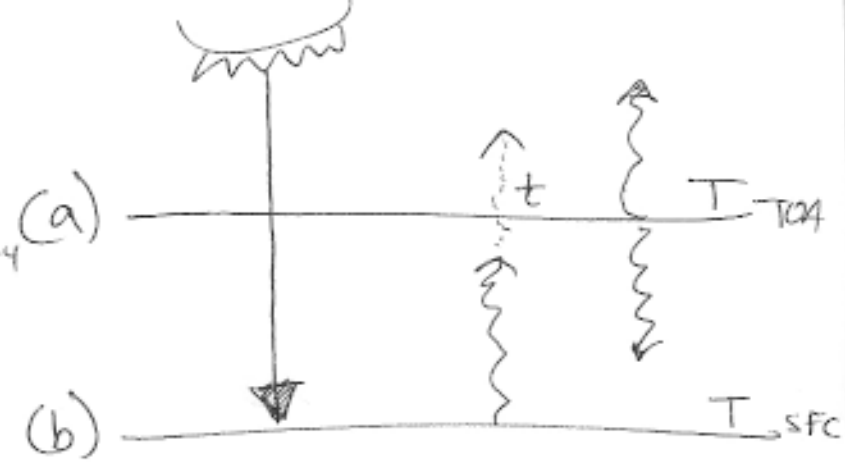
$S_o = 1367\ W/m^2$

$\alpha = 0.3$ (albedo)

$t = 0.2$ (transmisivity)

$\sigma = 5.67 \times 10^{-8}\ W m^{-2} K^{-4}$



Energy Balance @ TOA

(a) $\frac{S_o}{4}(1-\alpha) = t\sigma T_s^4 + \sigma T_A^4$

$\frac{S_o}{4}(1-\alpha) - t\sigma T_s^4 = \sigma T_A^4$

Energy Balance @ SFC

(b) $\frac{S_o}{4}(1-\alpha) + \sigma T_A^4 = \sigma T_s^4$

$\frac{S_o}{4}(1-\alpha) + \frac{S_o}{4}(1-\alpha) - t\sigma T_s^4 = \sigma T_s^4$

$\frac{2S_o}{4}(1-\alpha) = (1+t)\sigma T_s^4$

$\sqrt[4]{\frac{S_o(1-\alpha)}{2(1+t)\sigma}} = T_s$

- $t = 0.2$
- assume 20% of surface radiation escapes

$\boxed{T_s = 289\ K}$