

MODELLING CLIMATE CHANGE: ESTIMATING ENERGY FLOW FROM THE SUN

All of our weather and climate is driven by energy from the Sun. The energy from the Sun is transferred to the Earth by radiation. In this activity you will use a lamp to estimate the flow of energy from the Sun.

1. Switch on the lamp and put your hand about 20 cm from the light bulb. Can you feel anything? How is energy being transferred from the lamp to your hand? In what way is the lamp like the Sun?
2. Move your hand closer to the lamp and stop when the warmth feels similar to the Sun on a warm day. Measure and record the distance from the centre of your hand to the light bulb.

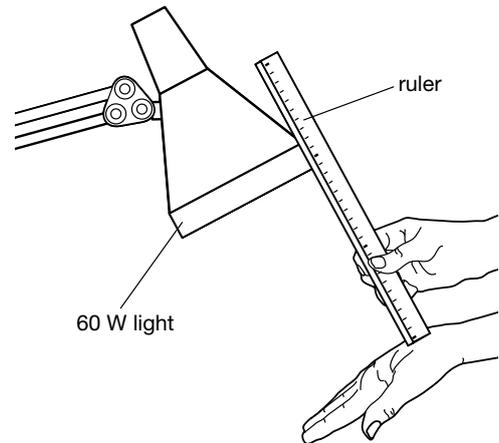
The energy spreads out in all directions from the bulb. You can think of your hand as being part of a 'sphere' with an area of $4\pi r^2$ where r is the distance from the centre of the bulb to your hand.

3. Use the following equation to work out the value of the energy flow at the position of your hand:

$$\begin{aligned} \text{energy flow (W/m}^2\text{)} &= \frac{\text{power of bulb (W)}}{\text{area (m}^2\text{)}} \\ &= \frac{\text{power of bulb (W)}}{4\pi r^2 \text{ (m}^2\text{)}} \end{aligned}$$

4. Repeat with other students in your group and record the results in a table like the one shown. Use these results to calculate an average (mean).
5. The actual energy flow from the Sun at midday on a sunny mid-summer day in the UK is typically 1200 W/m^2 . At the top of the Earth's atmosphere the value is around 1370 W/m^2 . Is your estimate accurate?
6. Can you suggest any reasons why your estimated value may differ from the observed data?

 Do not touch the hot light bulb.



Run	Distance (m)	Area (m ²)	Energy flow (W/m ²)
1			
2			
3			
4			
5			
Mean			