



Exploring the science of climate

Sun, sunspots and volcanoes

Narrator:

What could account for these changes? The theory has to include the role the sun, the source of all the energy driving the climate system. The Earth is continually altering its position in relation to the sun, and so the amount of energy received can change, the angle of the tilt of the Earth varies, taking over 40,000 years to complete the move. At the same time the axis behaves like a top, it takes around 21,000 years to trace out a full circle in the sky. Then there's the Earth's orbit around the sun. It changes from circular to elliptical and back to circular, over about 100,000 years. But these aren't the only changes that take place. Other factors have to be put into a theory of climate change. Radiation from the sun changes on a much shorter time scale. One important change relates to sun spots. The more sun spots there are, the more radiation we receive from the sun, and there's a change in sun spot activity on a cycle of about eleven years. Scientists now know that the period of cold in Western Europe recorded by the Mannheim Group coincided with one of these more significant changes in sun spot activity. But there are other much less predictable causes of climatic change.

John Kington:

So there are scattered but fragmentary observations throughout the period.

Narrator:

And evidence of one of them lies in the Met Office archives.

Mick Wood:

In addition to the regular weather observations we had from the 1850's, we also have some older observations compiled by private individuals in the 1700's. This particular one is taken from Linden Hall in Rutland from 1777-1789, and here's a particularly interesting one for June 1783. He makes some comments about uncommon 'smoky air' for ten or twelve days at the end of the month. Now what he meant by that is open to some speculation.

Narrator:

The cold snap in 1783 was probably a result of low sun spot activity compounded by haze from the eruption of Laki Volcano in Iceland. But are the sun and volcanoes the only natural cause of change? There's at least one important element missing. The greenhouse theory suggests that changes in carbon dioxide levels affect temperature.

Geoff Jenkins:

There is a natural cycle of carbon that's going on all the time. Vast amounts of carbon dioxide is being exchanged between the oceans, the terrestrial biosphere, trees and plants, and so on, and the atmosphere. That goes on all the time and has been going on for billions of years. The carbon dioxide and water vapour that's already in the air already makes the Earth about 33 degrees warmer than it would otherwise be, and therefore it makes life habitable. What mankind is doing is burning fossil fuels, coal, gas and oil. The carbon in those fossil fuels is combining with oxygen in the atmosphere and creating more carbon dioxide, and it's unbalancing the natural cycle. An enhancement of the greenhouse effect by more gases going into the atmosphere will allow those temperatures to rise and rise, and that's the focus of the concern.