



Surface Temperature

$$T_s = \sqrt[4]{\frac{I_0}{\sigma(2-\varepsilon)}(1+\tau)(1-A\tau)}$$

Atmosphere Temperature

$$T_a = \sqrt[4]{\frac{I_0}{\sigma\varepsilon(2-\varepsilon)}[(1-\tau)(1+A\tau) + \varepsilon\tau(1-A)]}$$

NOTES:

τ is solar transmission

ε is long wave emissivity

$I_0 = 1368/4 \text{ W/m}^2 = 342 \text{ W/m}^2$

$$I_0 \downarrow \quad I_0 \tau^2 A \uparrow \quad \varepsilon \sigma T_a^4 \uparrow \quad (1-\varepsilon) \sigma T_s^4 \uparrow$$

Atmosphere

T_a

$$I_0 \tau \downarrow$$

$$I_0 \tau A \uparrow$$

$$\varepsilon \sigma T_a^4 \downarrow$$

$$\sigma T_s^4 \uparrow$$

Earth's Surface

T_s

1 Layer Atmosphere Model

Shortwave Albedo = 0.3 Shortwave Transmissivity = 0.96

