**TOPICS THAT MATTER in Faint young sun**

*2 – evidence for and background of the problem*

* ICE-ALBEDO feedback (low solar input => more ice => higher albedo => less heat absorbed (higher reflectance) => more ice => SNOWBALL EARTH!)
  + *A key ingredient…* *“a recent modeling study suggests a third stable state in which a narrow strip in the tropics remains free of ice due to the combined effects of the lower albedo of snow-free sea ice and the reduced cloud cover in this region [Abbot et al., 2011].”…* extrapolating… could this have a Larger Area of Impact thus preventing Snowball Earth on a large scale?
  + *Another avenue of exploration…* varying “Critical Luminosities;” bifurcation point for Snowball Earth; *“While earlier models placed the critical luminosity threshold at 2–5% below the present-day value for modern continental configuration [Budyko, 1969; Sellers, 1969; Gérard et al., 1992], later studies with more sophisticated models found values of 10–15% and up to 18% for global ocean conditions”*… big differences between studies => big implications, given the “faint young sun” was only ~25% fainter…! Looking at the 18% critical luminosity… if it was 26%, +8%, we would not have snowball earth.
* Section 4… modification of standard solar model… why is intensity increasing… how much is it increasing… why was it 25% lower four eons ago…? Are we correct…?

UV vs Luminosity…

F\_in (short-wavelength)… F\_out (Outgoing Longwave Radiation ;))

Temp changes as atmosphere spreads out… change in DENSITY

Height at which F\_in == F\_out …?

How does left vs right-hand side of energy balance work… plot left side vs right side… emissivity… Flux\_in(t) derivative is positive…

Hydrogen fusion making temp increase…

Basic radiation balance BEFORE ice-albedo feedback…

HAZE layer

Inverse greenhouse effect… when haze transparent to OLR and opaque to ISR

Rye & Holland 1969… fossilized raindrops… how dense was atmosphere

N\_2 triple bond getting broke…

Mindmap… outline… plan… Practice… practice DRAWING !

What matters for ARGUMENT… reduce noise… see the “middle”

Snowball Earth climate dynamics and cryogenian geology-geobiology… PaulHoffman…

Panglacial State…

Look at lower albedo vs greenhouse gases…. Y!>