What happens to the sky?

Communicating 'A simple recipe for the Greeenhouse Effect'

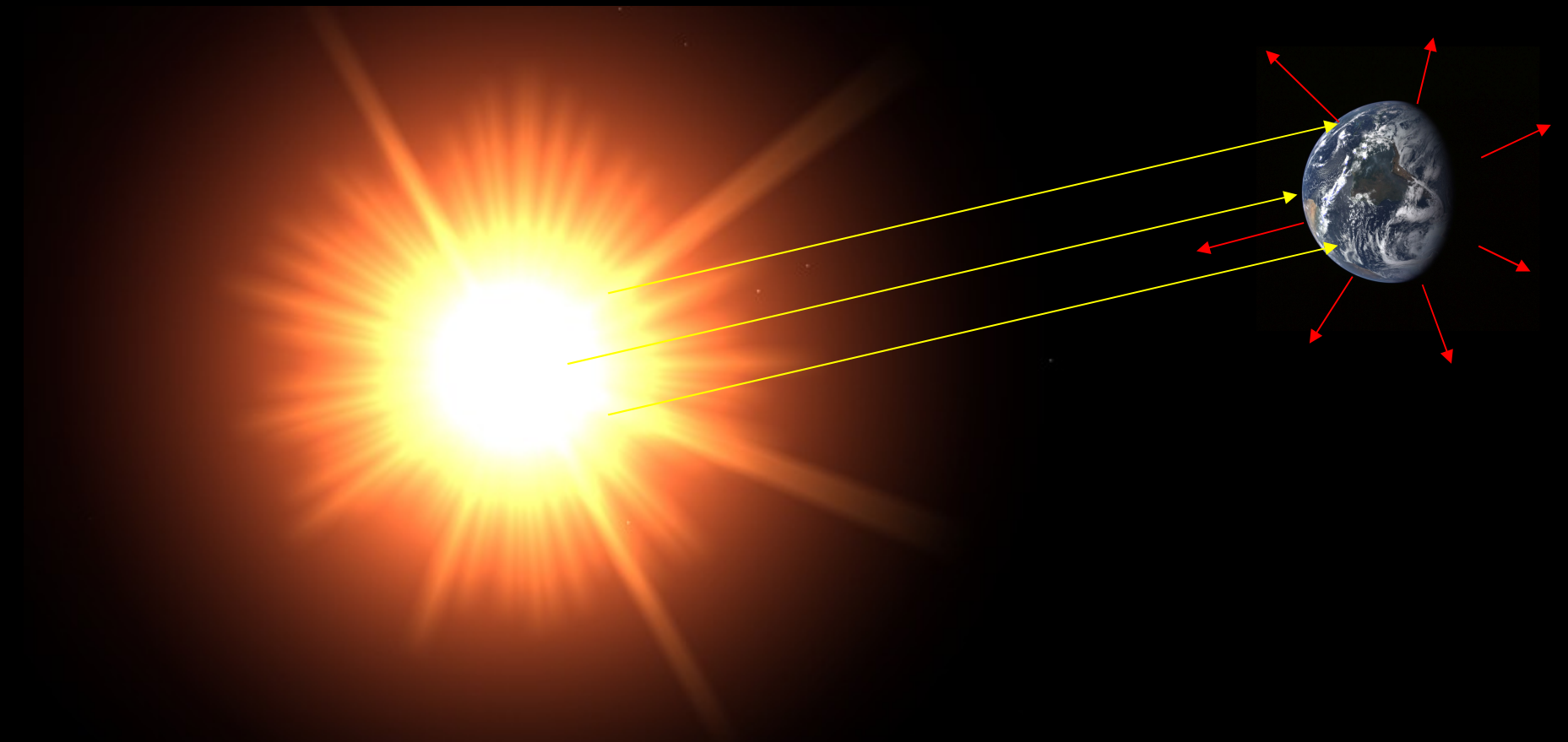
rasmus.benestad@met.no

The blue sky:

-Evidence of atoms' existence.

-Scattering processes

The Space filled with vacuum

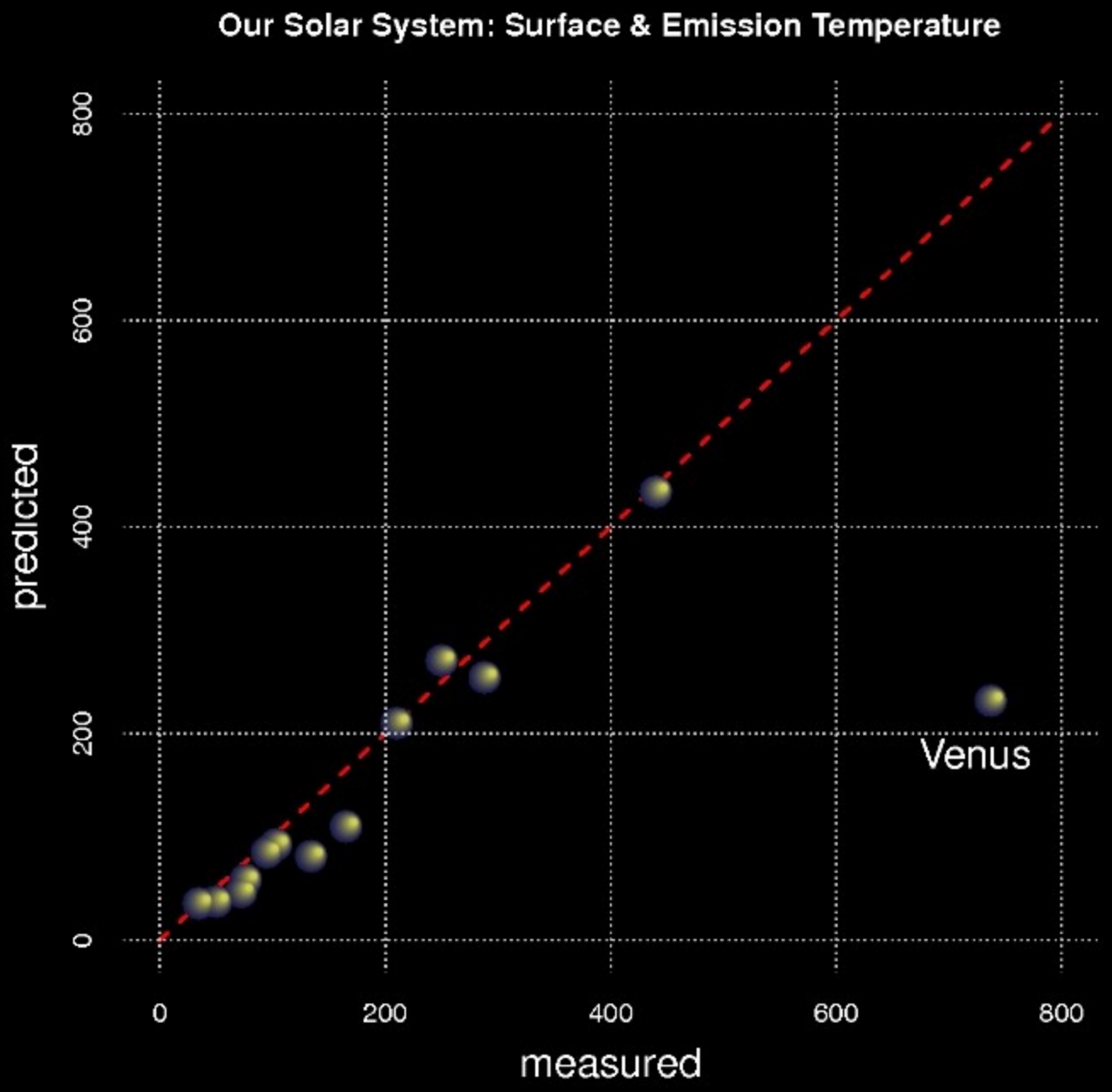


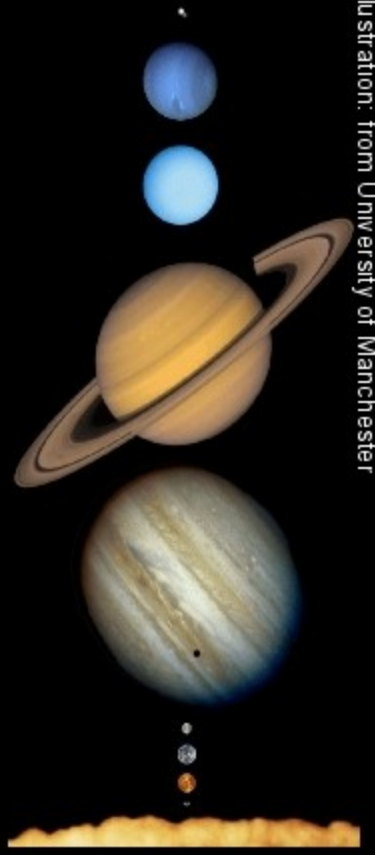
Light is energy.

The earth receives energy.

The earth loses energy

Measured & predicted





Balance:
+ Energy (light) from the sun
- Heat loss

Sunlight intensity.
Reflection from surface.


The sunlight reaches earth's surface, where it deposits energy.

Heat loss *cannot* take place from surface

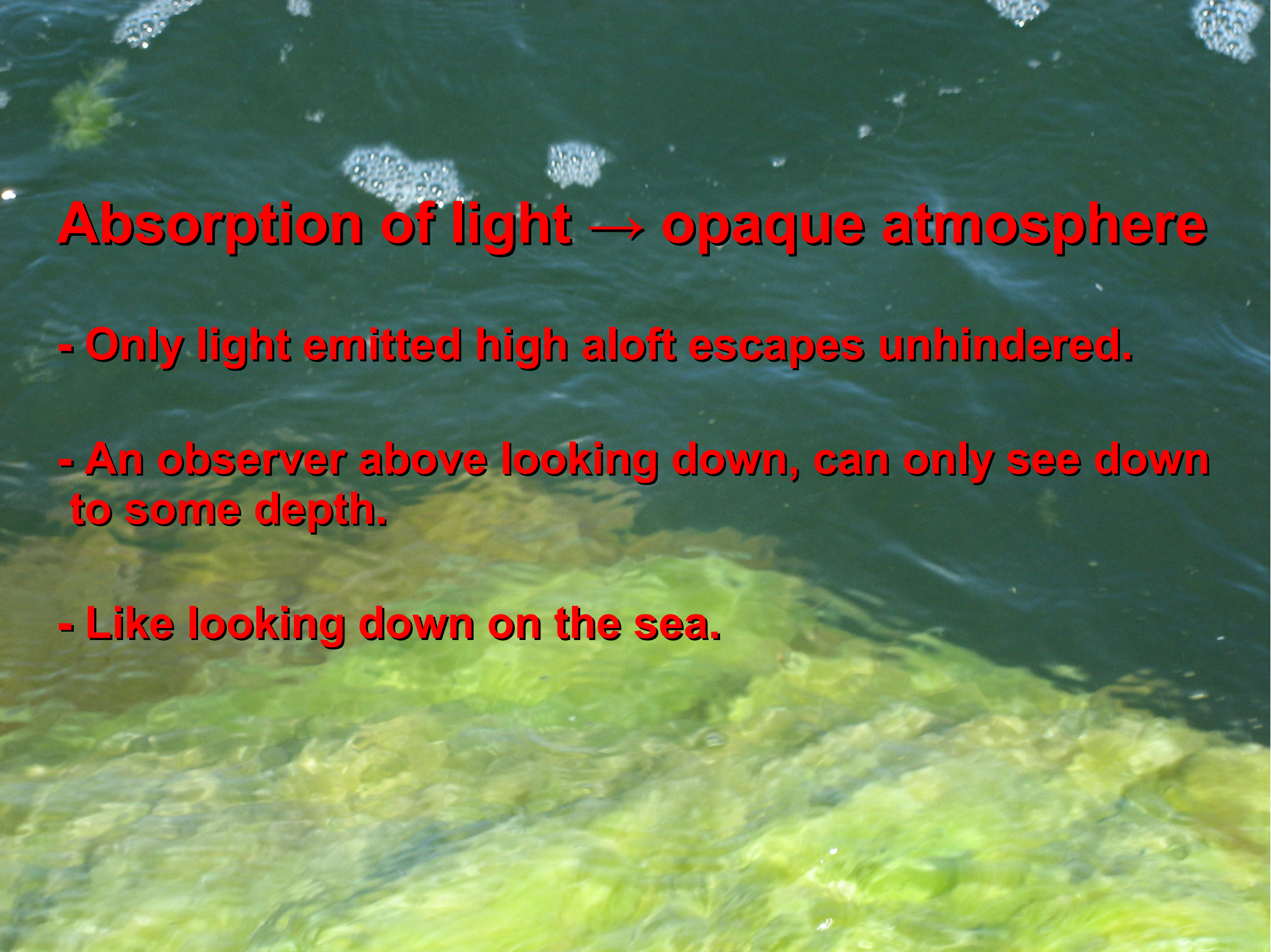
Earth's mean temperature: +15ºC

Energy balance: heat loss ~ -19ºC

Heat loss to space at +15ºC would violate the energy balance.

Colours in the sky:

-Scatter and abosorption of light.
  – depends on wavelength



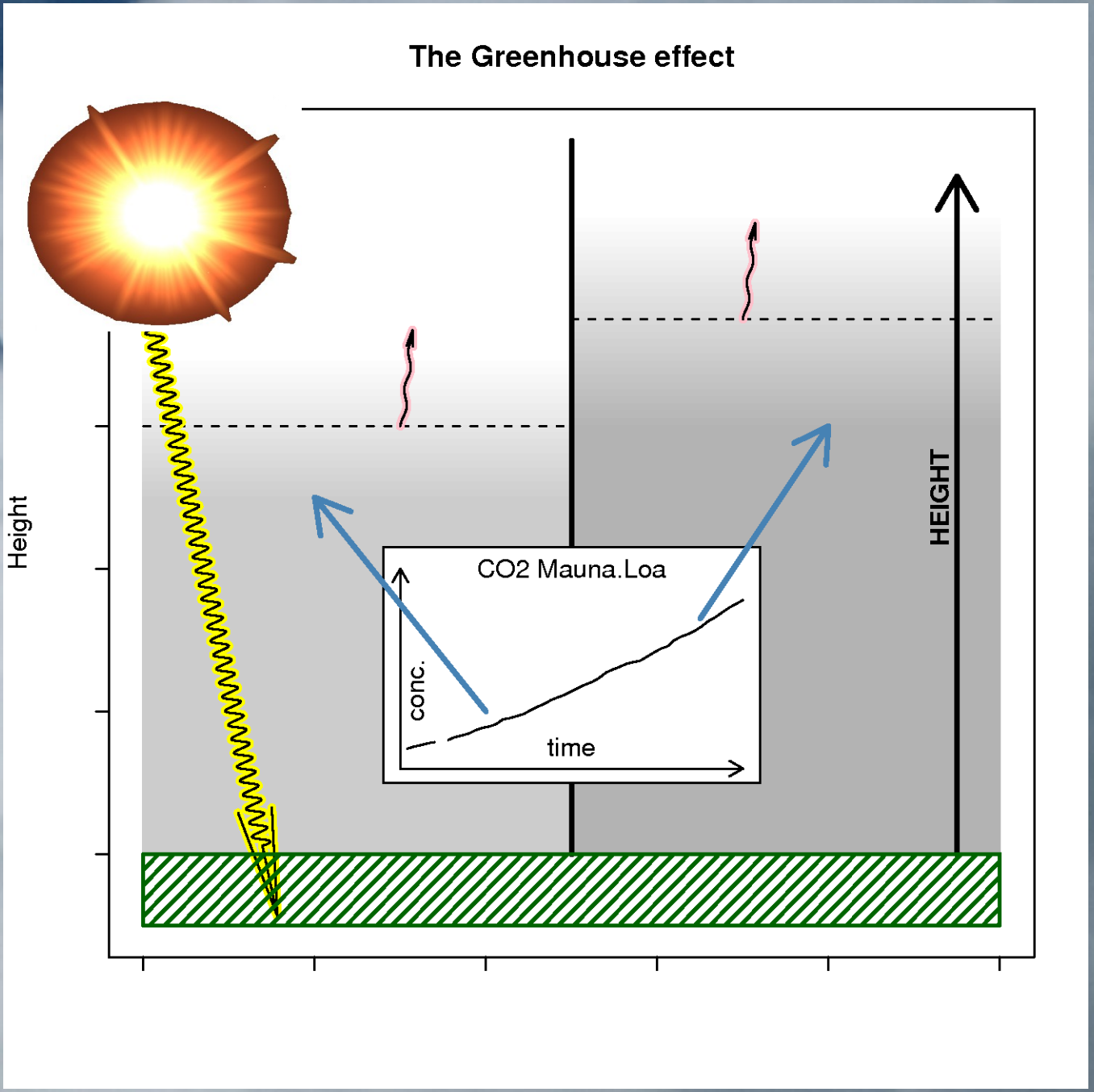
Absorption of light → opaque atmosphere

- Only light emitted high aloft escapes unhindered.

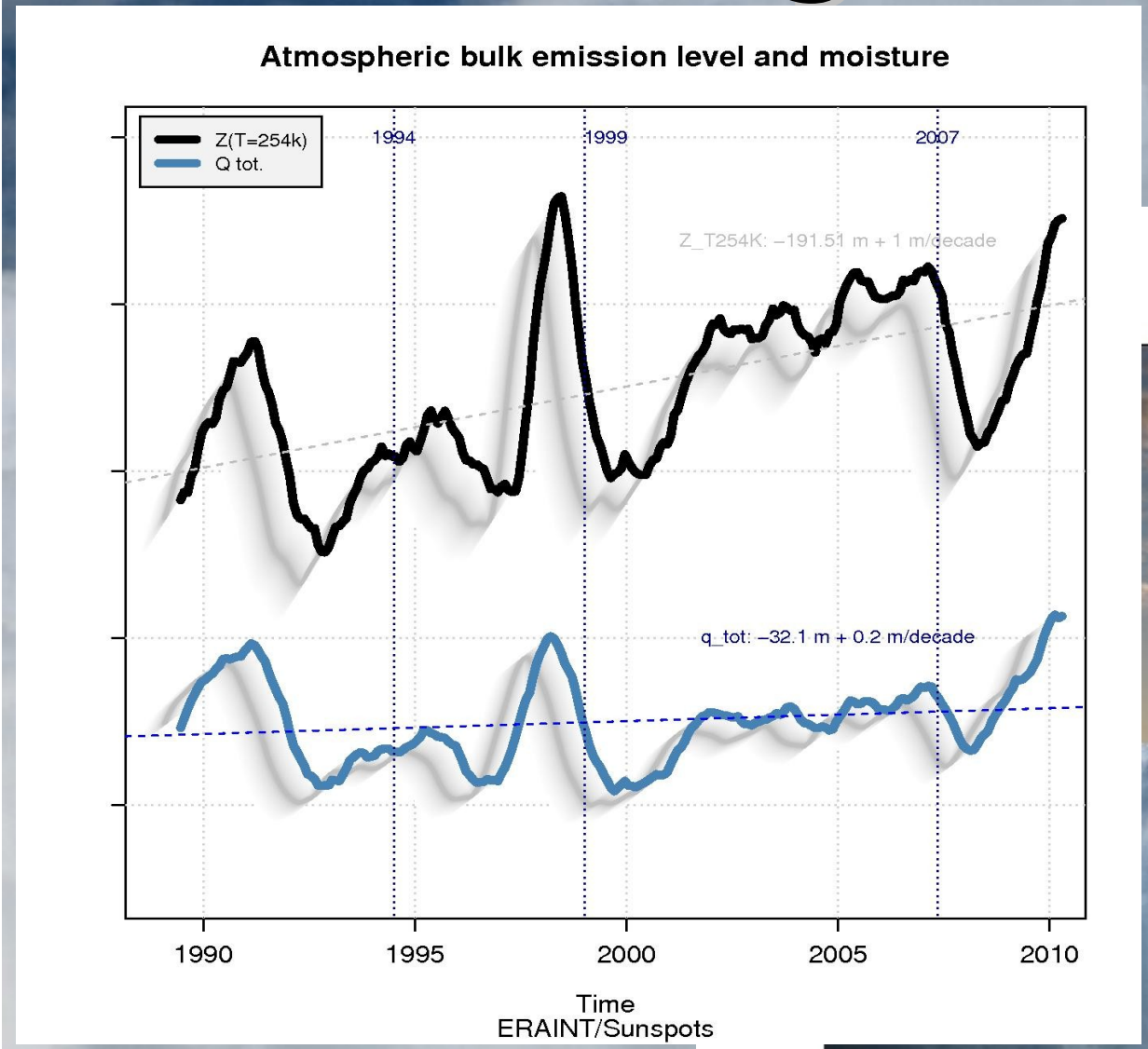
- An observer above looking down, can only see down to some depth.

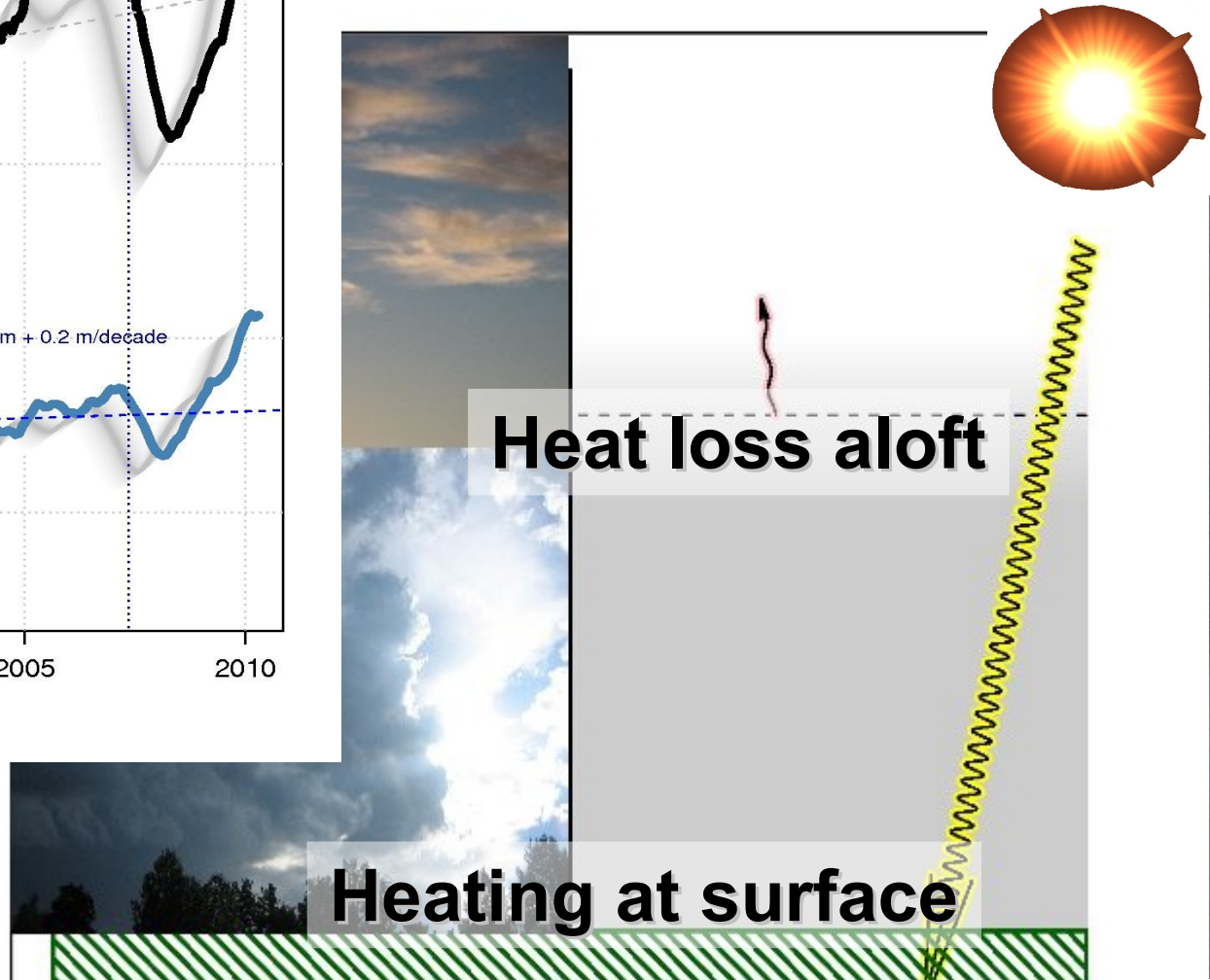
- Like looking down on the sea.

Optical depth

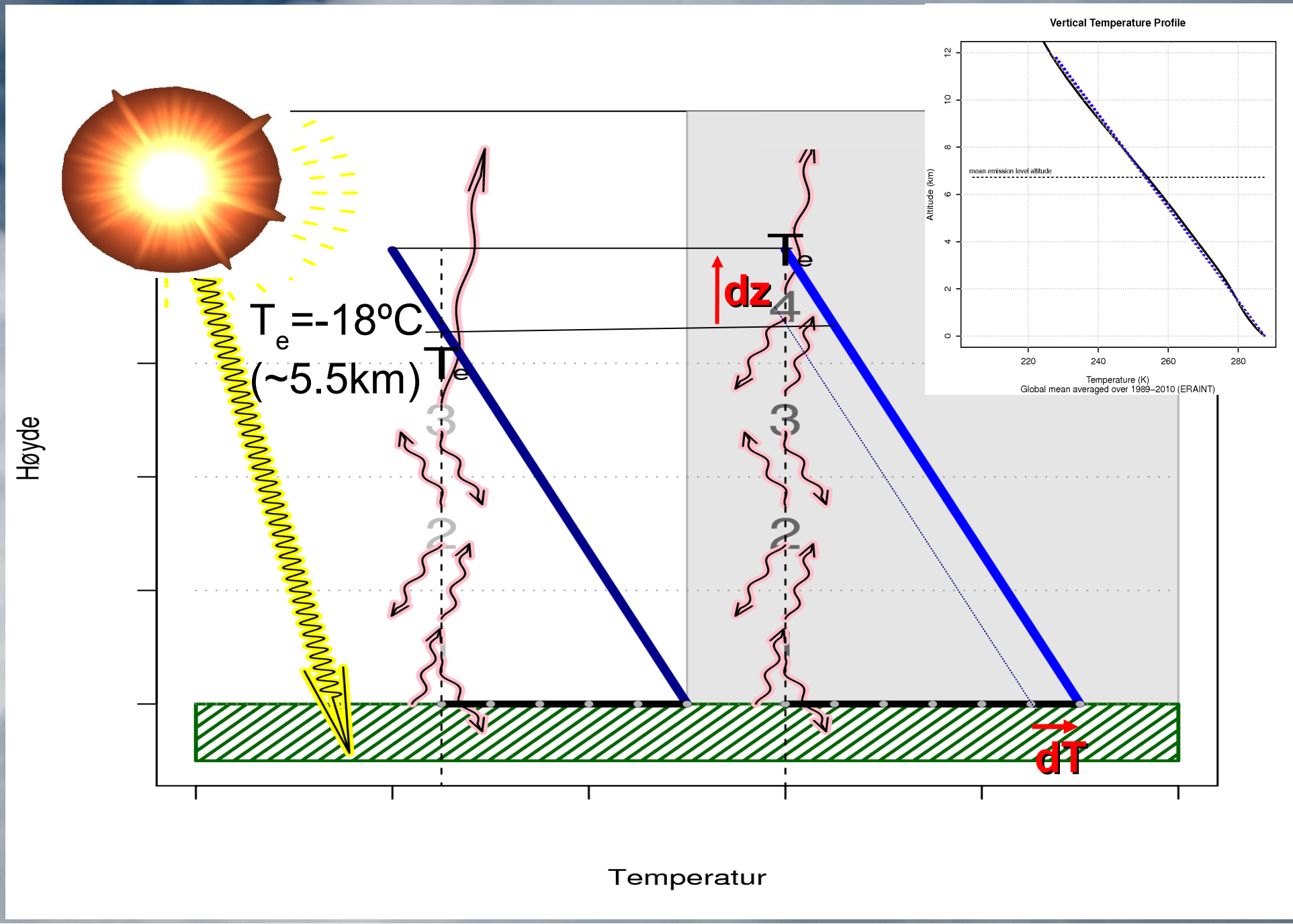


Heating & Heat loss

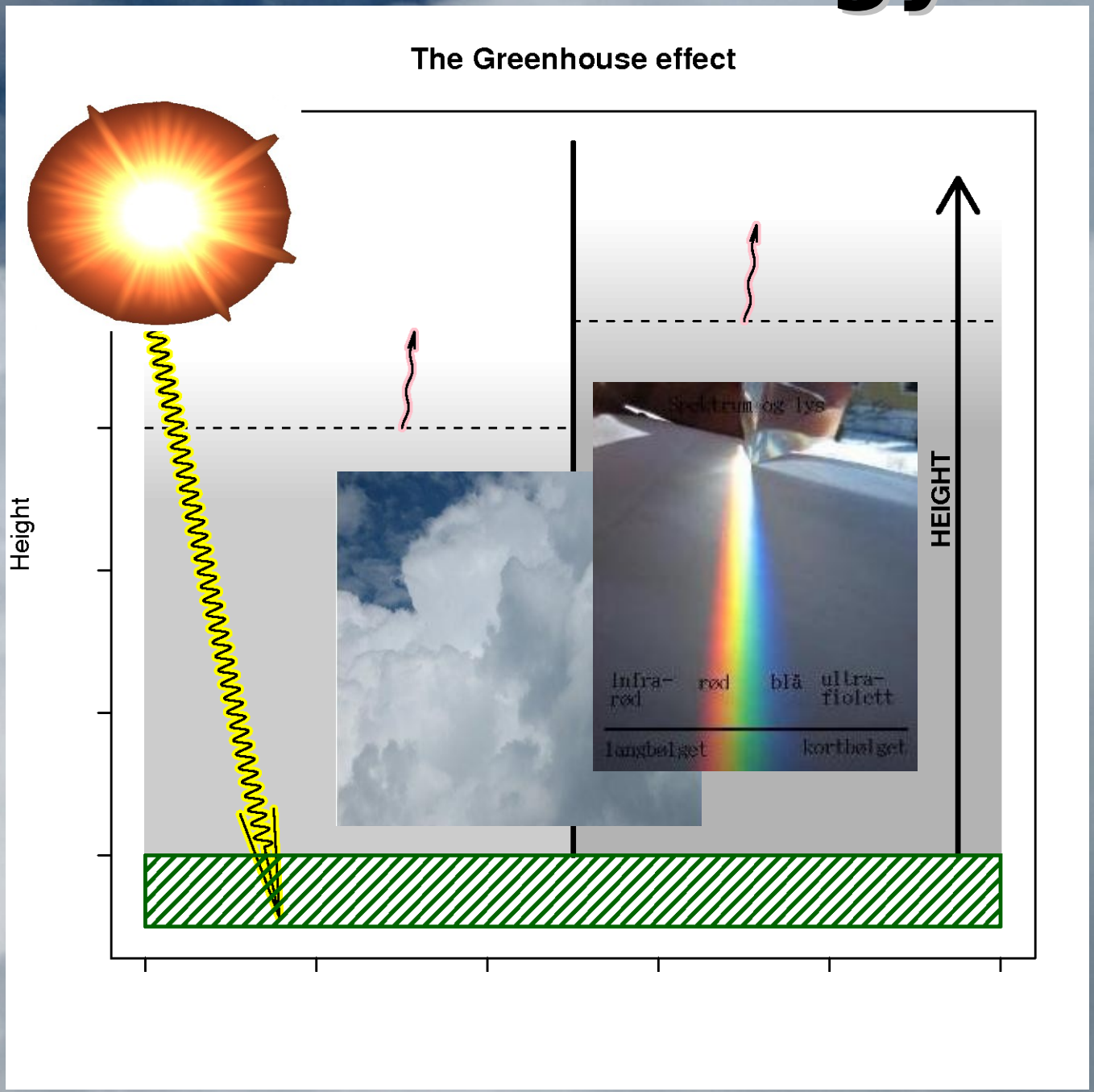




The greenhouse effect



The energy flows

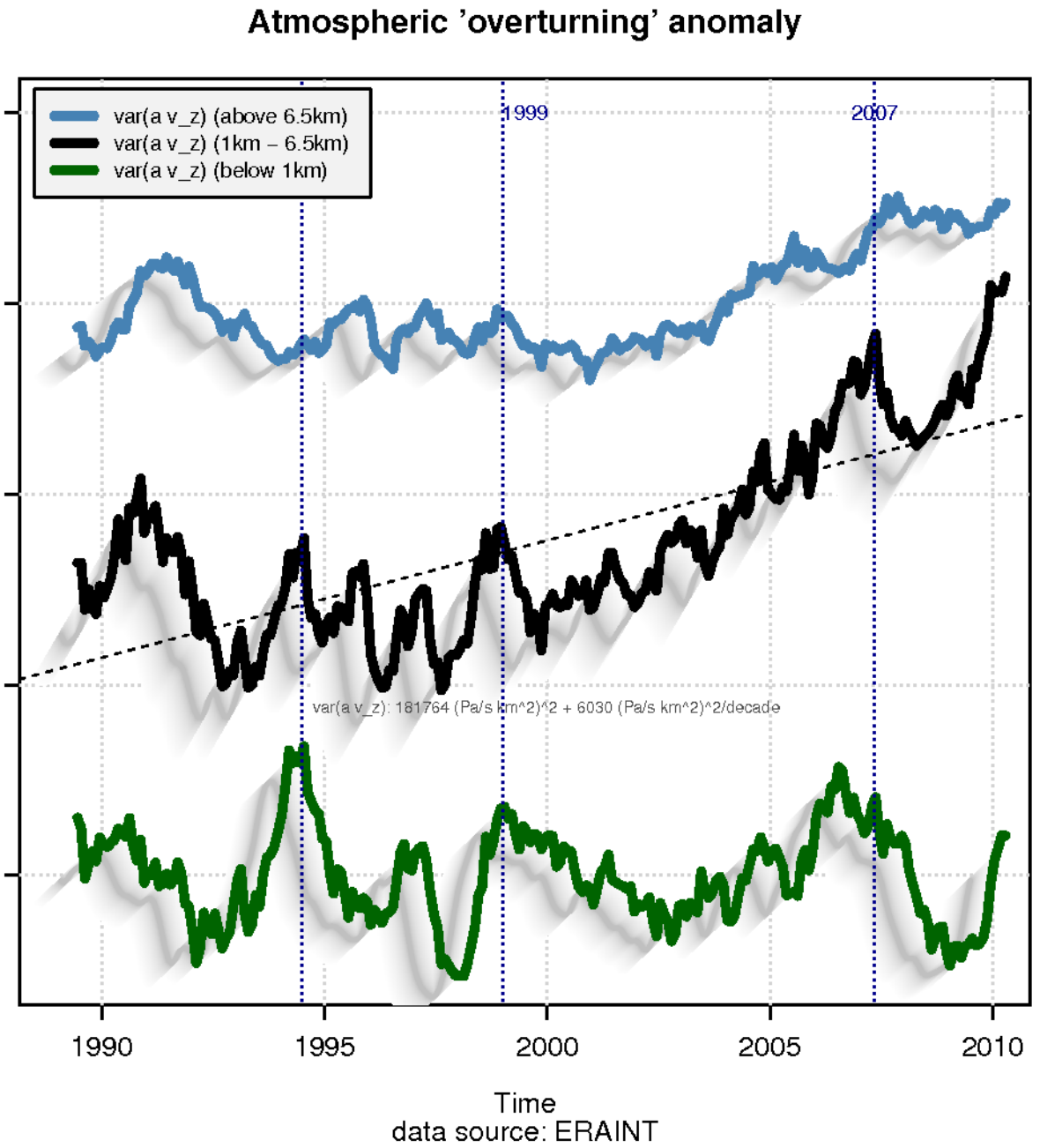


Energy
not created nor destroyed.

Modes of transfer
Light
Vertical motion
Waves

Implications
Vertical Temperature profile

Compensation of vertical energy flow?

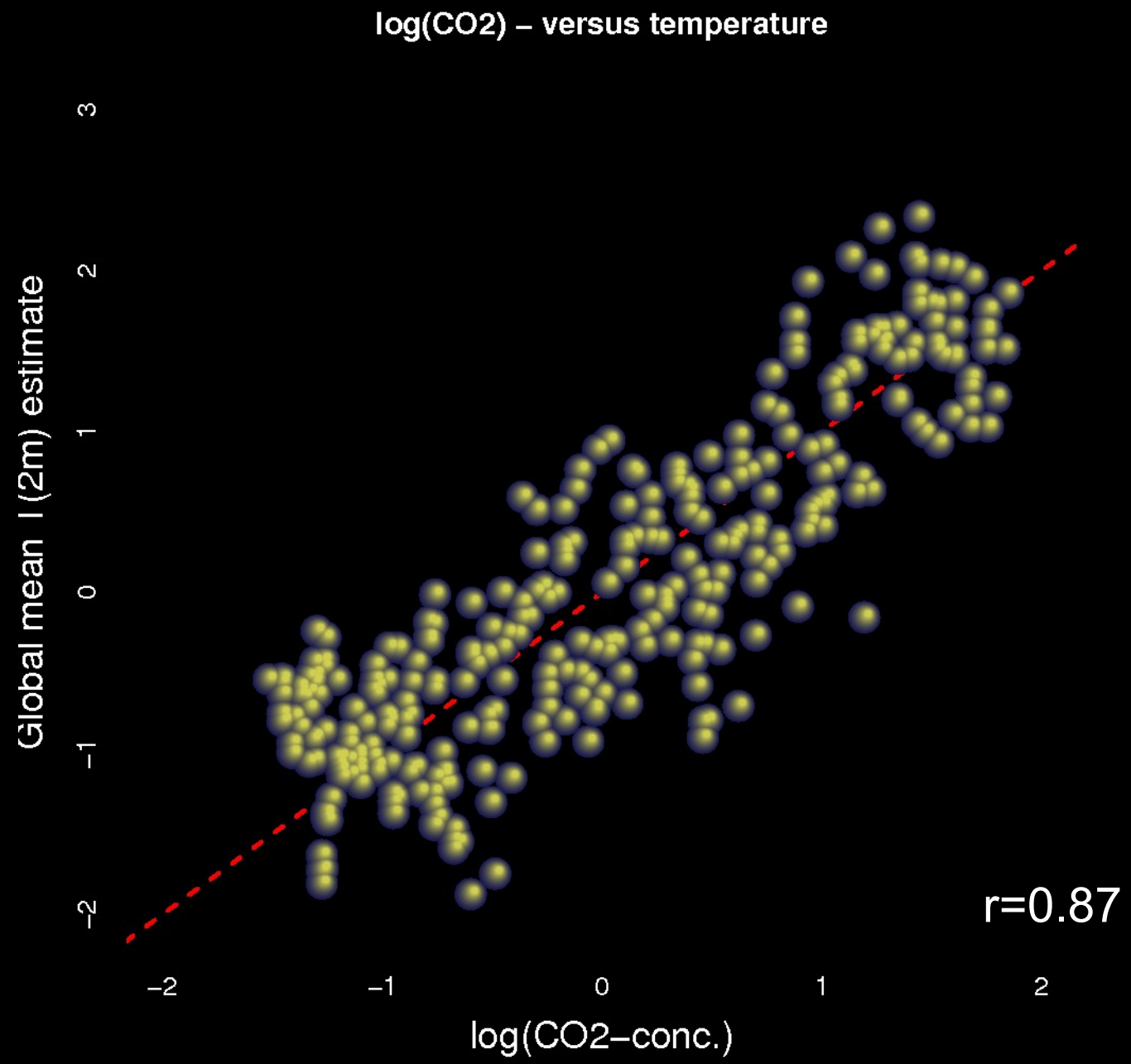


'Atmospheric Overturning'

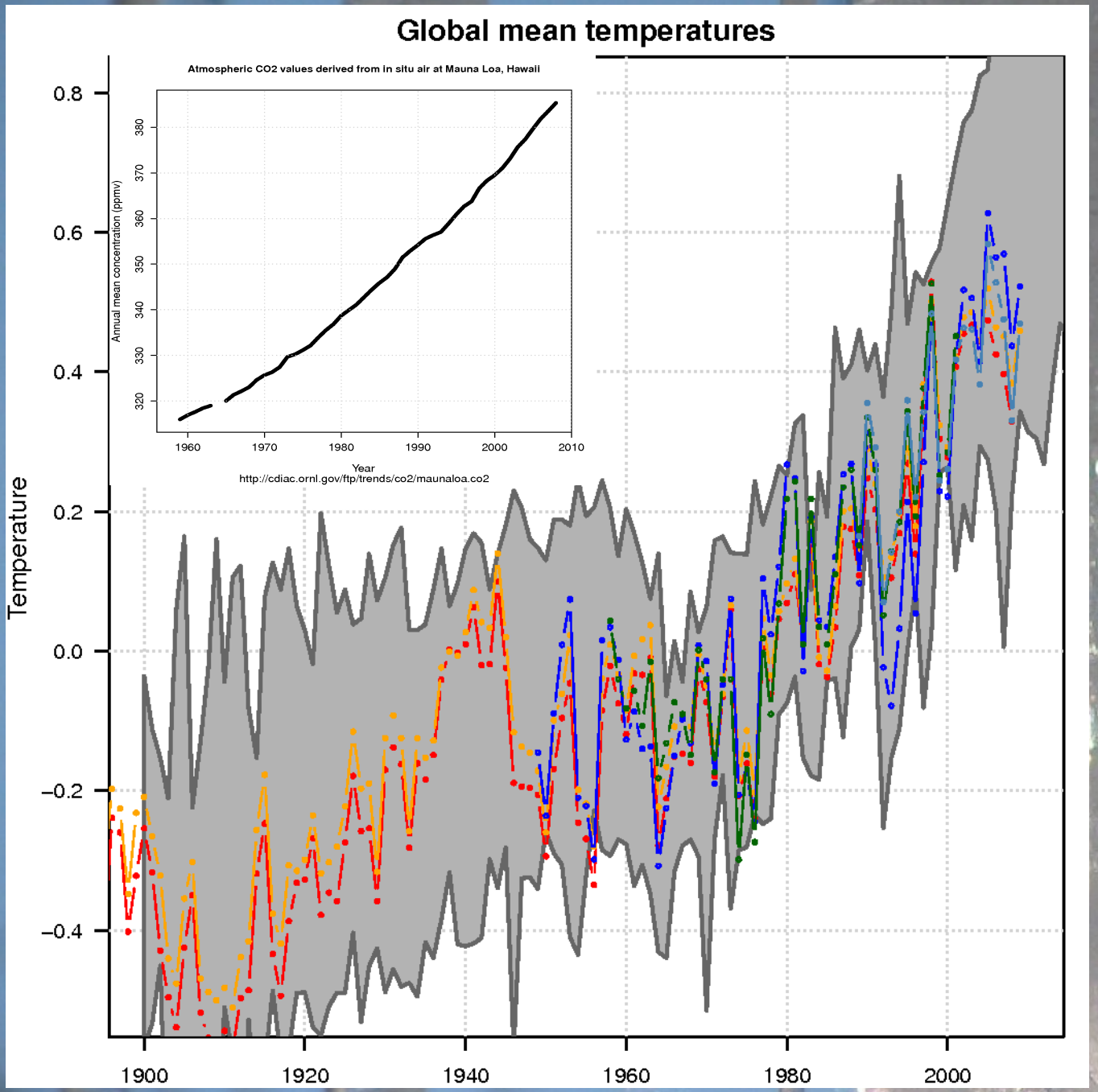
Other studies do not agree

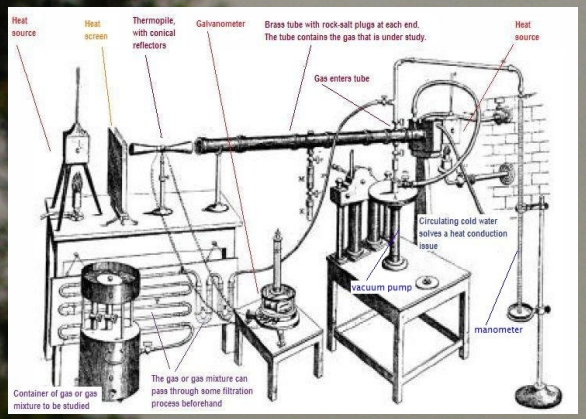
ERAINT re-analyses.

Correlation CO_2 and temperature



Climate change





arXiv:1106.4937