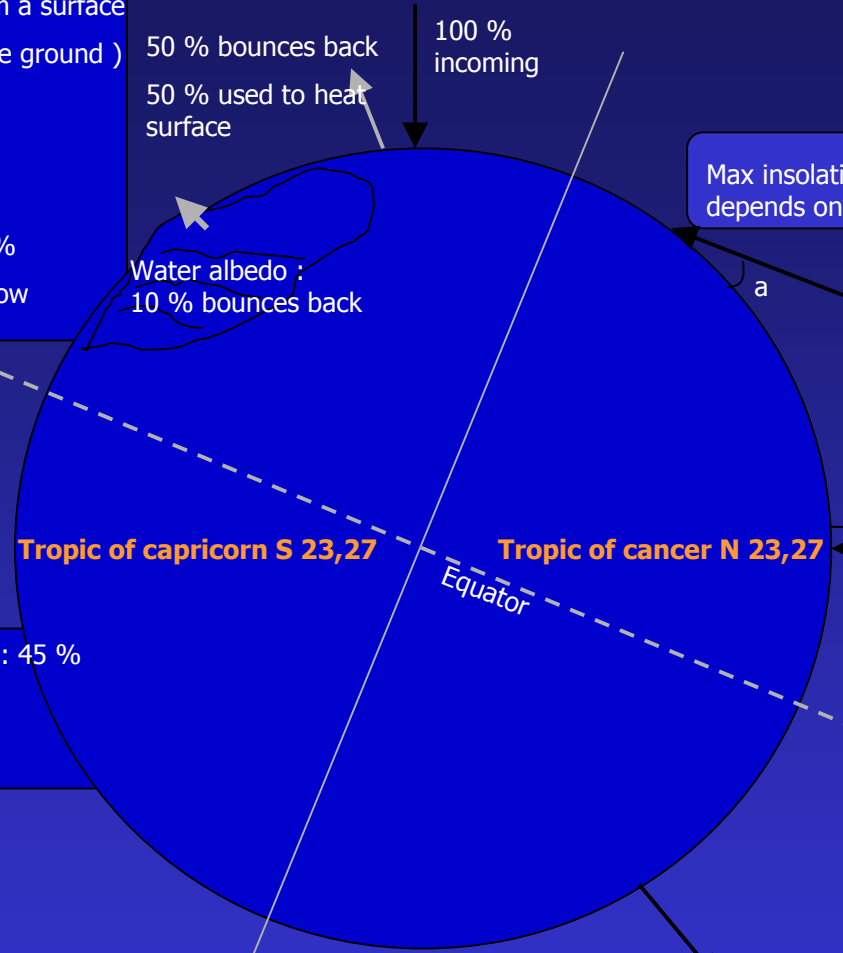


Temperature on earth

- All incoming heat radiation is re radiated to space
- The net heat absorption is 0 (Constant average temperature)

Albedo :
The amount of heat re radiated from a surface (Not heating the ground)

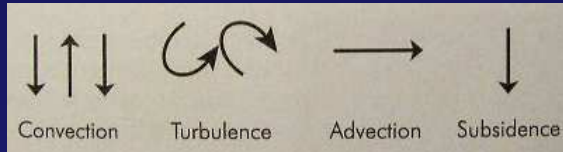
- Snow : 90 %
- Sand : 30 %
- Forest : 10 %
- Clouds : - 90 %
- Water : Very low



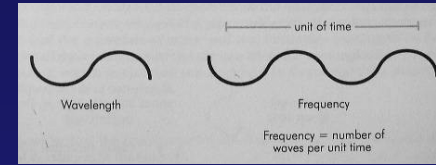
Average albedo : 45 %
SKC : 75 %
OVC : 25 %

- The temperature of an object i K will determine the radiation wavelength
- Shorter wavelengths (high frequencies) : High energy
 - 15 C (290 K) : 10 micron
 - Sunlight 5800 K (5500 C) : 0.5 micron

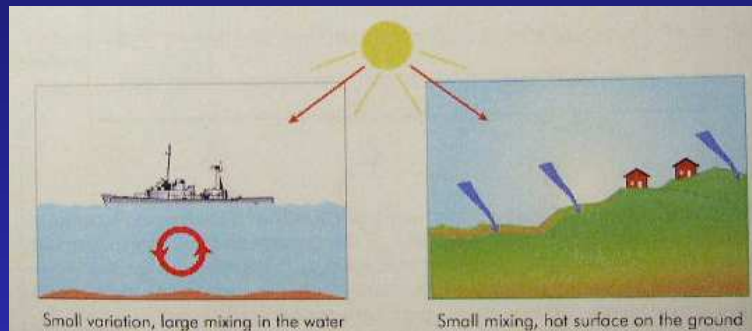
$$WL = 300 / \text{freq (Mhz)}$$



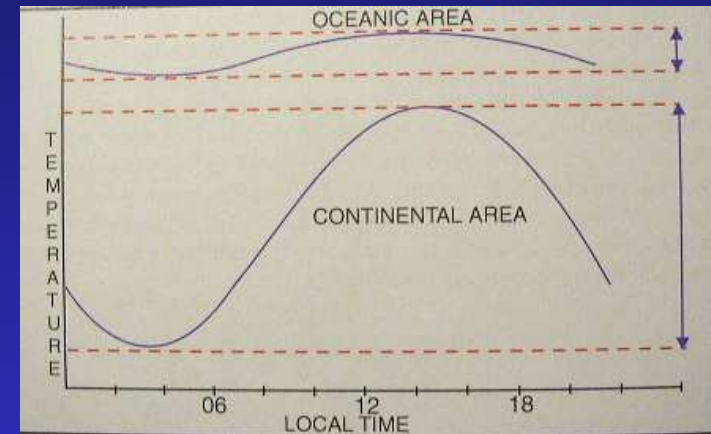
- The ground will only be heated up to 1 m without mixing
- These are the processes that bring heat energy around in the atmosphere



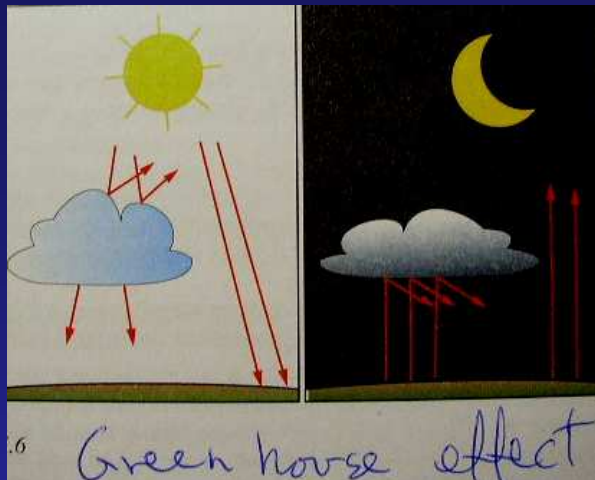
- Incoming : Short wave
- Outgoing : Long Wave



- Heated ground will quickly re radiate its heat to the air.
 - Poor storage of energy
- Water will bring the energy down to the depths and act as a reservoir of latent heat
 - Stores energy
 - **When condensation happens, this latent energy is released and heats the atmosphere, then re radiates to space**
 - **Vaporization will " take heat energy and store it " Re released at condensation**



- Water has low diurnal / seasonal temp change
 - Cool days / Warm nights
 - Cool summers / Mild winters
- Soil has high diurnal / seasonal change
 - Warm days / Cold nights
 - Warm summers / Cold winters

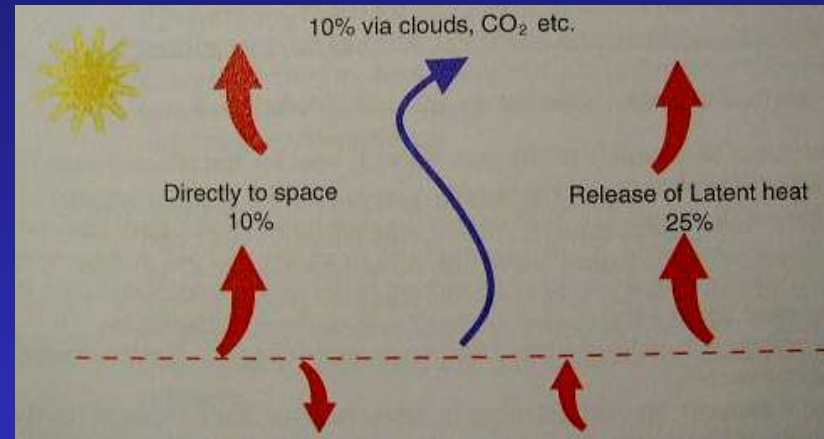


Warmer nights / Cool days when overcast

Cool days / mild nights when windy due to larger mixing

6 Green house effect

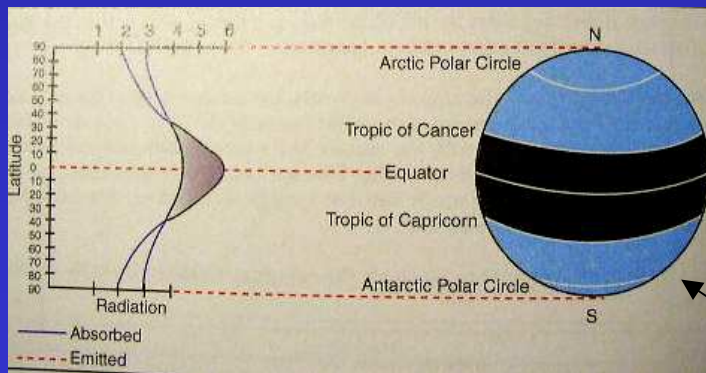
- Clouds and CO₂ will let short waves through
- Clouds and CO₂ will trap long waves
- The incoming radiation is greater than the Outgoing



If we look at the outgoing radiation, the climate would be colder.

Because of latent heat release (Heat stored in the oceans) the NET result is 0

Constant average temp.

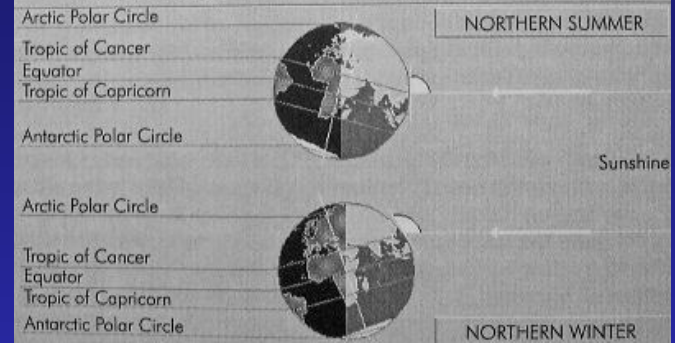


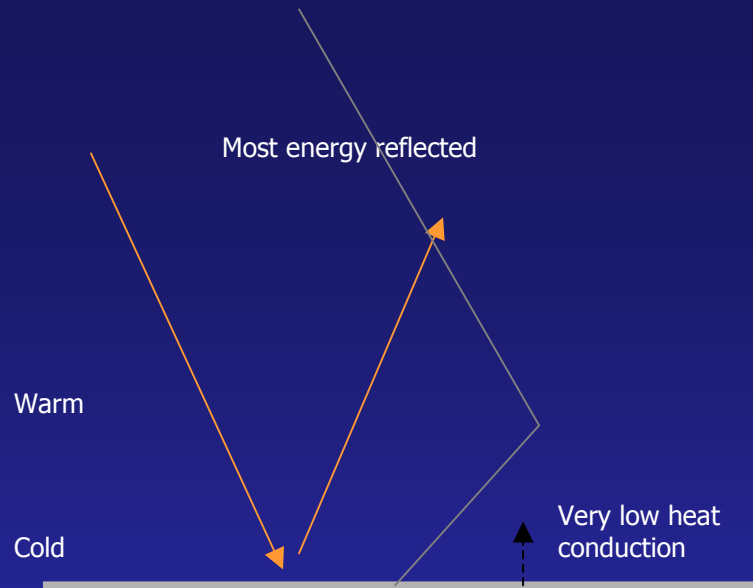
Net increase of heat

Result is 0

Net loss of heat

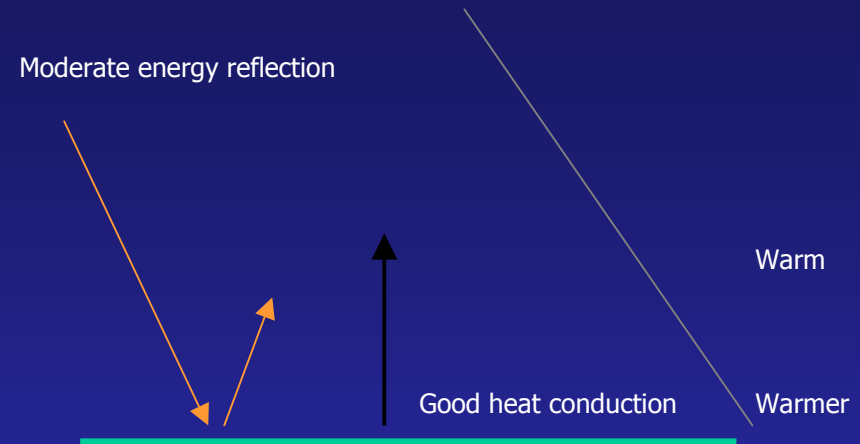
The change of sun's angle with season





- Snow covered ground

- 90 % reflection (albedo)
- Very low heat conduction
- Extreme cooling of the lower layers
- Temp on ground can be 20 C colder than at 200 m



- Bare ground

- Early snow in autumn will lead to cold winter and late spring
- Bare ground will cause mild winter / early spring

