

CHARACTERISTICS OF SUN LIGHT

LIGHT IS A PART OF WIDE SPECTRUM OF ELECTRO MAGNETIC PARTICLES WITH DIFFERENT WAVELENGTH

$$E = hf = \frac{hc}{\lambda}$$

E = ENERGY f = FREQUENCY

λ = WAVE LENGTH (PARTICLES / PHOTON)

c = VELOCITY OF LIGHT $3 \times 10^8 \text{ m/s}$

h = PLANK CONSTANT $6.625 \times 10^{-34} \text{ J s}$

BLACK BODY

A BLACK BODY IS AN IDEAL ABSORBER AND EMITTER OF RADIATION.

AS IT IS HEATED, IT STARTS TO GLOW TO EMIT ELECTRON RADIATION.

ENERGY DENSITY OF BLACK BODY RADIATION

$$U(f) df = \frac{8 \pi h f^3 df}{e^3 [e^{hf/kT} - 1]}$$

$U(f)$ = ENERGY PER UNIT AREA & UNIT WAVE LENGTH

k = BOLTZMANN'S CONSTANT

f = FREQUENCY

h = PLANK CONSTANT

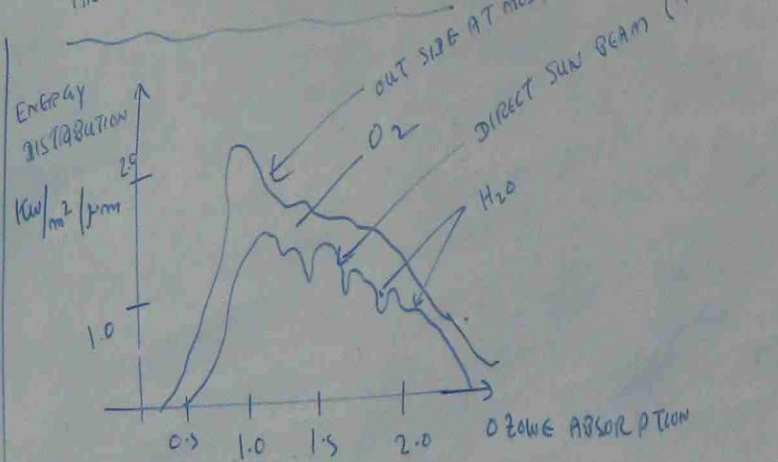
T = TEMPERATURE ('K)

$$e = 2.718$$

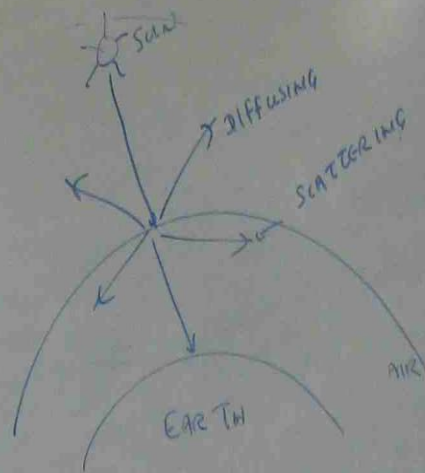
df = CHANGE IN FREQUENCY

$U(f) df$ = CHANGE IN ENERGY PER UNIT AREA AND WAVE LENGTH DUE TO CHANGE OF FREQUENCY

THE DISTRIBUTION OF SUN LIGHT



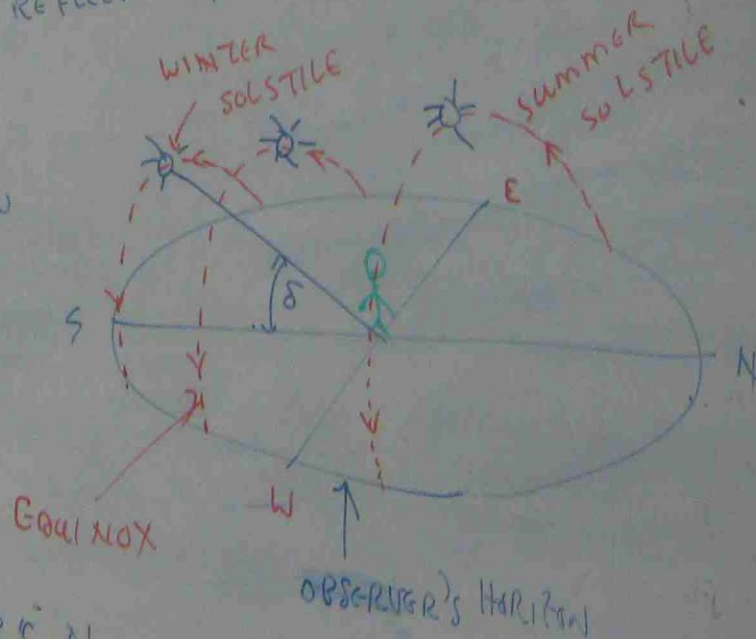
THE SUM OF ENERGY OVER THE ENTIRE WAVE LENGTH
IS $970 \text{ W/m}^2 \approx 1000 \text{ W/m}^2$



SUN ENERGY IS REDUCED DUE TO SCATTERING / DIFFUSION
AND REFLECTION BY HIGH ALTITUDE CIRRUS

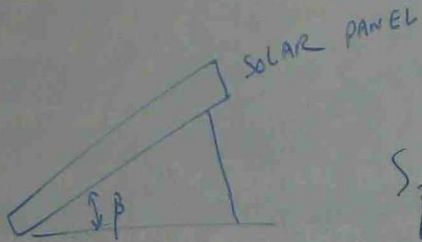
$\delta = \text{DECLINATION OF EARTH}$
 $23^\circ 27'$

OBSERVER'S
POSITION IS 35° N

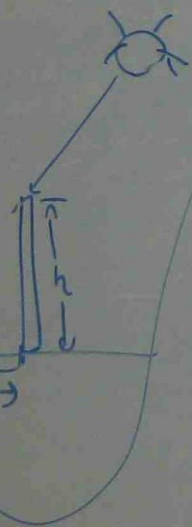


SOLAR INSOLATION (IRRIGATION) MEASUREMENT

= CORRESPONDING INSOLATION INCIDENT ON A SOLAR PLANE
TILTED AT ANGLE β TO THE HORIZONTAL



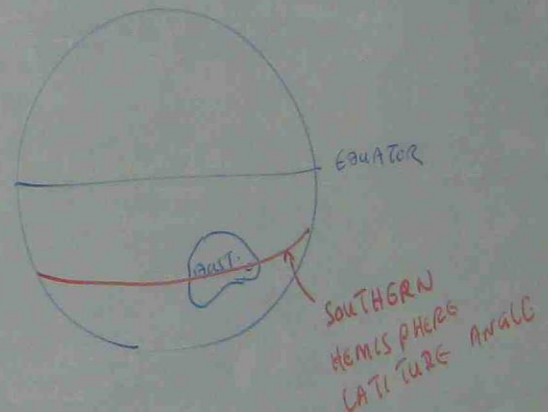
$$S_{\beta} = \frac{S \sin(\alpha + \beta)}{\sin \alpha}$$



S = DIRECT COMPONENT OF HORIZONTAL SURFACE

$$\alpha = 90 - \phi - \delta$$

ϕ = SOUTHERN HEMISPHERE LATITUDE



$$\delta = 23.45 \sin \left[\frac{(d - s_1) \times 360}{365} \right]$$

d = DAY NUMBER, 1st January $d = 1$

s_1 = DIRECT COMPONENT OF HORIZONTAL SURFACE, 2nd January $d = 2$

ESTIMATION OF GLOBAL RADIATION

$$\frac{R}{R_0} = \alpha + \frac{\beta n}{N}$$

R = ESTIMATION OF GLOBAL RADIATION

R_0 = DAILY EXTRA TERRESTRIAL RADIATION

n = OBSERVED HOURS OF SUN SHINE IN THE DAY

N = OBSERVED MAXIMUM HOURS OF SUN SHINE IN THE DAY

α = CONSTANT = 0.24

β = CONSTANT = 0.48

SOLAR GEOMETRY

