

Earth Homework

The Earth has a surface temperature around 270 K and an emissivity of 0.8, while space has a temperature of around 2 K. What is the net power radiated by the earth into free space?

(Radii of the Earth and the Sun are $R_e = 6.38 \times 10^6$ m, $R_s = 7 \times 10^8$ m.)

$$I_{\text{net}} = I_{\text{emit}} - I_{\text{absorb}} = eA\sigma(T^4 - T_0^4)$$

$$= (5.76 \times 10^{-8}) (4\pi R_{\text{earth}}^2) (0.8) (270^4 - 2^4)$$

$$= 1.23 \times 10^{17} \text{ Watts}$$

