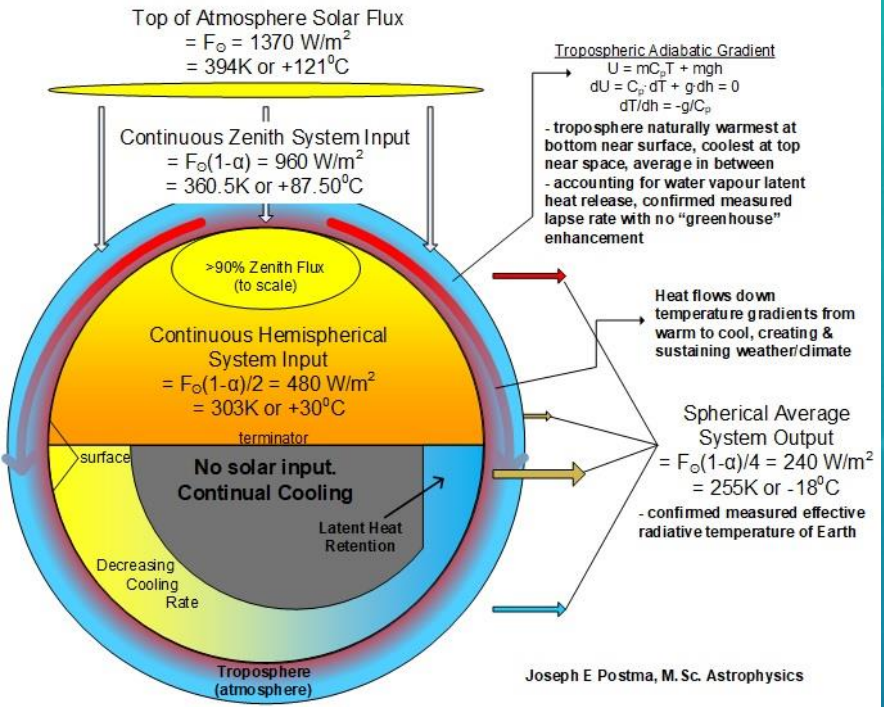


Earth's Thermodynamic Energy Budget



PLANETARY PHYSICS 201

$$B_\lambda(\lambda, T) = \frac{2hc^2}{\lambda^5} \frac{1}{e^{hc/(\lambda k_B T)} - 1}$$

Lect. 1: Earth's Temperature

Joseph E. Postma

TEMPERATURE

- What would we like to know about planets?
 - Let's try **temperature**, because why not – lots of physics
- What is Earth's temperature?
 - $+15^{\circ}\text{C}$? -18°C ? $+22^{\circ}\text{C}$?
 - All common answers, but none strictly correct
- Temperature is intensive – has value where you measure it
 - Average value is not meaningful: average number of testes/ovaries
 - "It's a *real* calculation." "It's the *real* average." – no meaning

TEMPERATURE (CONT'D)

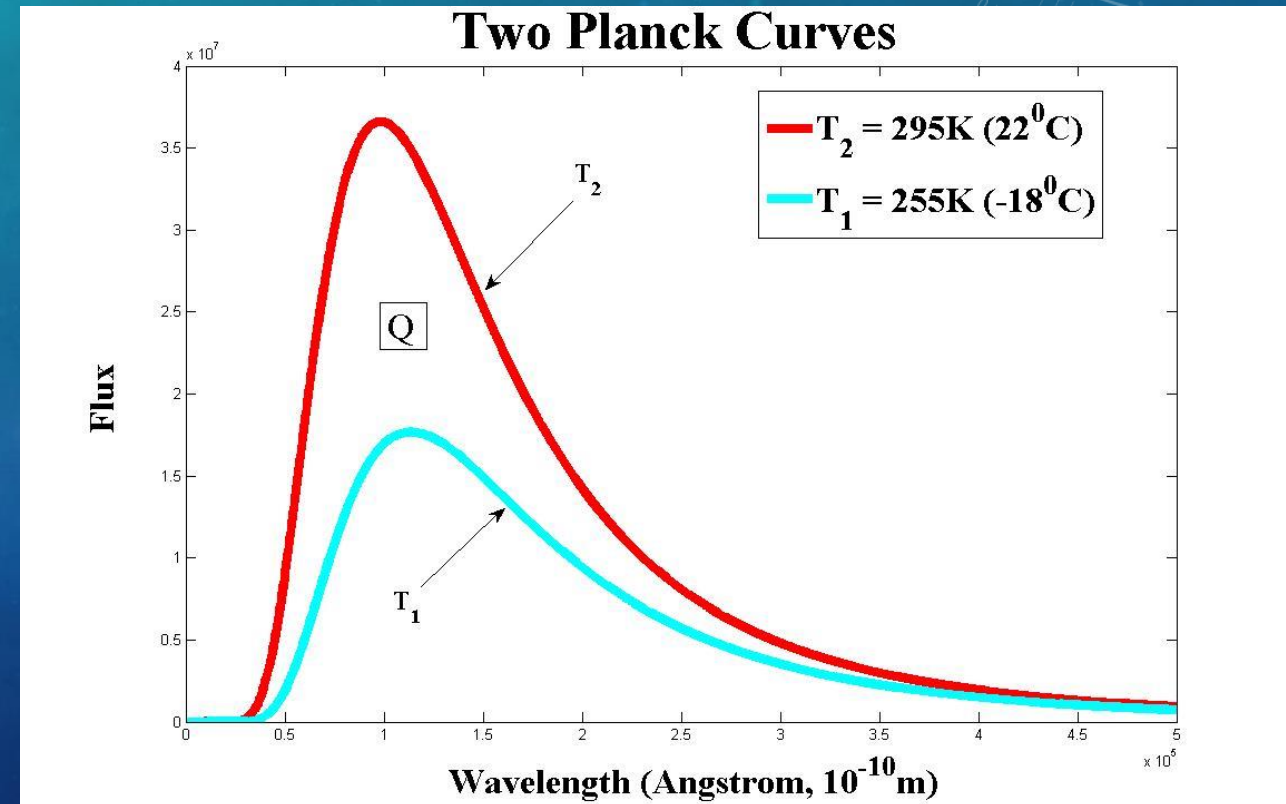
- Just because you can compute it or *say* it, does not necessarily mean anything at all: Gödel's Incompleteness Theorem (also: lies)
- Example of extensive quantity would be mass
- In astronomy, stars have temperature – but why & how?
 - No one has stuck a thermometer in a star!
 - Temperature is still always intensive, so how does a whole star have a single temperature? Are stars uniform? Sun isn't...
 - So, what's the trick to get a star's temperature?

PLANCK'S LAW

$$B_\nu(\nu, T) = \frac{2h\nu^3}{c^2} \frac{1}{e^{h\nu/(k_B T)} - 1}$$

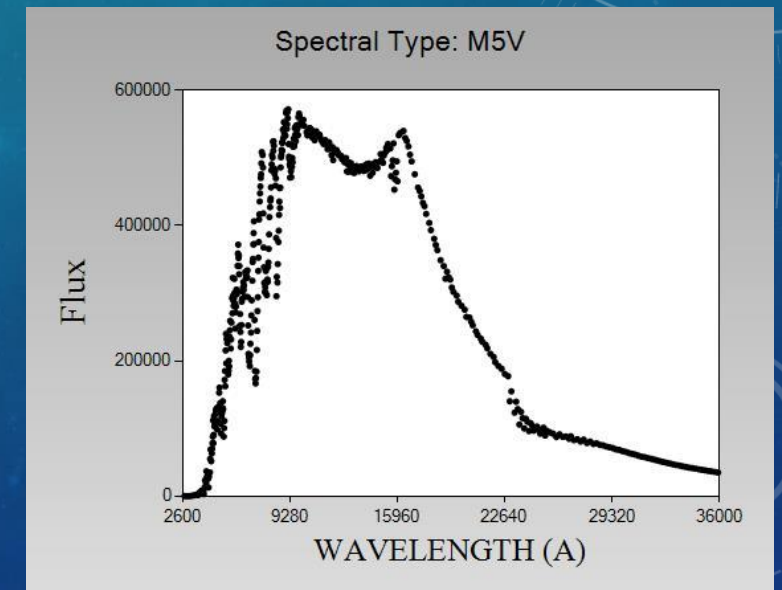
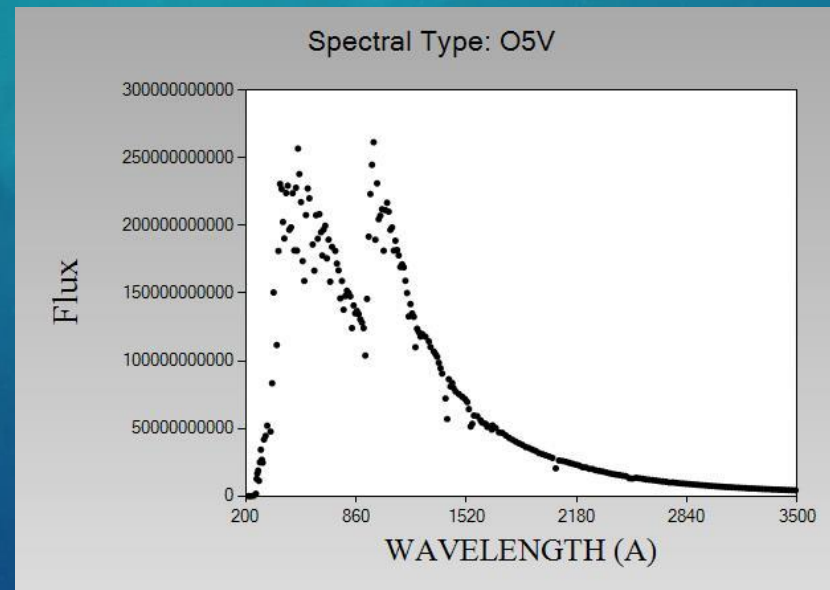
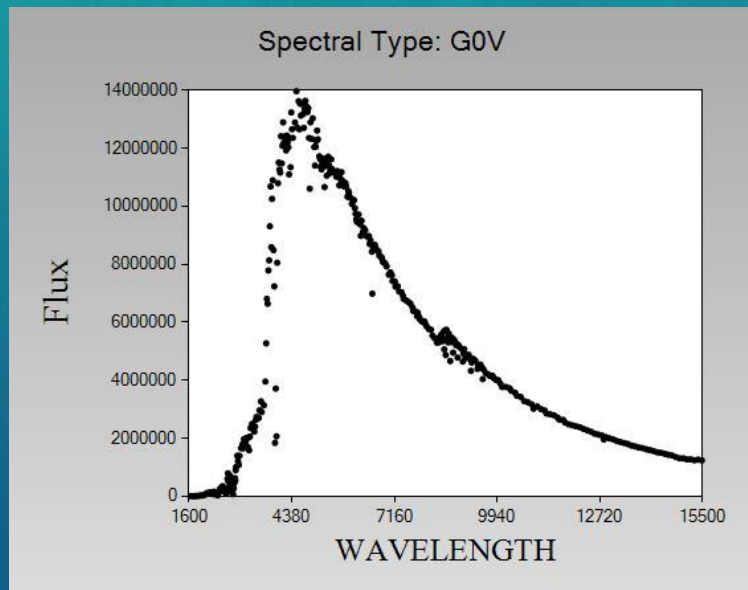
$$B_\lambda(\lambda, T) = \frac{2hc^2}{\lambda^5} \frac{1}{e^{hc/(\lambda k_B T)} - 1}$$

- Function of radiative intensity vs. frequency or wavelength, for a given temperature



PLANCK'S LAW & STARS

- Stars emit somewhat like blackbodies:



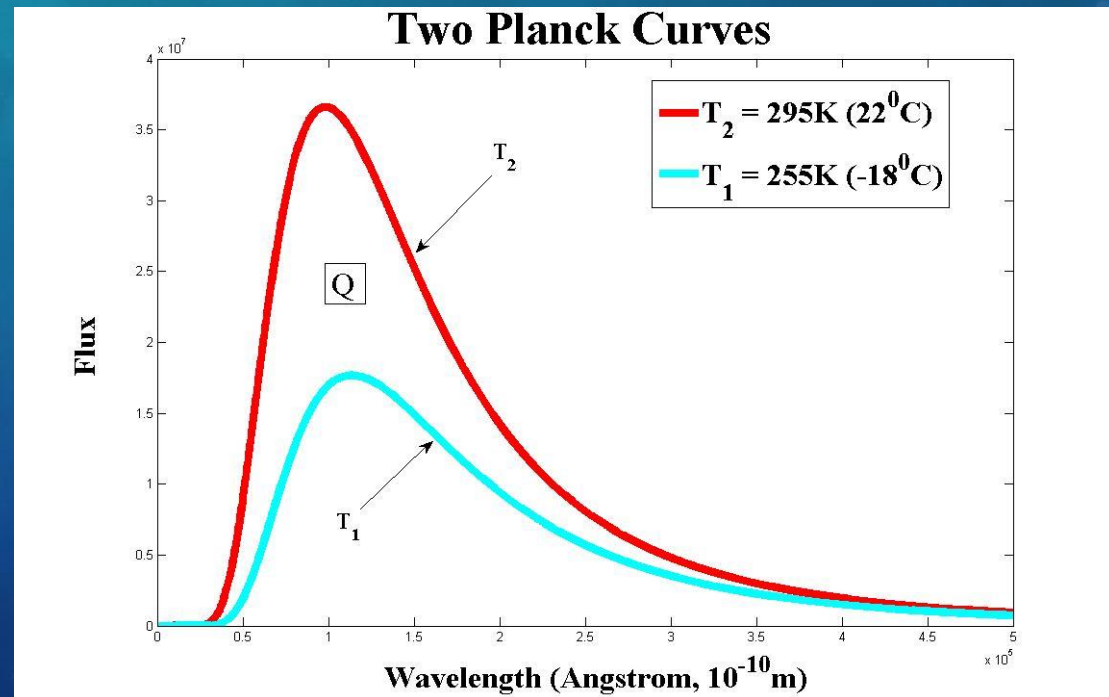
STEFAN-BOLTZMANN LAW

- Total power per unit area $\text{J/s/m}^2 = \text{W/m}^2 = \text{Flux}$

$$P = \int_0^\infty d\nu \int_0^{\frac{\pi}{2}} d\theta \int_0^{2\pi} d\phi B_\nu(T) \cos(\theta) \sin(\theta) = \sigma T^4$$

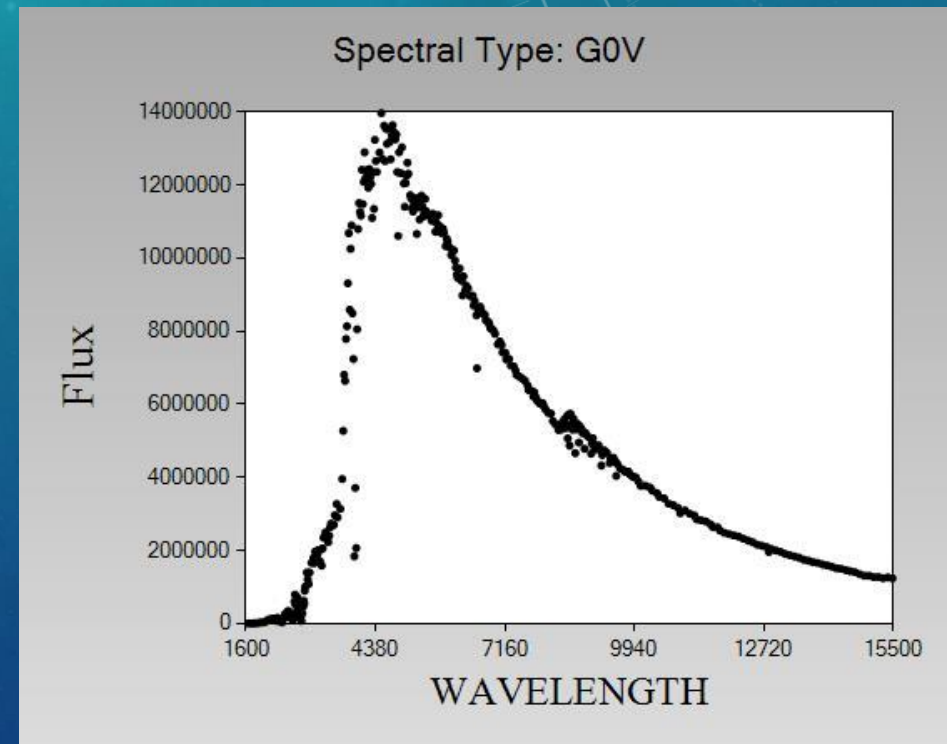
- S-B Law gives total area under the Planck Curve at a given temperature

- $F = \sigma T^4$



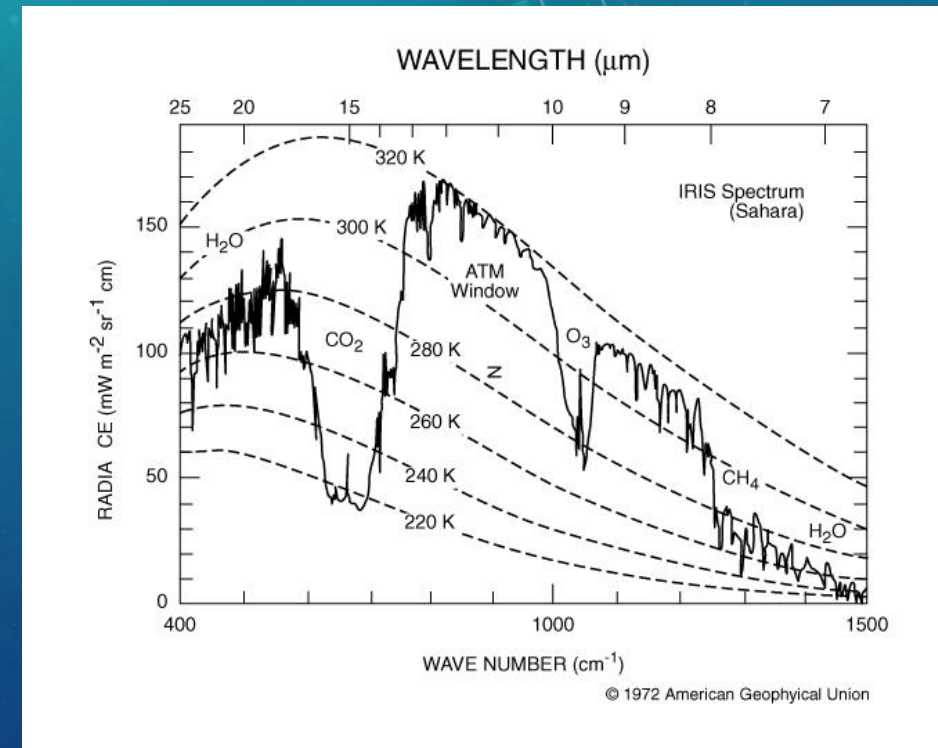
EFFECTIVE TEMPERATURE

- Let us define *Effective Temperature*: the temperature at which a blackbody would emit if it emitted the same total flux as the integrated stellar spectrum: $F = \sigma T_{\text{eff}}^4$
 - It's *not the actual temperature* of the star, but, it is perhaps a ballpark metric
 - Strictly a *fictional* temperature!
 - Works well enough for spectral classification



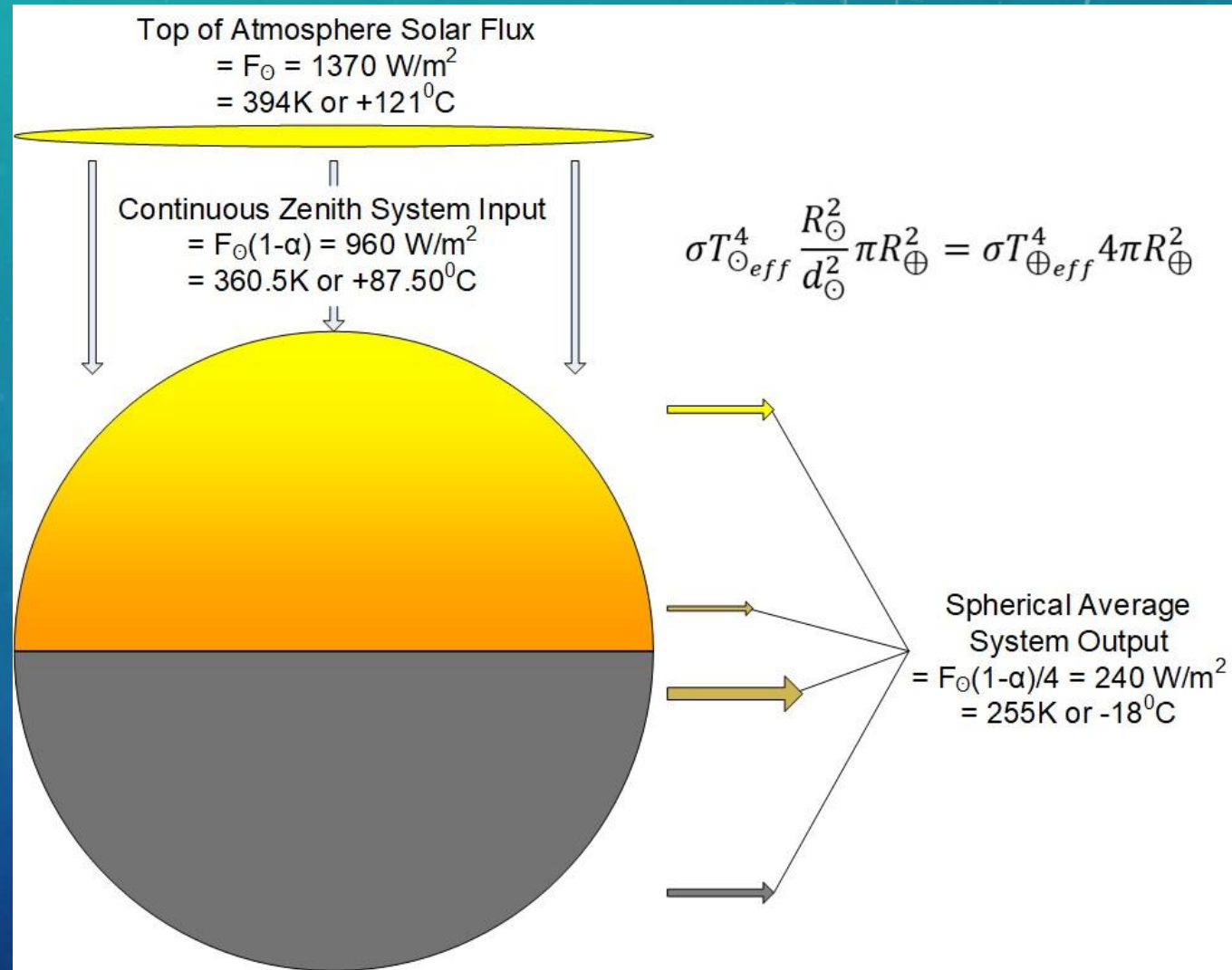
EARTH AND T_{EFF}

- Can we do T_{eff} for Earth?
 - Sure! Why not? Just an estimate!
- Can solve from first principles of conservation of energy with solar input, assuming COE applies and no other sources



EARTH AND T_{EFF} (CONT'D)

- Given the Sun's T_{eff} , its distance from Earth, and Earth's radius, use cross-section of Earth to get total absorbed solar energy (factored for albedo), and use that as Earth's output per average unit area of Earth's surface



EARTH AND T_{EFF} (CONT'D)

- Result is:
 - Earth $T_{\text{eff}} = 255\text{K}$ or -18°C from $\sim 240 \text{ W/m}^2$; This IS Earth's T_{eff} !
- But: Should Earth *be* this temperature everywhere?
 - NO – Why not?
 - Earth is heated on one side & rotating: temperature always changing
 - Atmospheric temperature changes with altitude due to IGL & gravity
 - T_{eff} is fictional, not literal or physical: Earth is NOT a blackbody!
- Like a star's photosphere (from modelling), the T_{eff} *may* be found physically somewhere in the photosphere/atmosphere...

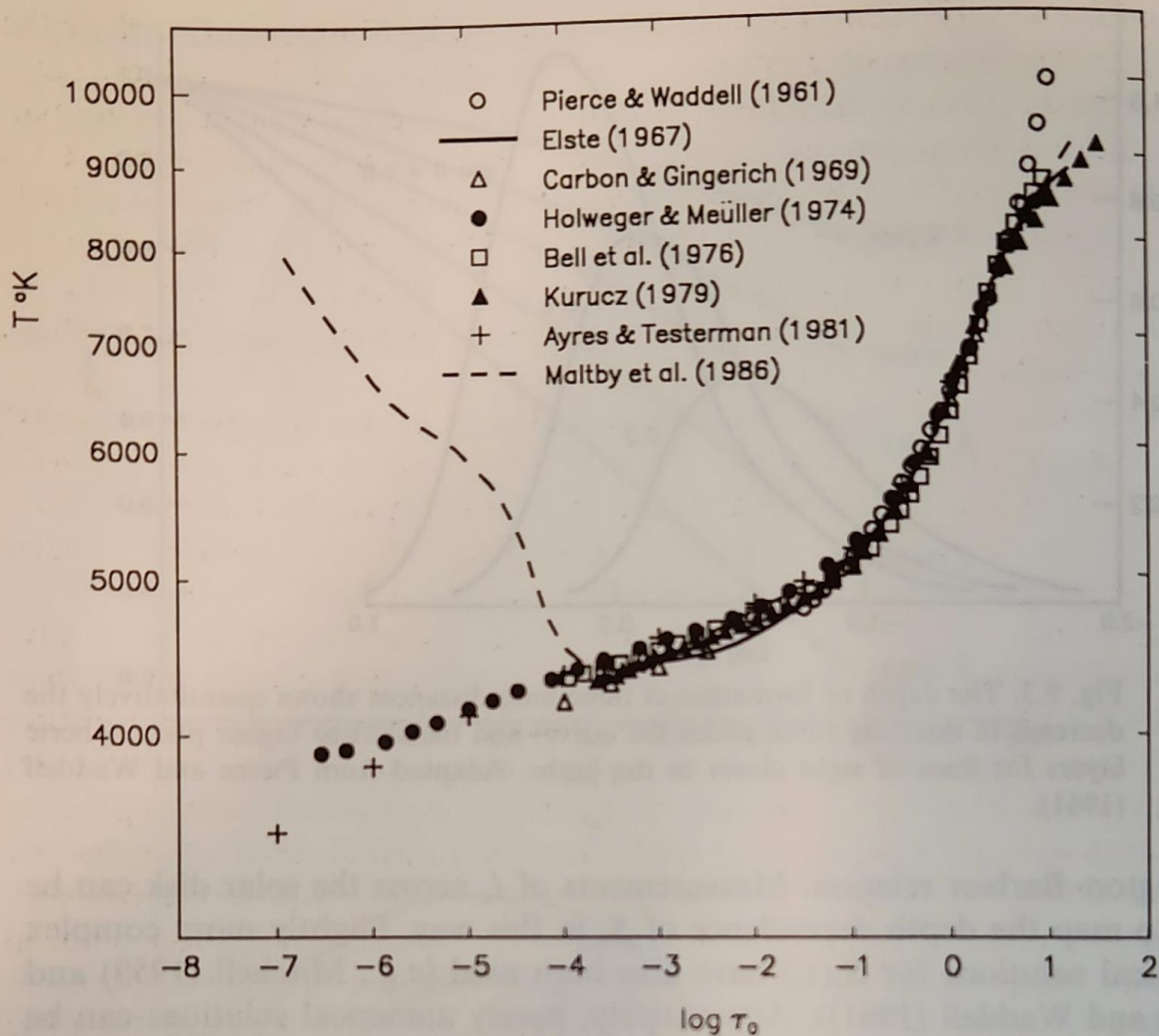


Fig. 9.4. Several solar temperature distributions are compared.

Table 9.2. Solar mean temperature distribution.

$\log \tau_{5000}$	T (K)	$\log \tau_{5000}$	T (K)
-4.0	4300	-0.6	5490
-3.5	4350	-0.4	5733
-3.0	4450	-0.2	6043
-2.5	4550	0.0	6429
-2.0	4650	0.2	6904
-1.6	4800	0.4	7467
-1.4	4874	0.6	7962
-1.2	4995	0.8	8358
-1.0	5132	1.0	8630
-0.8	5294	1.2	8811

LAPSE RATE

- Lapse rate refers to change in temperature with distance
 - “Like” a stellar photosphere, Earth’s atmosphere T changes w. alt.
- With stellar photospheres we apply local thermodynamic equilibrium (LTE) at each layer for modeling
 - Can try for Earth too? Why not! But with caveats:
 - Photosphere is highly radially symmetric – any given column quite is similar to any other, & heat input is uniform; vs.:
 - No radial symmetry on Earth, heat input not uniform long. or lat.
 - ...but then, only first few hundred m of Earth atmosphere changes T...

LTE FOR EARTH'S ATMOSPHERE

- Let's try LTE and see what happens anyway!
- $U = mC_pT + mgh + c$ (total energy of an air parcel)
- LTE at each infinitesimal layer: $dU = mC_pdT + mgdh = 0$
 - Adiabatic lapse rate
 - $\Gamma = dT/dh = -g/C_p = \sim -9.7 \text{ K/km}$ (dry lapse rate)
 - This is too high (true for deserts)! Measured average is -6.5 K/km .
 - What would slow down the lapse rate? How to do that?

FIRST LAW OF THERMODYNAMICS

- How does one change or affect temperature?
- 1st Law of Thermodynamics tells you how!
 - $dU = Q + W = mC_p dT$
 - No Work, other than gravity term already accounted for
 - Therefore, Q? Any source of Q?
 - Q_{Sun} ? Only occurs at bottom of atmosphere – need entire column
 - N_2 ? O_2 ? Ar? CO_2 ?
 - H_2O ? Latent heat!
 - Releases thermal energy without changing temperature (wow!)

WET ENVIRONMENTAL LAPSE RATE

- Water Vapor mass concentration at surface: $\chi_m^{H_2O} = \chi_v^{H_2O} \cdot \frac{m_{H_2O}}{M_{Air}}$
 - $\chi_v^{H_2O} = 2.5\%$; $m_{H_2O} = 18.02$ g/mol
 - $M_{Air} = 28.57$ g/mol (STP)
 - $m_{Air} = 1.225$ kg/m³
 - Latent heat of vaporization: 2,257,000 J/kg
 - Concentration of H₂O vapor goes to zero ~10km
- Do the math!
 - Calculate rate of Q per m (km) from latent heat release, and get:
 - $\Gamma = -6.24$ K/km after factoring in to -9.7K/km result (WOW!!)

EMPIRICAL PHYSICS

- $\Gamma = -6.24$ K/km calculated vs. -6.5 K/km observed
 - Considering we assumed LTE, but system not really in LTE: this is GREAT!
- Indicates no other major T-modulating factors (work or heat)
 - If there were, like when we calculated dry rate, we wouldn't get close answer
 - No other major factors...or they all cancel...but what would they be?
 - (Sun? Solar heat absorbed at surface, and some in atmosphere...)
 - Small discrepancy due to estimate errors or rounding?
 - C_p and LH_{vap} not constant with temperature
 - 2nd order effects

ATMOSPHERIC PROFILE

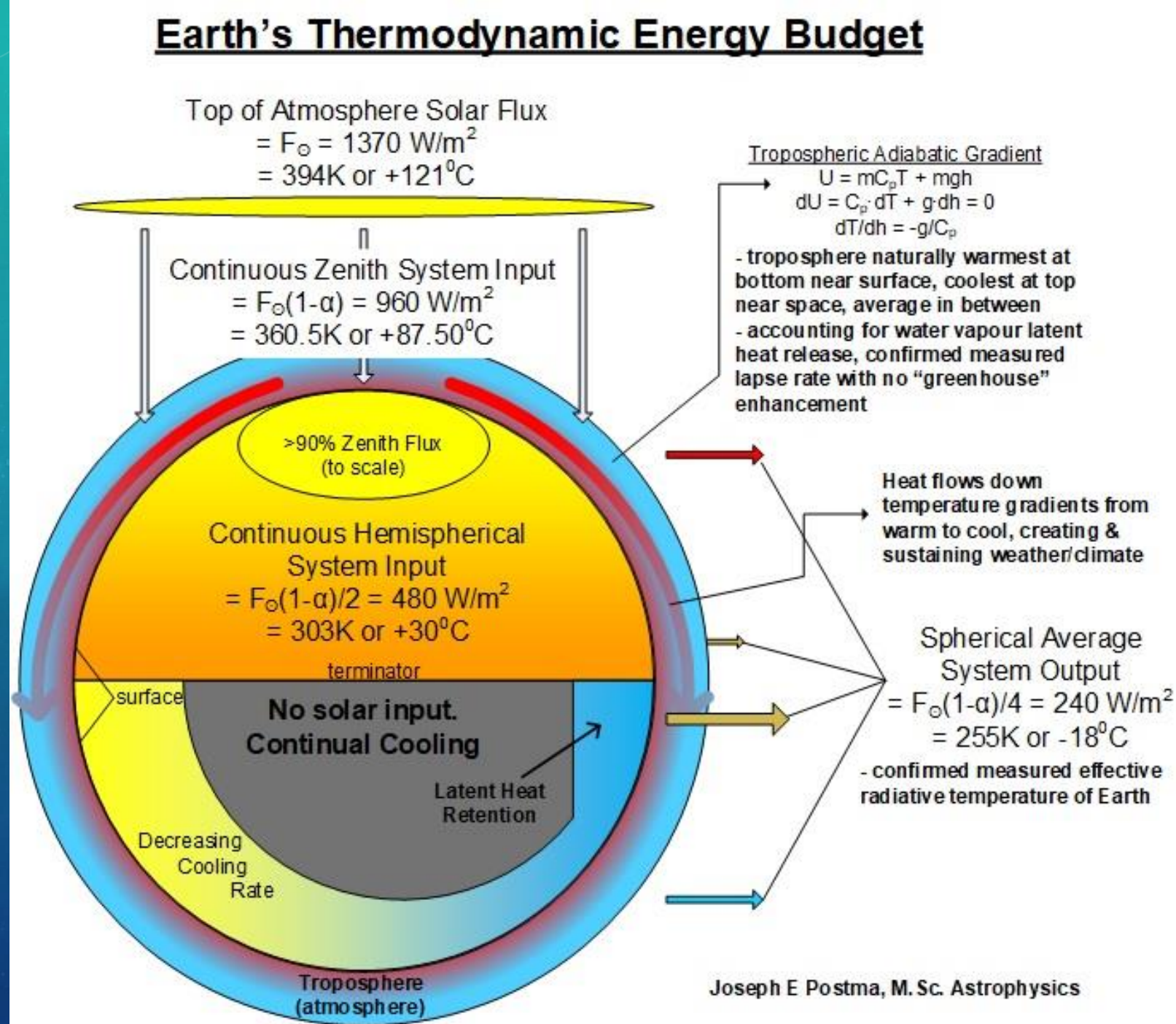
- Integrate $\Gamma = dT/dh = -6.5 \text{ K/km}$
 - $T(h) = -6.5 \text{ K/km} * (h - h_0) + T_0$
- What is h_0 and T_0 ?
 - Why not use $T_0 = T_{\text{eff}} = -18^\circ\text{C}$, $h_0 = 5 \text{ km}$ (observed); get:
 - $T(0) = -6.5 \text{ K/km} * (0 \text{ km} - 5 \text{ km}) - 18^\circ\text{C} = \mathbf{14.5^\circ\text{C}}$ -> **NICE!** (vs. 15°C observed)
- Discrepancies (C_p and L_{vap} not const. w. T , -18°C fict.; **0.3% err!**)
 - Heat from Sun occurs at surface – pushes surface T higher
 - Latent heat of freezing and vaporization – keeps surface T higher
 - Not really in thermal equilibrium or BB...but close? **BB is lowest T for F?**
- Atmospheric temperature profile **fully** explained! ($h_0 \rightarrow$ IGL)

IDEAL GAS LAW & h_0 $PV = nkT$

- P set by Earth's gravity: higher g, higher P, lower g, lower P
- V set by Earth's size: atmospheric shell vs. Earth radius
- n set by amount (mass) of atmosphere: fixed (slow outgassing)
- T is the independent, determined variable
 - occurs where it has to
 - other planets 1 Earth atm. have same temperature
- h_0 for T_0 **cannot** occur at Earth's surface
 - Solar heat occurs at surf., therefore bottom must be warmest part
 - Lapse rate requires T distribution with altitude: bottom warmest!
 - Expected average by definition occurs around middle of sequence

BUDGET

- Heat flows one way (down temp gradients)
- Heat comes from Sun
- Solar heat creates and sustains the climate
- Temperature structure entirely explained by IGL
- No other effects...?



GENERALIZATION

- Thought Experiment (what happens?):
 - Remove shells of Earth's crust and replace with atmosphere of appropriate pressure and other variables as function of depth (assume Earth mass stays the same or negligibly changes)
 - -18C stays at the same location (*at that altitude no diurnal changes)
 - Bottom of atmosphere gets hotter and hotter the more depth
 - Reminds you of?
- **Venus:** atmosphere is 90 times Earth's atmospheric mass, depth; analysis works for Venus too! Physics is universal!

FEEDBACK AND STABILITY

- Effect of w.v. is to significantly lessen the adiabatic gradient
 - Makes it cooler at the surface than the dry rate (+22⁰C)
 - Tropical areas vs. desert areas at same latitude always *cooler*
 - Warm air holds higher w.v., therefore negative feedback to warming
- Effect of latent heat in H₂O slows cooling/freezing of air
 - Therefore also negative feedback to cooling
- Water vapor and semi-thick atmosphere makes Earth's surface climate very stable
 - Moon changes from +121⁰C to -150⁰C

SUMMARY

- Get Earth's T_{eff}
 - This is not the ground surface temperature; shouldn't be thought of as such; atmosphere is integral part of the Earth ensemble
 - Perhaps can be likened to an expected average temperature of the system
- Derive Lapse Rate
 - Factor in latent heat release from water vapor
 - Existence of LR necessitates that any expected average cannot occur at an extremity
- Integrate Lapse Rate to get temperature as function of height
 - Use T_{eff} as expected average (though Earth is not a BB)
 - Use h_0 where T_{eff} physically occurs in the atmosphere; h_0 occurs where it has to due to IGL
- Calculate $T(h = 0)$ -> **very** close to empirical surface temperature (0.3%)
 - Surface temperature *slightly* higher for many reasons (tiny 0.3% error – WOW!!)
- Temperature profile of Earth entirely explained with no RGHE

Earth's Thermodynamic Energy Budget

Top of Atmosphere Solar Flux
 $= F_{\odot} = 1370 \text{ W/m}^2$
 $= 394\text{K}$ or $+121^{\circ}\text{C}$

Continuous Zenith System Input
 $= F_{\odot}(1-\alpha) = 960 \text{ W/m}^2$
 $= 360.5\text{K}$ or $+87.5^{\circ}\text{C}$

Continuous Hemispherical System Input
 $= F_{\odot}(1-\alpha)/2 = 480 \text{ W/m}^2$
 $= 303\text{K}$ or $+30^{\circ}\text{C}$

No solar input.
 Continual Cooling

Latent Heat Retention

Decreasing Cooling Rate

Troposphere (atmosphere)

Tropospheric Adiabatic Gradient

$$U = mC_p T + mgh$$

$$dU = C_p dT + g dh = 0$$

$$dT/dh = -g/C_p$$

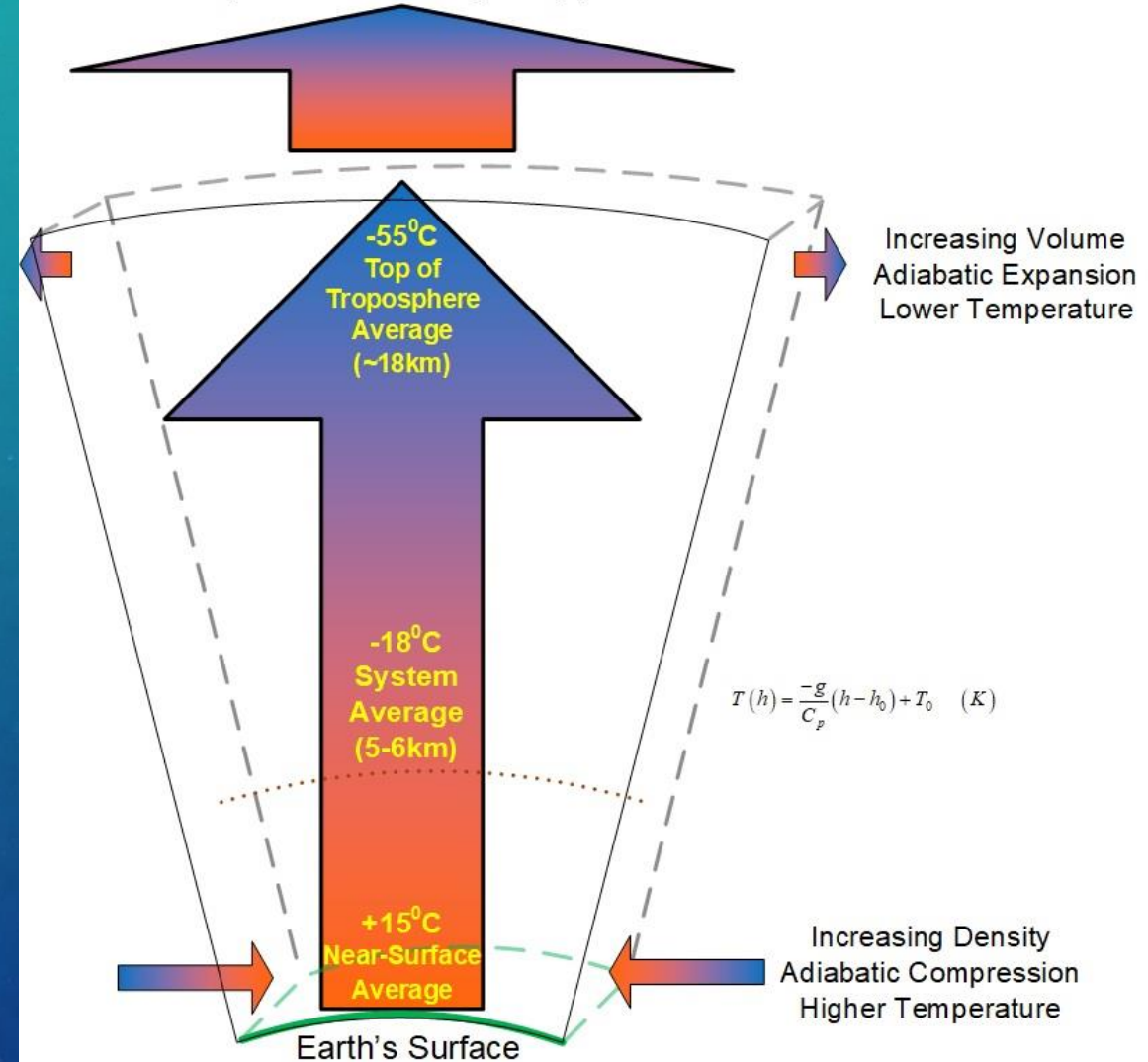
- troposphere naturally warmest at bottom near surface, coolest at top near space, average in between
 - accounting for water vapour latent heat release, confirmed measured lapse rate with no "greenhouse" enhancement

Heat flows down temperature gradients from warm to cool, creating & sustaining weather/climate

Spherical Average System Output
 $= F_{\odot}(1-\alpha)/4 = 240 \text{ W/m}^2$
 $= 255\text{K}$ or -18°C
 - confirmed measured effective radiative temperature of Earth

Joseph E Postma, M. Sc. Astrophysics

-18°C Radiative Aggregate Output (Effective Blackbody Temp.)



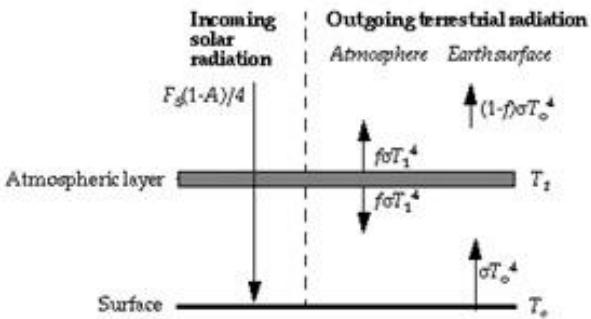
POINT OF DEPARTURE?

- Where does the prevailing narrative depart from the development shown here?
 - Let's check! (slide 10)
 - -18°C should be everywhere
 - Treats T_{eff} as solar input; Sun cannot create the climate or weather
 - Treats Earth as flat plane
 - No mention or derivation of dry and wet lapse rate
 - Assumes that T_{eff} should occur at the bottom of the atmosphere, the hottest part, instead of at the average.

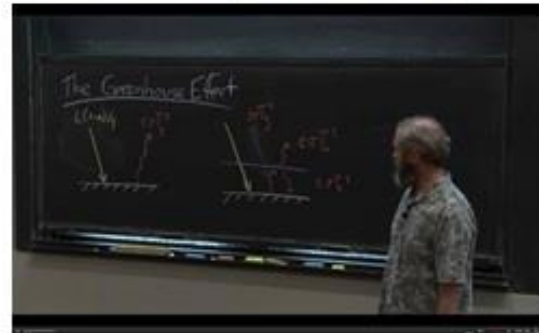
Roy Spencer: "sunlight does get spread over the full sphere of the Earth, how can you dispute that, it's the starting point for all of climate science"

The Foundation of Climate Science

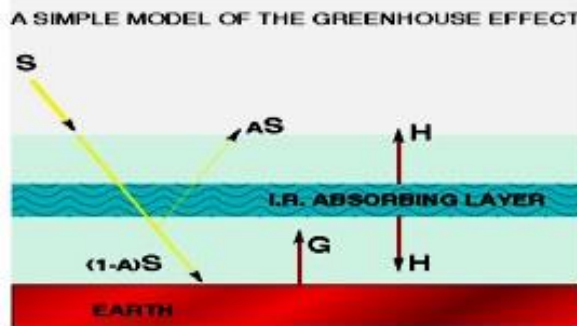
Harvard University



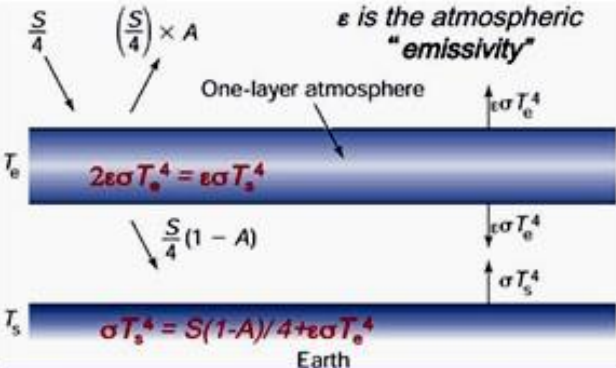
University of Chicago



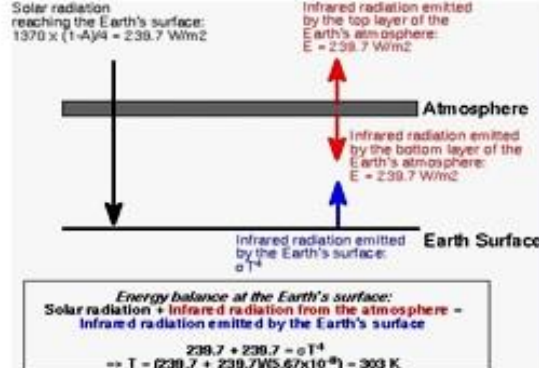
Columbia University



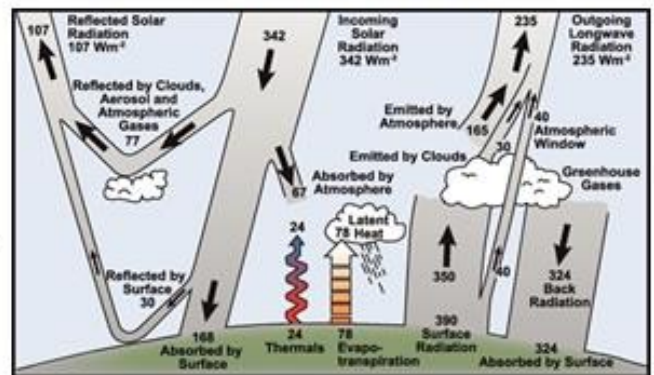
Pennsylvania State University



University of Washington



American Meteorological Soc.



These diagrams demonstrate the universal starting point by which climate science then derives its "greenhouse effect". Look past the math and see what the math is being developed for: What is a flat line representing the entire Earth called?

Joseph E. Postma - M.Sc. Astrophysics

WHICH ONE?

Sun

Sun

Sphere Earth

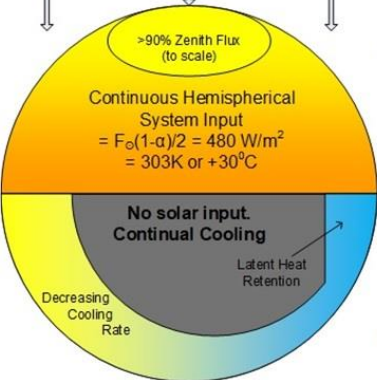
Flat Earth

- Sun creates climate
- Climate is transfer of solar heat
- Input transfers through to output
- Physically, mathematically realistic
- Consistent with Thermodynamic Laws
- Empirically observable
- ***Not acceptable to climate science peer-review***

- Sun cannot create climate
- Climate creates itself out of nothing
- Output reversed for input
- Mathematically, physically, theoretically, & graphically equivalent to flat Earth
- Inconsistent with Thermodynamic Law
- Empirically fictional
- Fake version of greenhouse effect refuted by real greenhouses
- ***Peer-reviewed climate science***

Top of Atmosphere Solar Flux
 $= F_o = 1370 \text{ W/m}^2$
 $= 394\text{K or } +121^\circ\text{C}$

Continuous Zenith System Input
 $= F_o(1-\alpha) = 960 \text{ W/m}^2$
 $= 360.5\text{K or } +87.5^\circ\text{C}$



Spherical Average System Output
 $= F_o(1-\alpha)/4 = 240 \text{ W/m}^2$
 $= 255\text{K or } -18^\circ\text{C}$

"They cannot both be correct."
 - Joseph E Postma, M.Sc. Astrophysics

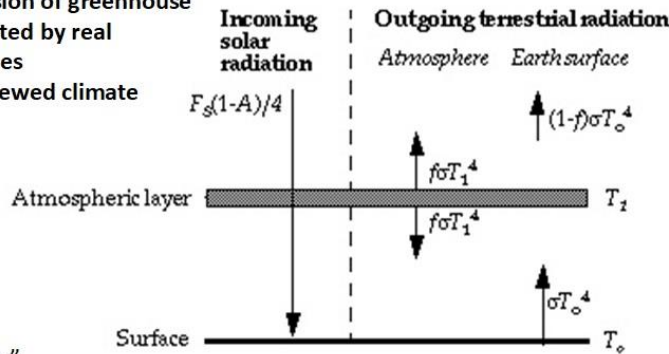


Table 1: Comparison of the standard global energy budget to that of the alternative thermodynamic energy budget presented in this paper

Global Energy Budget	Standard Model	Thermodynamic Model
Solar Input Geometry:	Evenly over entire spherical surface represented as a flat plane	Over single hemisphere as a function of solar zenith angle
Heat Flow:	Reversible/recyclable	Unidirectional
Climate:	As a secondary consequence of heat recycling	As a direct consequence of solar heat flow
Solar flux:	Insufficient to create a climate without heat recycling	Sufficient to create a climate directly
Empirically:	Fictional	Observable
Thermodynamically:	Inconsistent with Theory	Consistent with Theory

VALID VS. INVALID FICTION

- Working out physics for fictional things leads to impossible results
 - Orbital mechanics for flat Earth. Why not? What speed to orbit?
 - Thermodynamics for flat Earth? Impossible heat flow, etc. etc. etc.
- Not all approximations or fictional representations are valid
 - “fiction” of a free body diagram *is* a valid fiction for depicting total Force
 - “fiction” of a flat Earth is *not* a valid fiction for depicting solar input
- What’s the difference? THIS IS IMPORTANT!
 - If the fiction dictates & determines the mathematical topology
 - Flat Earth dictates Sun cannot create climate
 - Flat Earth requires heat flow from cold to hot to “make” it work

CONSEQUENCES OF INCORRECT SCIENCE

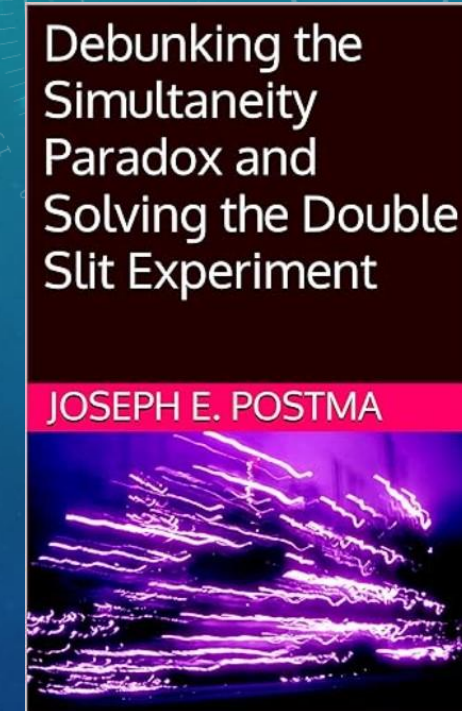
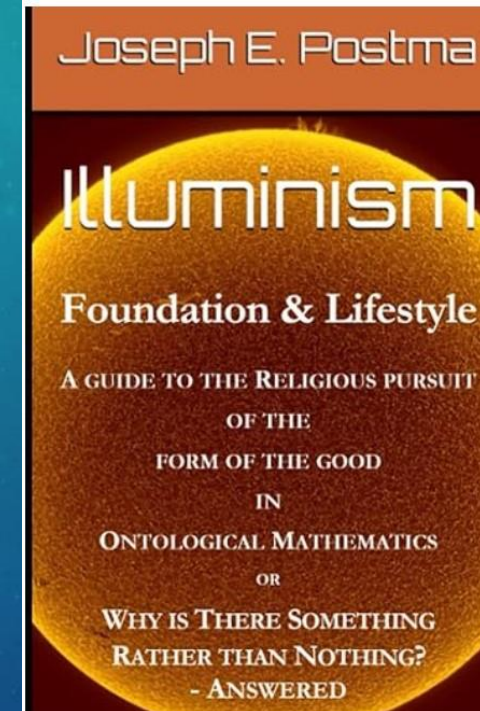
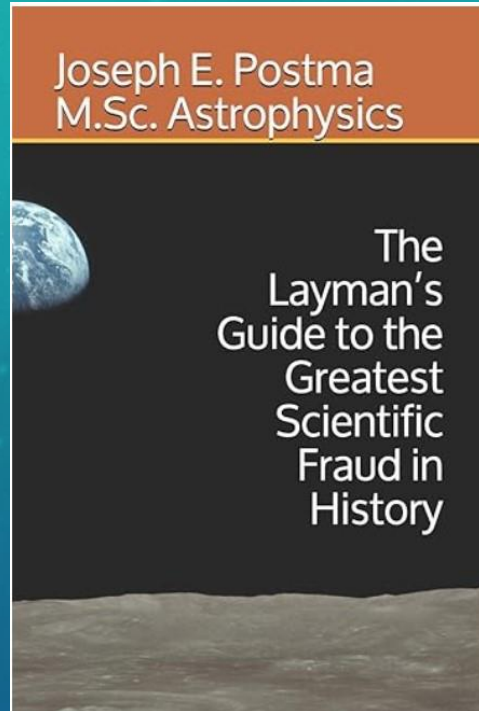
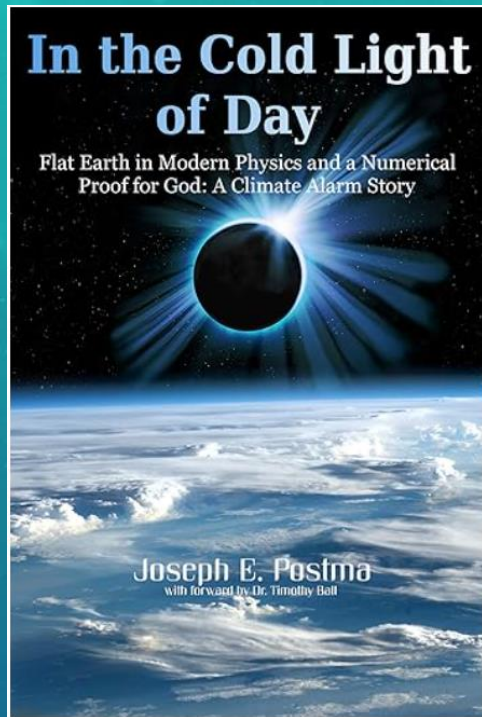
- What are the consequences of doing this wrong?
- In contrast of this presentation to the prevailing narrative:
 - Demonstrates the philosophical idea that false science leads to false knowledge, and that false knowledge equates, variously, to death, anti-“God”, destruction, & ofc *contradiction*
 - Cut down forests for env.; remove CO₂ & Sunlight for env.
 - Engineer bacteria to remove CO₂ -> T.E.L.E.

- This is all based on the conclusions of a fictional flat Earth theory & its resulting impossible-physics:
- <https://www.politico.com/news/2023/07/01/white-house-cautiously-opens-door-to-study-blocking-suns-rays-to-slow-global-warming-ee-00104513>
 - “SRM {“solar radiation management”} offers the possibility of cooling the planet significantly on a timescale of a few years.”
 - “Politicization around climate change has obviously been the huge driver” of policy gridlock on reducing carbon emissions, she said. “And so I think trying to avoid politicization around geoengineering is also important.”
 - “Policymakers in the European Union have signaled a willingness to begin international discussions of whether and how humanity could limit heating from the sun.”
 - “Climate change is already having profound effects on the physical and natural world, and on human well-being, and these effects will only grow as greenhouse gas concentrations increase and warming continues,” the report said. “Understanding these impacts is crucial to enable informed decisions around a possible role for SRM in addressing human hardships associated with climate change.”
 - “European Union leaders opened the door to international discussions of SRM. It also followed a call by more than 60 leading scientists to increase research on the topic.”
 - “This report also signals that the U.S. government is supportive of well-governed research, including outdoor experimentation, which I think is quite significant.”
- From the timesofisrael.com:
 - “In possible climate breakthrough, Israeli scientists engineer bacteria to eat CO₂.” “Decade-long research at Weizmann Institute could pave way remove excess global warming CO₂ from air.” “In a remarkable breakthrough, researchers at the Weizmann Institute have produced a genetically engineered bacteria that can live on carbon dioxide rather than sugar.”
- From the U.S.A. President Biden’s “climate envoy”, Senator John Kerry, on carbon dioxide:
 - “Even if we get to net zero, we still have to get carbon dioxide out of the atmosphere.”
- From Bloomberg Business:
 - “What if We Blotted Out the Sun to Fight Global Warming? “Cutting off sunlight to fight climate change could be necessary”.
- <https://www.forbes.com/sites/startswithabang/2018/05/26/ask-ethan-can-we-build-a-sun-screen-to-combat-global-climate-change/?sh=2866b8371f00>
 - “the idea is to build something that would stay between us and sun all year long...” – at the Lagrange point between Earth & Sun
 - “This is one of the most ambitious, but also one of the sanest, options we could possibly consider when it comes to combatting global climate change.”
- Peer Review of my proposal that we use spherical Earth where Sun creates climate (discussed fully in Planet Wars book); *impossible responses*:
 - “The proposed spherical model is incomplete and quite wrong in so many ways.” re: *That the Sun creates the climate*: “This is nonsense.”
 - “there should be some solid theoretical evidence provided to support your proposed idea was a better method which should lead to some scientifically significant results.”
 - “no compelling evidence or analysis for a new approach or model; much more extensive underpinnings are required for new scientific claims”
 - “Our journal deals with subjects that would be adequate for university-level teaching, not with scientific quarrels or alternate interpretations one might conceive like you mention.”
 - “I believe that your approach should first be vetted by experts who could validate or invalidate it.”
 - “The arguments made for consideration of an alternative mean energy budget model are ad-hoc and without justification or mathematical rigour.”
 - *Variously 1v1 @ me*: “heat flow from hot to cold only does not apply to radiation”; “you seriously don’t understand a cartoon with planar geometry?!”; “cannot communicate my disrespect; dangerously ill-informed model”; red-herring (misleading distraction): “not worthy of attention - the gcm’s use a spherical Earth”
- They *really do want* to end all life on Earth. **They really do mean it!** They’re going quite out of their way to justify it and engineer it while ***pretending*** env. virtue
- Has the Kepler Space Telescope Discovered an Alien Megastructure? <https://www.space.com/30832-kepler-telescope-alien-megastructure.html>
 - Consider: A derelict artefact of a long-lost civilization now randomly occluding their star’s light, looking upon a world bereft of life, moon-barren, and dead
 - A people perhaps not much unlike us: industrious, trusting, naïve, too-easily frightened, too young in consciousness, like children, too innocent: ***intellectually raped to death***

SUPPORT

- These people aren't stopping, aren't going to stop, and my videos and books don't matter to psychopaths who ***obviously*** want to destroy life on Earth; they don't care!
 - Strangely ***totally resistant*** to physics solutions showing no problem, no need to do SRM/CCS/str. geoeng.
- I lost my career because it's "harassment" and "hatred" when I point out their flat-Earth-based plans to ***wreck*** planet Earth (they can gaslight-harass, mentally violate and rape you all they want, of course; but if you complain about it, you'll be punished)
- **We are apparently in the situation where we need to defend planet Earth from a well-coordinated effort to end our biological template of photosynthesis**
 - JFK: "For we are opposed around the world by a monolithic and ruthless conspiracy that relies on covert means for expanding its sphere of influence-on infiltration instead of invasion, on subversion instead of elections, on intimidation instead of free choice, guerrillas by night instead of armies by day. It is a system which has conscripted vast human and material resources into the building of a tightly knit, highly efficient machine that combines military, diplomatic, intelligence, economic, scientific and political operations. Its preparations are concealed, not published. Its mistakes are buried not headlined. Its dissenters are silenced, not praised. No expenditure is questioned, no rumor is printed, no secret is revealed."
 - Who could JFK have possibly been talking about? Us regular humans simply aren't capable of that degree of CnC. JFK was the leader of the most powerful country and military on Earth, and he's not referring to Communism or Russia here, and is overwhelmed by what he's facing. What the heck could it be?
- <https://www.paypal.com/paypalme/joepostma>
- <https://www.givesendgo.com/ontologicalmathematics>

BOOKS



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