MODELLING CLIMATE CHANGE:
FACTORS AFFECTING CLIMATE CHANGE

Volcanic eruptions and changes in the output from the Sun are natural factors that affect climate. People can also affect global climate through emissions of greenhouse gases. Using an energy balance model you will investigate factors that cause climate change.

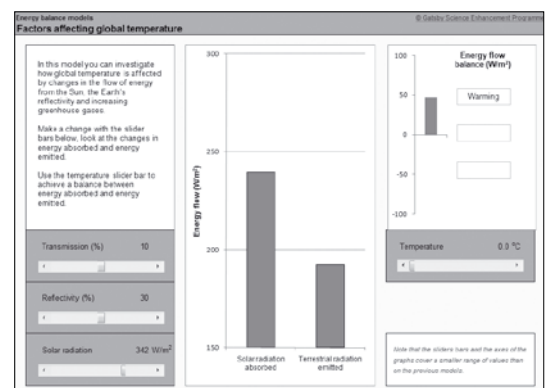## Task A Changes in energy from the Sun

1. Open the Excel spreadsheet *MCC_EnergyBalance* and click on the tab 'Model 4'.

2. The flow of energy from the Sun is on average $342 W/m^2$. Use the model to predict how much the global temperature would change, if the Sun's output decreased by $20 W/m^2$.

3. The flow of energy from the Sun does change, but it has only changed by around $0.5 W/m^2$ over the last 400 years. How big an effect on temperature might this have?

Task B Changes in the Earth's reflectivity

4. The eruption of Mt Pinatubo in 1991 caused an additional $3 W/m^2$ to be reflected by the Earth – an increase in reflectivity from 30% to 31%. Predict how this might affect temperature. Use the model to find out how much the temperature changes.

5. In reality, global temperature decreased by around 0.2 °C for 1 or 2 years after this. How does the observed value compare with your calculated temperature change?

Task C Changes in greenhouse gas levels

6. A doubling of carbon dioxide levels in the atmosphere would decrease transmission of infrared radiation from 10% to 8%. How would you expect this to affect temperature? Use the model to find out how much the temperature changes.

7. Scientists predict that a doubling of carbon dioxide levels would increase global temperature by 2.5 °C. How does this compare with your calculated value?

When using this model, reset the factors to today's values each time, before looking at the effect of changing one of them:

solar radiation = $342 W/m^2$
reflectivity = 30%
transmission = 10%

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