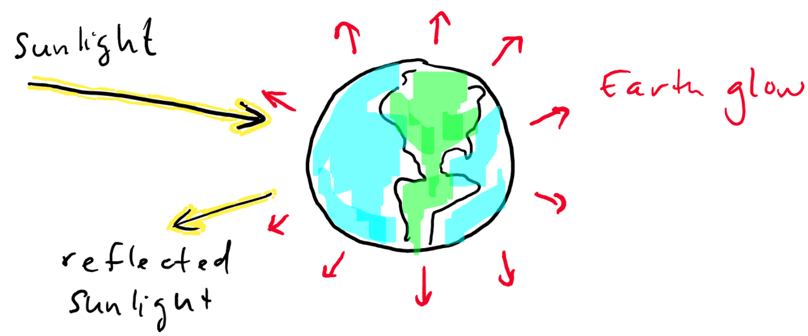
The **Stefan-Boltzmann law** states that the intensity of light from a blackbody object will be

$$I = \sigma T^4 \tag{1}$$

where σ is the Stefan-Boltzmann constant, which has dimeensions of intensity per T^4, and has a value of $\sim 5.7 \times 10^{-8} \frac{\text{J}}{\text{s}\cdot\text{m}^2\text{K}^4}$.



1 Climate modeling

For the Earth, we know the spectral distribution of incoming light and outgoing light, so we can construct an energy flow diagram.

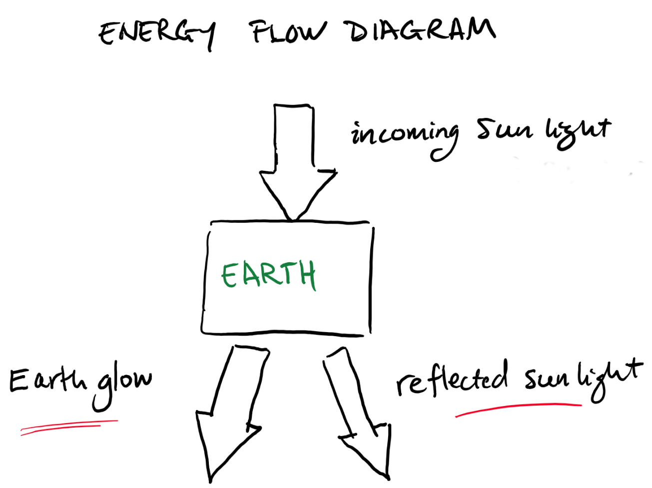


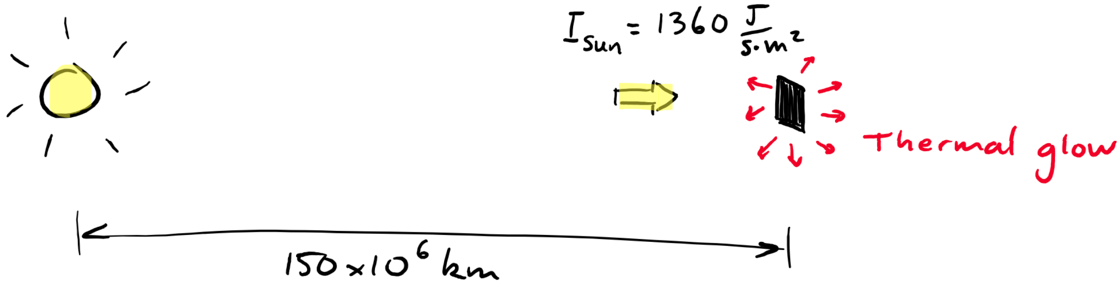
Figure 1: For T_{Earth} to be stable, the rate of energy out must be equal to the rate of energy in.

To a first order approximation, this is *all* the energy entering or leaving the Earth.

Other ways the Earth gains energy?	**Other ways the Earth loses energy?**
starlight	radio waves emitted
tidal forces $\rightarrow$ friction	
decay of radioactive elements in earth	
internal equilibration with core	

2 The temperature of objects in space

2.1 Example 1: A black metal panel



A thin sheet of black metal has dimension 1 m × 1 m × 0.001 m. It is facing normal to the Sun, absorbing energy at a rate of 1360 J/s from the Sun.

The sheet of metal has reached a stable temperature. What is that temperature?