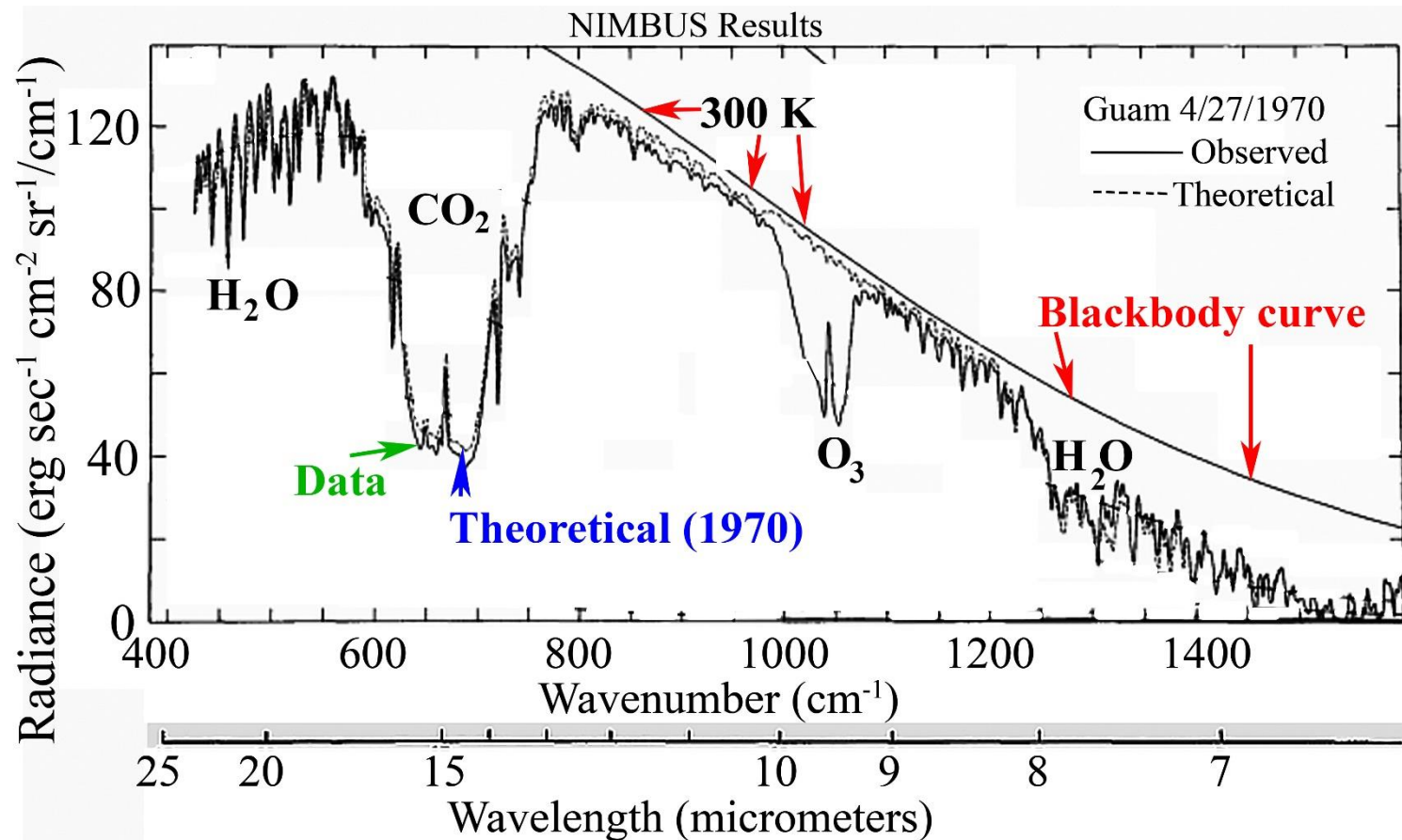


# The GreenHouse Effect

- Earth emits BlackBody radiation (smooth curve)
  - Determined by surface temperature
- Atmosphere absorbs and emits *some* radiation
- This slows down the planet's cooling (radiation to space)
  - Surface is warmer than if there were no atmosphere
- Net radiation escaping is *lower than* the BlackBody emission
- Total area between the two curves is the Greenhouse effect

# Early data – theory comparison

## Guam, 1970, with $T_{\text{surface}} \sim 295 \text{ K}$

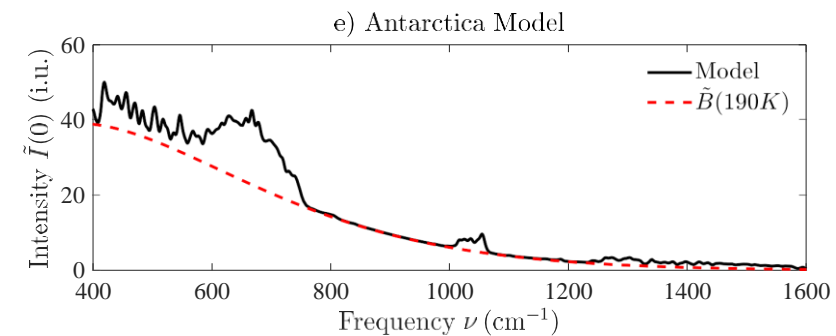
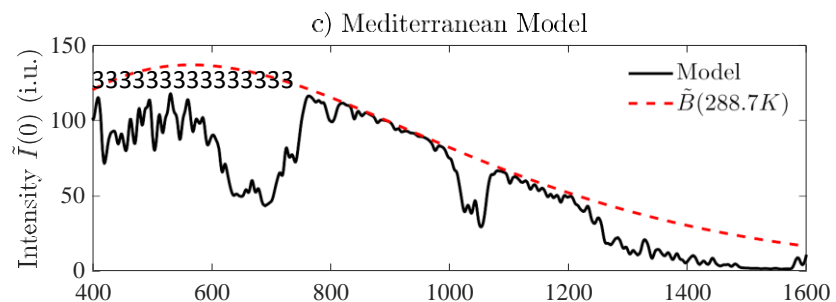
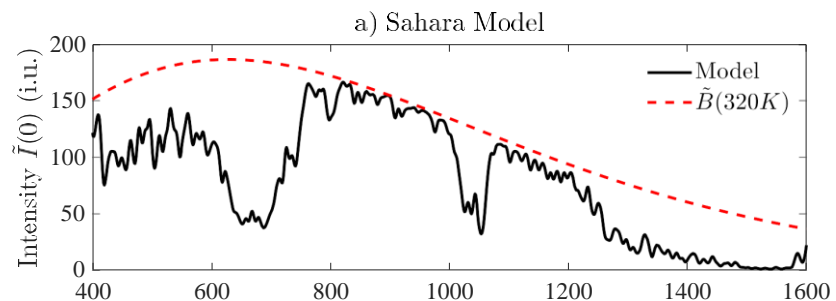


# Calculations by van Wijngaarden & Happer

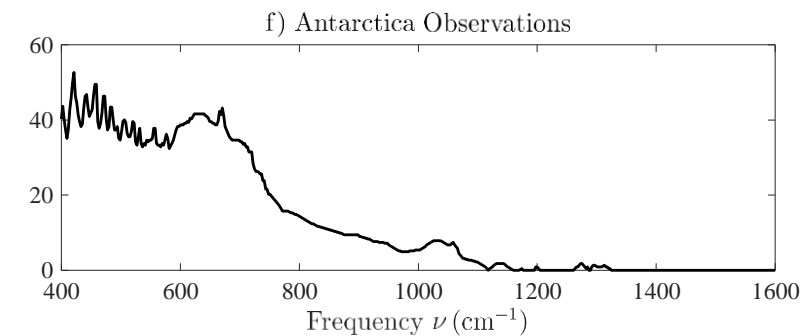
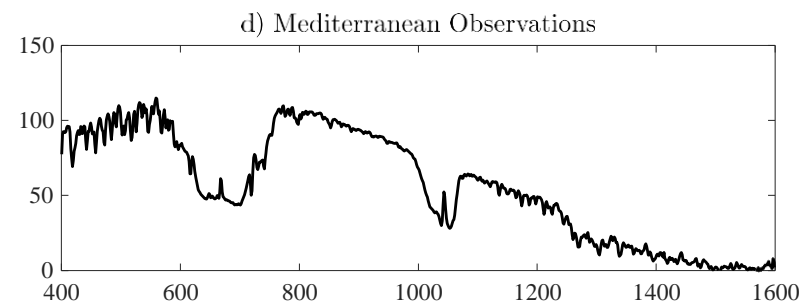
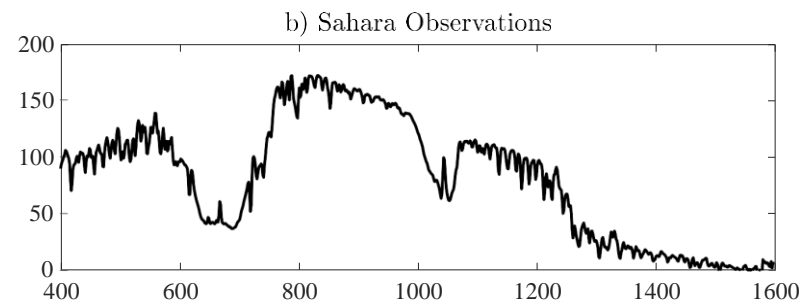
- Calculations were done for the *real* atmosphere
- All five GHGs were present at once
  - Real concentrations used
  - NOT the per-molecule case
  - H<sub>2</sub>O and CO<sub>2</sub> were in a state of “saturation”
- H<sub>2</sub>O is the dominant GHG (no surprise)
- CO<sub>2</sub> is secondary, but finite (~ 25%)
- O<sub>3</sub> matters in the stratosphere
- CH<sub>4</sub> and N<sub>2</sub>O vanish in importance

# Stunning agreement with measurements

## van Wijngaarden & Happer *calculations*



## *satellite measurements*

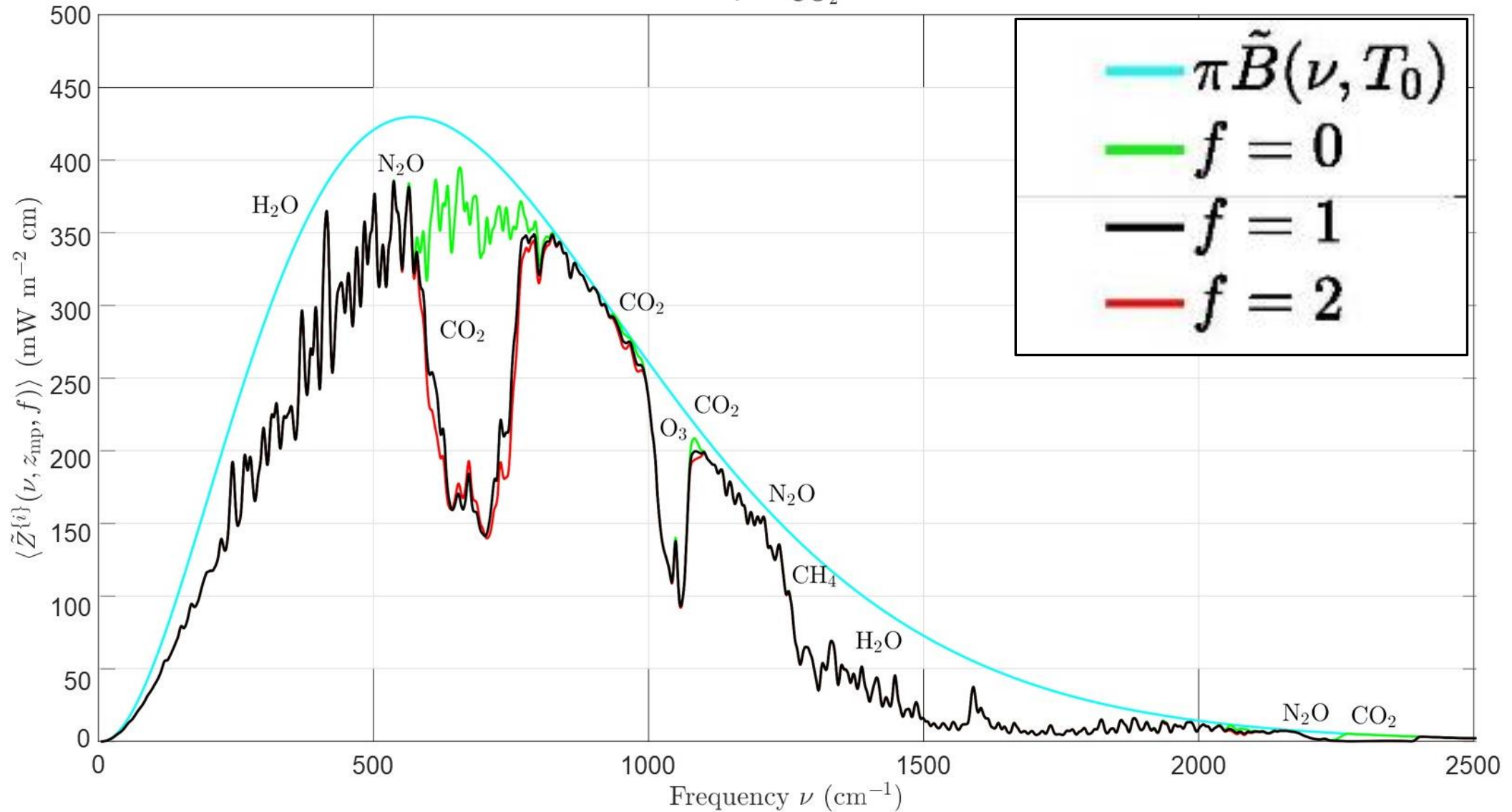


# Major Accomplishment

- THIS is the **correct** use of the Scientific Method:
- Because the agreement is so good between their calculations and actual measurements,
- At last we have a computational method that is trustworthy !
- Consequently, we can now conduct numerical experiments with CO<sub>2</sub> doubled, halved, etc.
- We do not have to rely upon artificially constructed numbers like “Global Warming Potential”

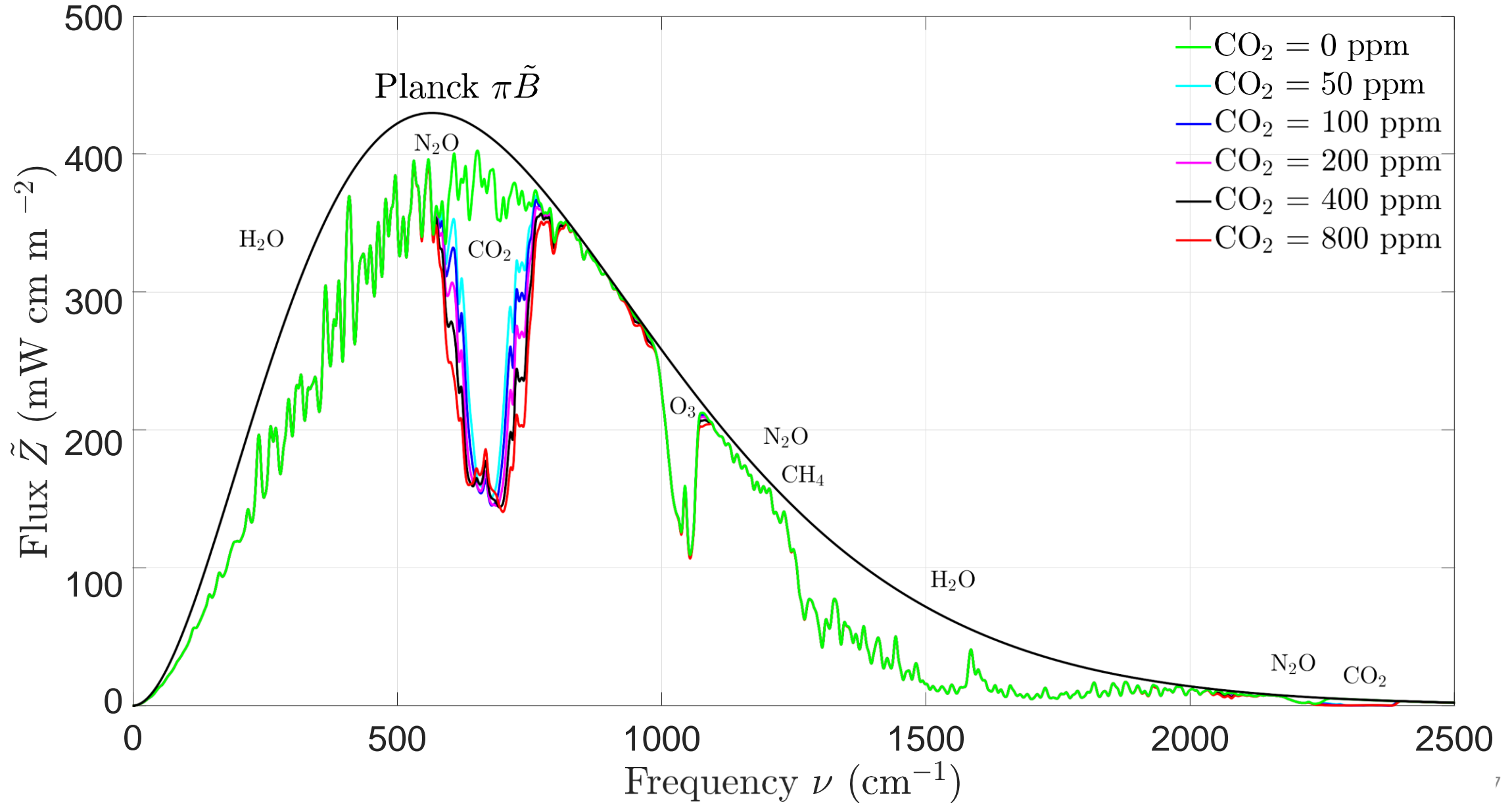
# Numerical experiment: CO<sub>2</sub> comparison

$i = \text{CO}_2$

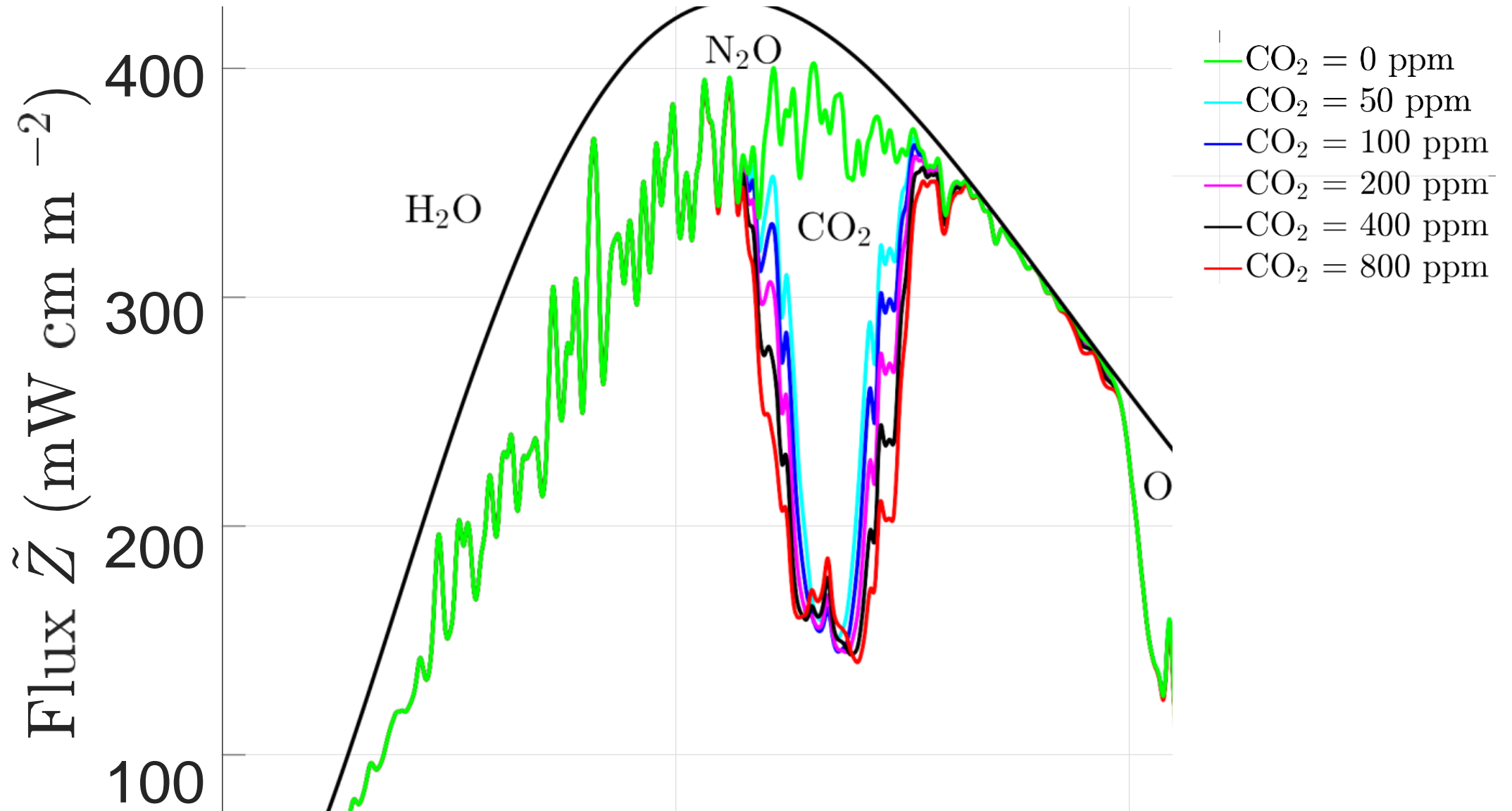




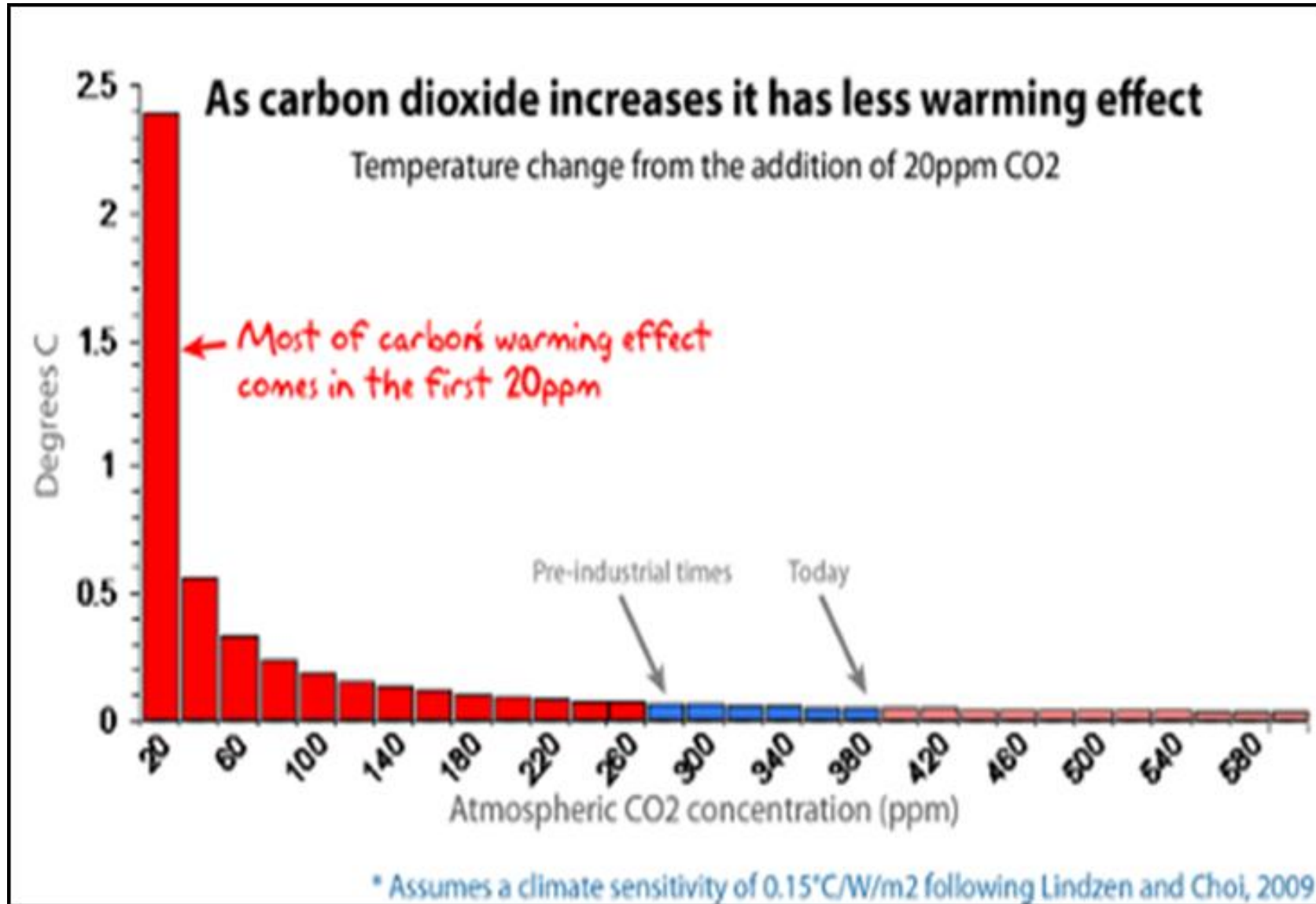
# Effect of adding increments of CO<sub>2</sub>



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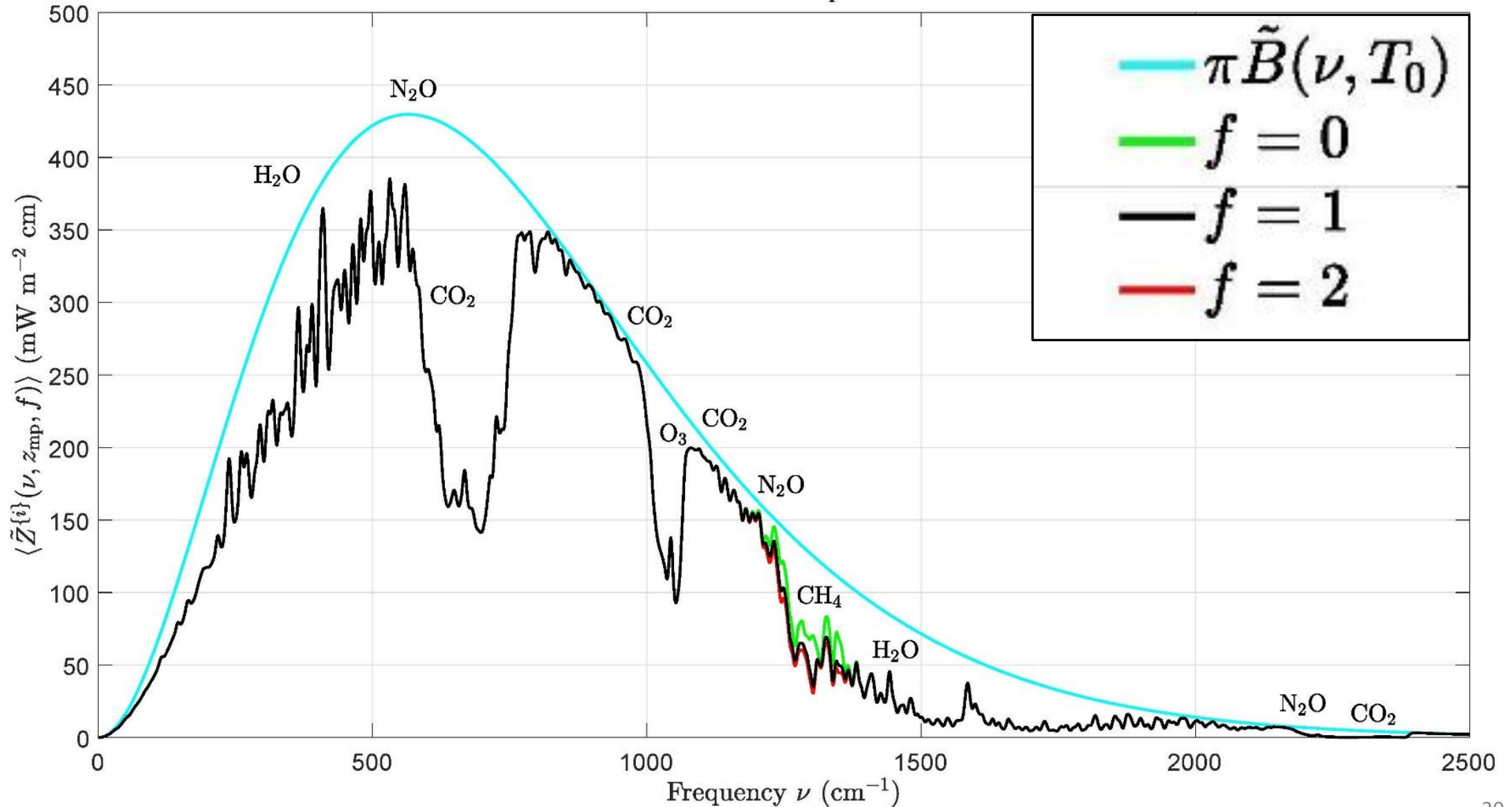


# CO<sub>2</sub> saturation curve

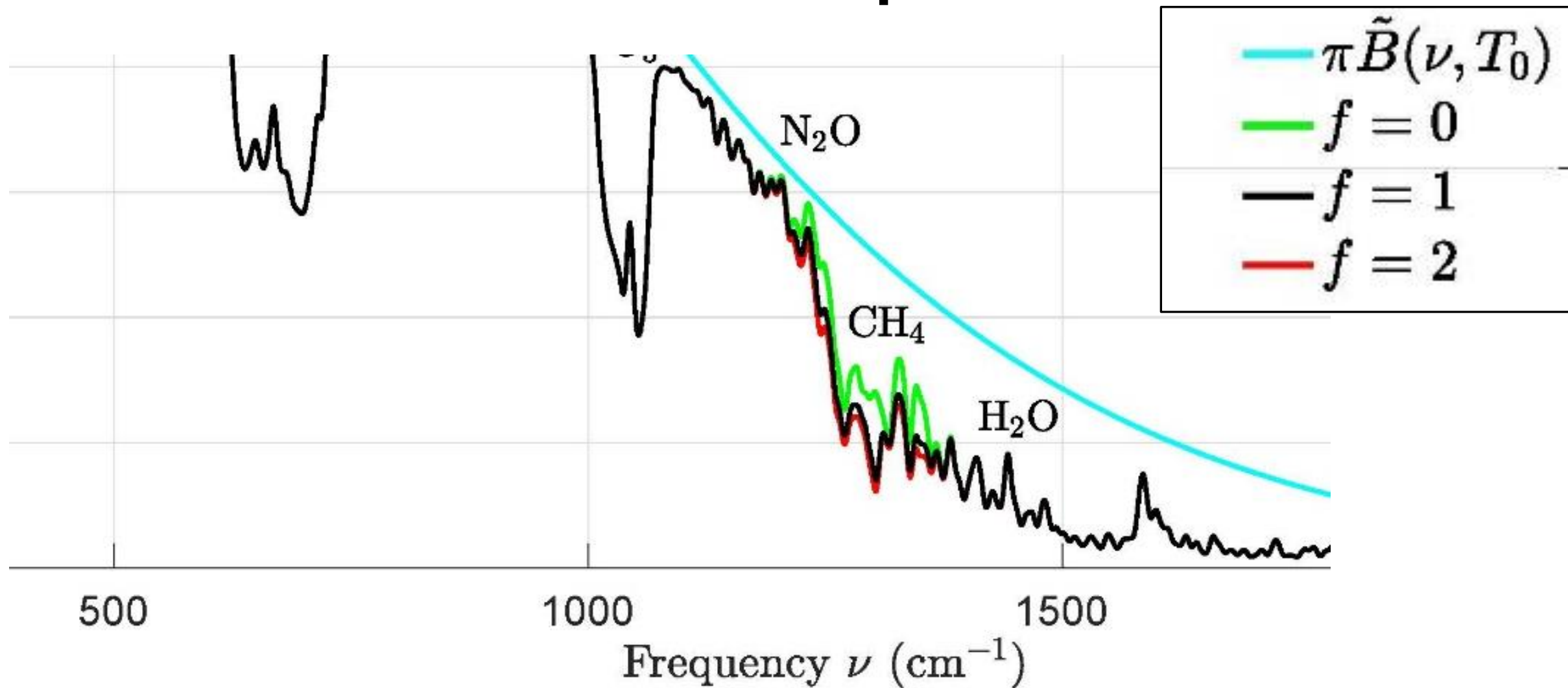


# CH4 Comparison

$i = \text{CH}_4$

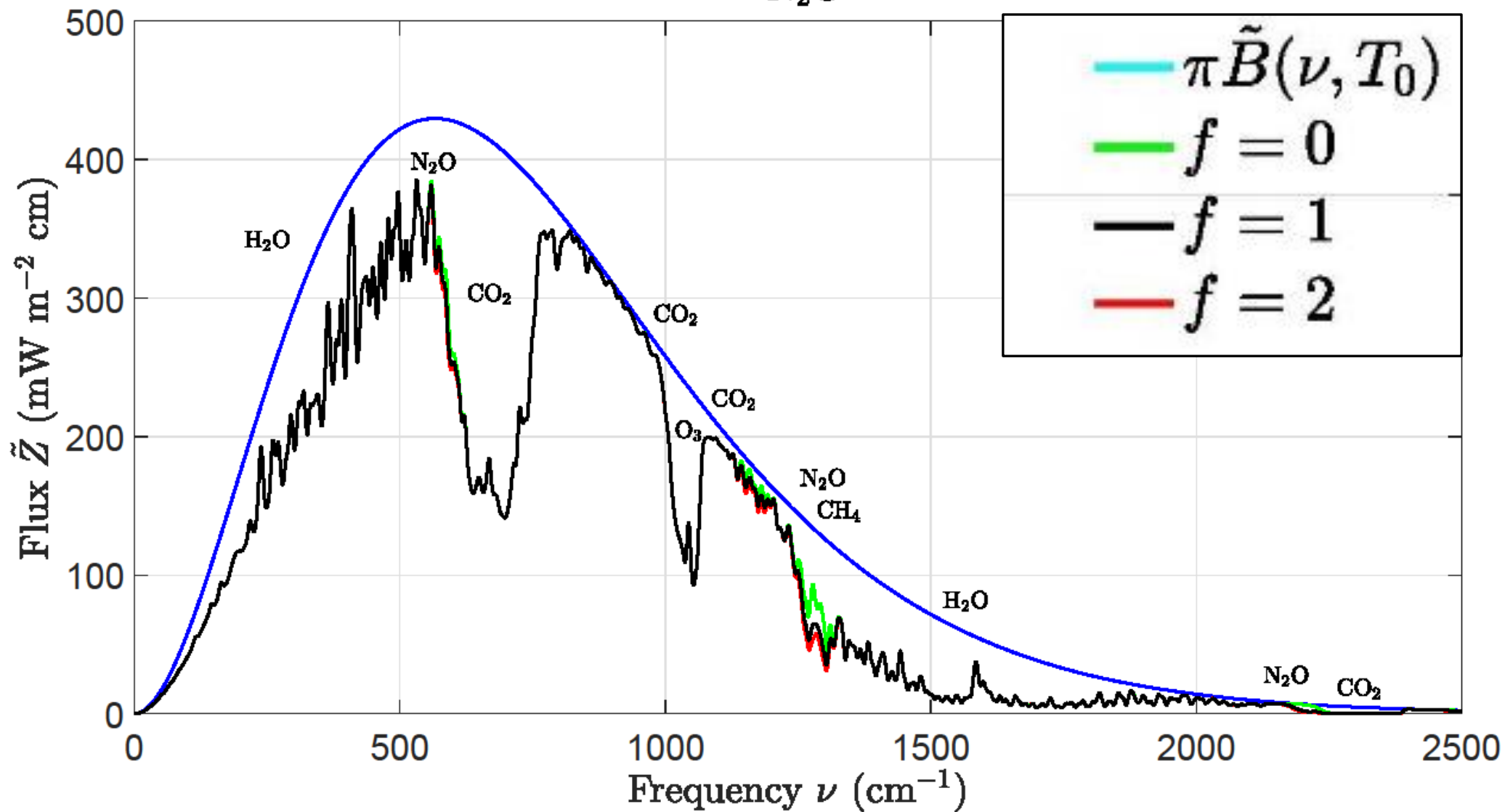


# CH4 Comparison

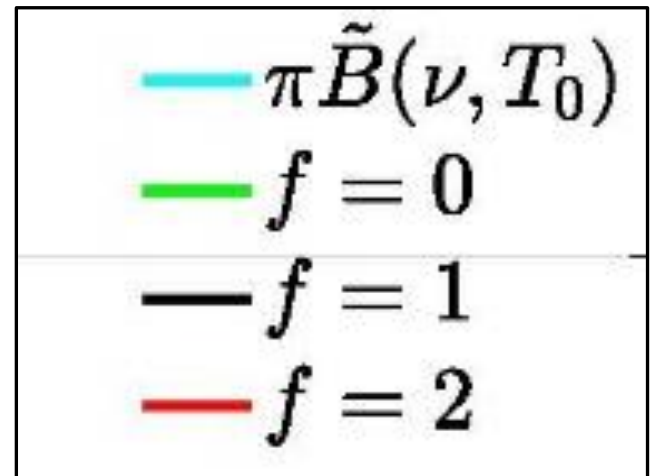
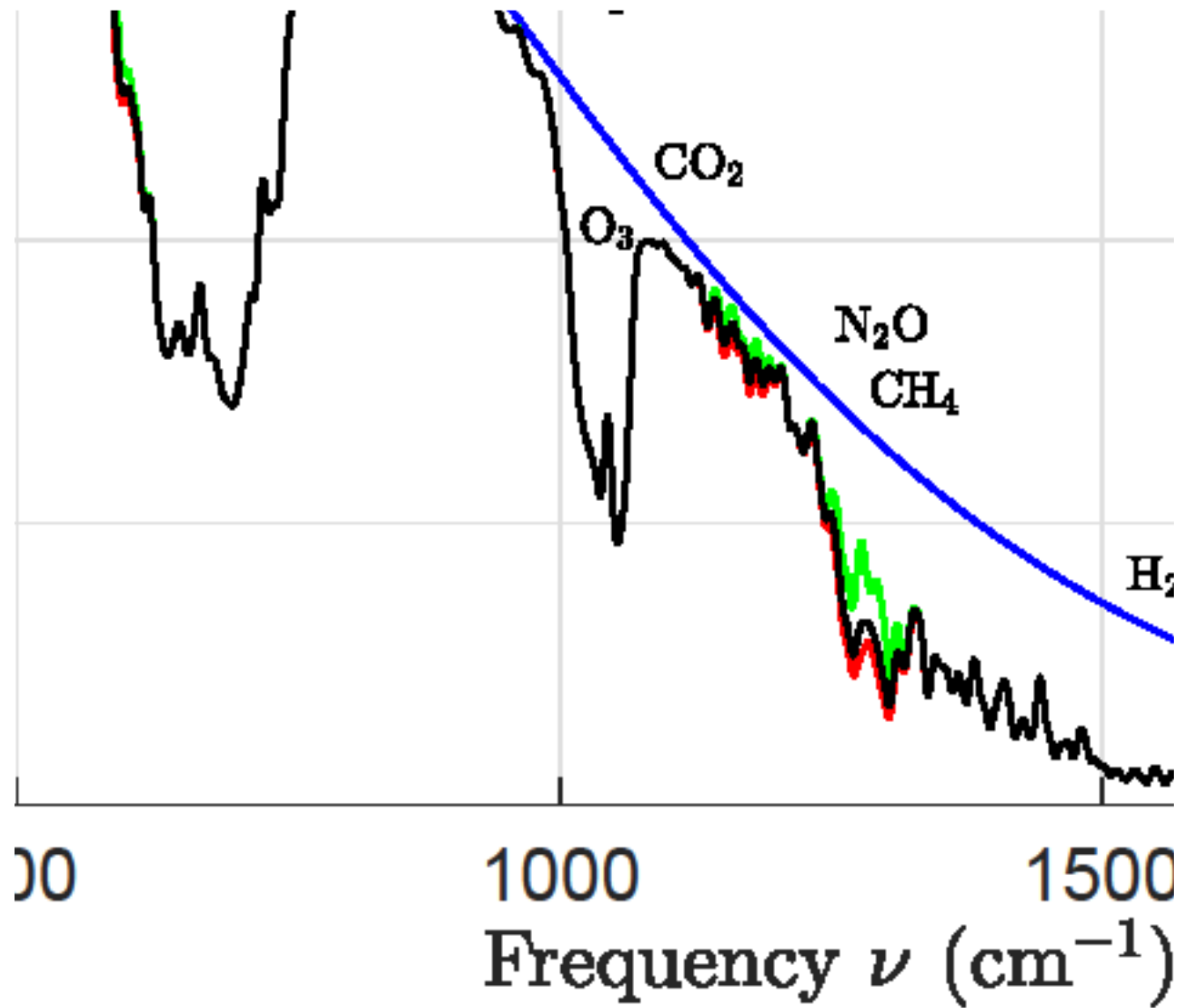


# N<sub>2</sub>O comparison

N<sub>2</sub>O



# N<sub>2</sub>O comparison



# Results of Numerical Experiments

## (What it All Means)

- If CO<sub>2</sub> were zero, it would make a big difference (about 25%),  
and the earth would be cooler
- If CO<sub>2</sub> were doubled, it would make a very small difference
- CH<sub>4</sub> and N<sub>2</sub>O are extremely hard to find on any graph  
Clearly, their contribution to the greenhouse effect is trivial
- Molecules of tiny concentration have even less effect
  - Example of HFCs, with extremely high GWP numbers



# Scientific Implications

- Agreement between theory and experiment  
is the hallmark of good science
- The method of van Wijngaarden & Happer meets that criterion
- It is far superior to the GCM results featured in IPCC reports,  
which always predict too high Temperatures.

More CO<sub>2</sub> makes only a tiny difference

More N<sub>2</sub>O or CH<sub>4</sub> is tinier still, far less than CO<sub>2</sub>'s effect

# Policy Implications

Acknowledge that “They Got it Right.”

Accept the results of van Wijngaarden & Happer,

instead of words in IPCC Summary-for-Policymakers

**There is NO climate emergency !**

Greenhouse gases can't stop the ever-changing climate

Therefore:

- Do not take expensive actions to mitigate climate change
- Do not strive to reduce CO<sub>2</sub> or other GreenHouse Gases

# How did we get into today's situation ?

- A “Summary for Policy-Makers” is written by *diplomats*  
*NOT scientists !*
- Busy people only read the highlights of the summary
- Real science gets buried very deep inside
- IPCC reports are lengthy and detailed
  - Working Group 1 examines the science
  - Working Group 2 asks what will happen
  - Working Group 3 asks what should be done about it.
- If WG1 said “no problem,” WG2 & WG3 would be out of business
  - Prestige, money, and momentum all reject that possibility.

# IPCC's fundamental errors (1)

- Real air vs. Dry air
  - The “standard atmosphere” doesn't exist in the real world
  - It is a laboratory gas, made by artificial means
    - It's easy to do calculations about dry air
  - Real air *always* contains some H<sub>2</sub>O
    - Enough so that saturation of the absorption bands occurs
- H<sub>2</sub>O is the *major* greenhouse gas
  - It should be calculated first, not later
    - Nobody ever does “perturbation” calculations that way

# IPCC's fundamental errors (2)

- Feedback mechanism
  - IPCC assumed *positive* feedback
    - Rising T → more H<sub>2</sub>O evap → GHGs closer to ground → rising T
      - Ref: Manabe's Nobel Lecture
  - Nature contains *negative* feedback mechanisms
    - LeChatelier's Principle
  - Feedback amplification misunderstood (Monckton *et al*)
    - Feedback acts on the entire signal, not just the delta

# Part 2: Why GWP is Useless

- Computational method is described in AR 4, pp 210 – 214
- Intent is to get a *ratio* of this gas compared to CO<sub>2</sub>
- The text presents an equation containing a triple integral
  - That intimidates most readers
  - People skim over the pages of verbiage that follows
- Simplifying assumptions immediately follow
  - Because of scant data, complicated functions are set = 1
  - Happer: “fuzzed up with poorly-known forcing times, indirect effects, etc.”
- A lengthy table of GWP values is presented
  - Notably CH<sub>4</sub> & N<sub>2</sub>O, but many more, including Freons.

# Three Reasons why CH<sub>4</sub> is Irrelevant

[ same is true for N<sub>2</sub>O ]

- 1. There isn't very much methane ( < 2 ppm)
  - Compare: CO<sub>2</sub> = 400 ppm and H<sub>2</sub>O = ~15,000 ppm ±
- 2. H<sub>2</sub>O out-competes CH<sub>4</sub> in the same spectral region
  - Collision-broadening of lines creates “overlap” in the troposphere
  - Only up in stratosphere do the “comb” of lines miss each other
- 3. Little energy emitted by earth in CH<sub>4</sub>'s absorption band
  - Remember: blackbody spectrum for 288 °K peaks at 15 microns
    - less than 20% of peak at 7.5 microns
    - CH<sub>4</sub> absorption band is very narrow
- **None of these are taken into account in GWP factor**

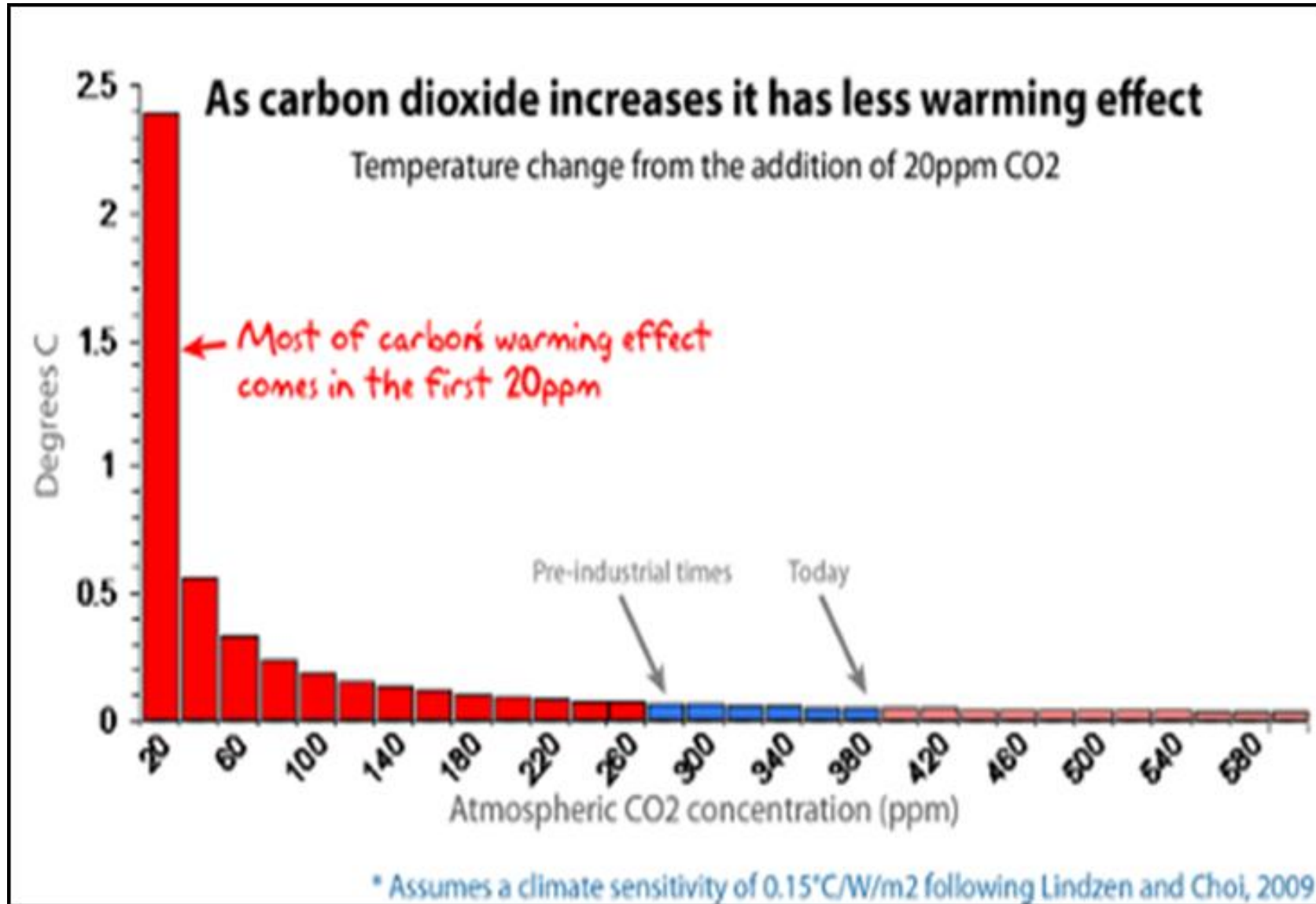
# Global Warming Potential

**GWP is the ratio of two slopes**

- Compares *saturation* curve for 2 gases
  - Vertical axis is absorption
  - Horizontal axis is concentration
- Concentration of  $\text{CO}_2 = 385$  ppm (in AR 4, 2007)
  - $\text{CO}_2$  absorption is very nearly saturated
  - Curve is very close to flat, and slope is a tiny negative number
- Concentration of  $\text{CH}_4 = 1.8$  ppm
  - Absorption curve declines steeply at low concentration
  - Slope is a substantial negative number



# CO<sub>2</sub> saturation curve



# “Diminutive Denominator” problem

- $Q = N / D$
- You can't divide by zero
- When the denominator is close to zero, the quotient will be huge
- For an increase (delta) of only 1 ppm:
  - CO<sub>2</sub> saturation curve changes very little
    - 410 → 411 ppm
    - Near-flat slope hardly changes at all
  - CH<sub>4</sub> saturation curve changes a lot
    - 1.8 → 2.8 ppm
    - Large slope becomes slightly less large

# Tiny denominator yields:

- CH<sub>4</sub>: GWP ~ 28
- N<sub>2</sub>O: GWP ~ 300
- Freons: GWP > 1000
- Every one of these numbers is *meaningless*
- The actual spectrum (vW & H) shows the reality

# Famous Last Words

- The climate system is a coupled non-linear chaotic system, and therefore the long-term prediction of future exact climate states is not possible.

•  
-- *IPCC, Third Assessment Report*

- This needs to be made clear to Elected officials everywhere

# Policy Implications

Accept the results of van Wijngaarden & Happer,  
rather than the IPCC Summary-for-Policymakers  
*OR the faulty contrived GWP values*

The trace gases don't influence the greenhouse effect

There is NO climate emergency

Greenhouse gases can't halt the ever-changing climate

Therefore:

- Do not take expensive actions to mitigate climate change
- Do not strive to reduce CO<sub>2</sub> or other greenhouse gases
- **Do not impose new regulations upon farmers**

# Questions?