Sun-climate links

No-one can deny the crucial influence that the Sun has on the Earth’s climate. The total amount of solar radiation reaching unit area of the Earth’s atmosphere is called the solar irradiance. This can be measured directly (as in recent years) or it can be estimated by proxies. For example, the solar irradiance is related to the Sunspot number, which is a measure of magnetic activity on the Sun.

The Sun shows a dominant 11-year cycle of solar irradiance (sunspot cycle). We are currently close to the solar minimum. The solar cycle has variable amplitude. A period of low irradiance was detected around the 18th century (the Maunder minimum) corresponding to the ‘little ice age’.

When the Sun is active, there is higher solar irradiance with large increases in UV and X-ray emission as seen in these X-ray images of the Sun from Yohkoh (1991-1999). The physical and chemical processes in the Earth’s atmosphere respond to enhanced UV and X-ray emission, but these processes are difficult to model.

Solar energetic particles and galactic cosmic rays can also affect the climate in complex ways.

The Earth’s surface temperature responds to solar irradiance, but the rise in temperature over the past three decades exceeds that which could be due to solar influences.

The vast majority of scientists are convinced that global warming is man-made. It is important that we develop sophisticated, integrated models in order to fully understand and predict the complex interaction between the Sun and the Earth.