How Sunspots Control Global Weather

How the sun controls the weather

The Sun is our nearest star, 93 million miles away, so far that it takes light just over 8 minutes to reach the Earth. Despite being so far away it supports nearly all life on Earth and drives the Earth's climate and weather. The effect of the sun has been recognised since pre-historic times but its only recently since the 19 century that astronomers have studied it in detail.

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One of the most easily observed features of the sun are sunspots. Sunspots are temporary phenomena on surface of the Sun that appear visibly as dark spots compared to surrounding regions. The largest sunspots can the tens of thousands of kilometres across.

The number of sunspots visible on the Sun is not constant, but varies over an 11-year cycle known as the solar cycle. The solar cycle has a significant influence on the Earth's climate as the Sun's luminosity has a direct relationship with the magnetic activity associated with sunspots.Solar activity minima tend to be correlated with colder temperatures, and longer than average solar cycles tend to be correlated with hotter temperatures.

This Viz shows how the number of sunspots, cosmic rays, irradiance (energy) influences the weather on Earth.

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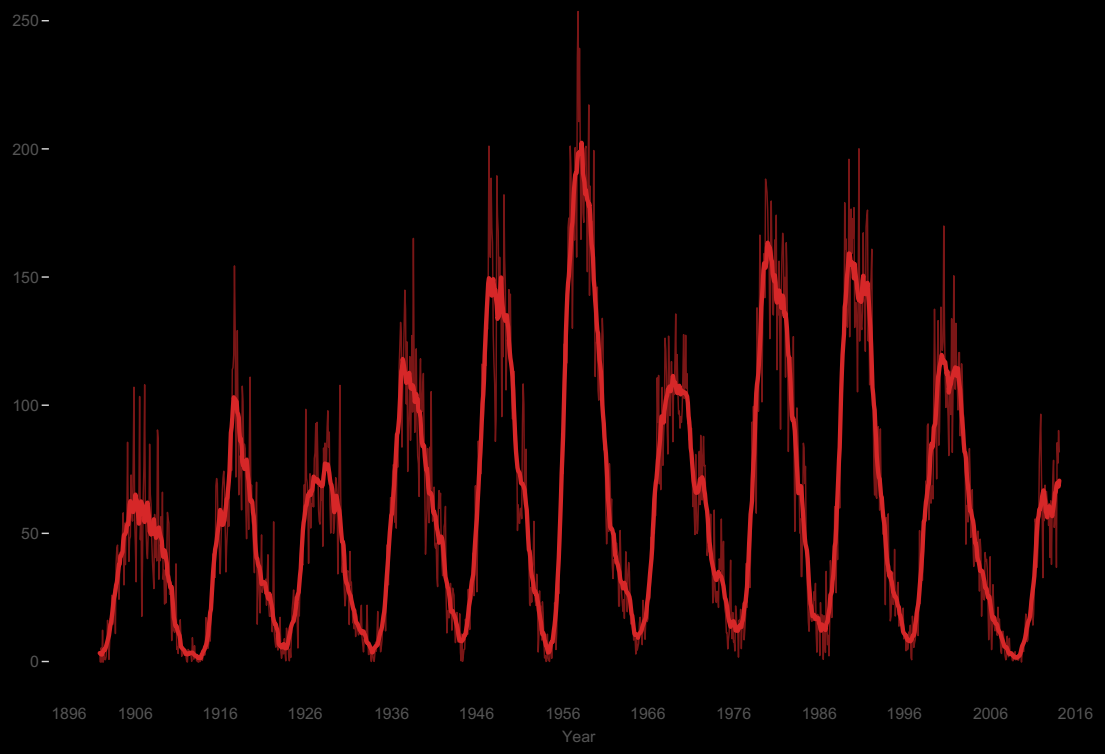
How The Sun Controls the Weather	The Solar Cycle	The number of sunspots...	...corresponds to the number of cosmic rays...	...and the amount of solar irradiation hitting the Earth...	...which influences global temperatures	Explore the data and see this lin..

Sunspots are temporary phenomena on the surface of the Sun that appear as dark spots compared to surrounding regions.The daily record since 1900 shows a clear 11 year max/min cycle...



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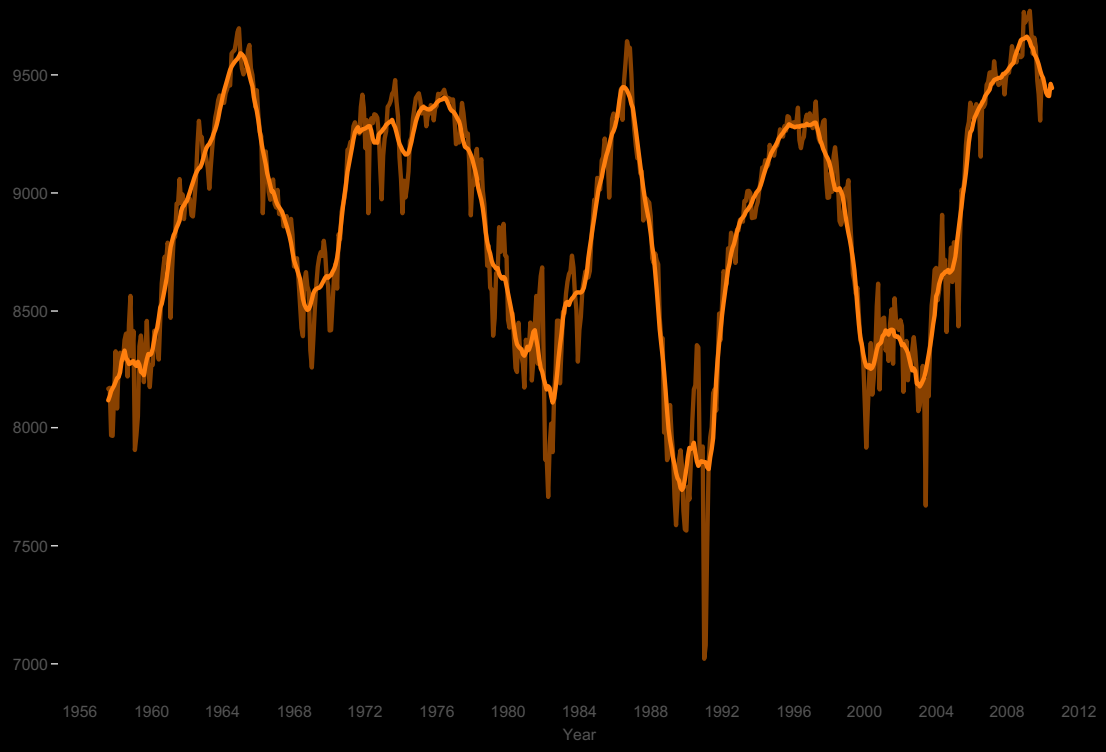
...as does the amount of cosmic rays, high energy particles emiited from the Sun, but the inverse to the sunspot and irradiance, high numbers of sunspots corresponds to low numbers of cosmic rays...



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..since 1978 satellites have recored Solar Irradiance, the amount of energy from the Sun that hits the Earth, this also follows the same 11 year cycle...

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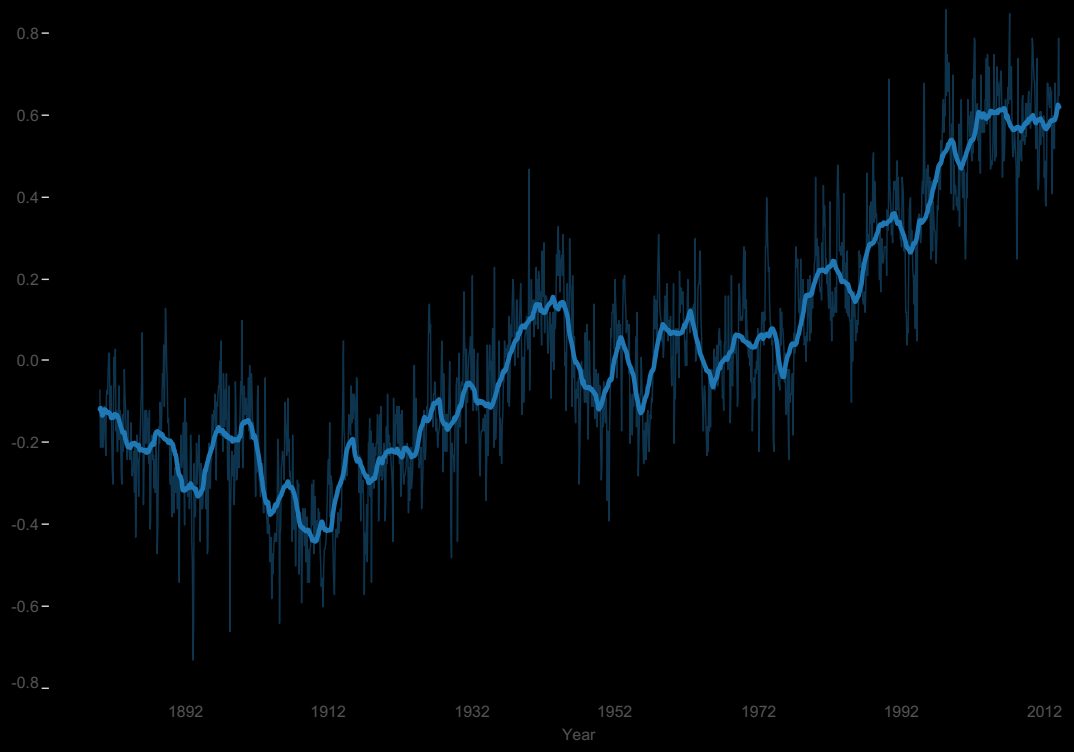
...and the global land and ocean temperature shows a higher variation during the solar maximum, the period of higher nunber of sunspots, irradiance and low cosmic rays.



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The Sun, our nearest star has a 11 year solar cycle which is clear from the number of sunspots, the power output and amount of cosmic rays. Cosmic rays have been linked to cloud formation, a lower number of rays means fewer clouds. More sunspots, means more energy hitting the earth, with less cloud cover thus causing greater temperature variations, which in turn can make for more exteme weather events.
Compare each of the measurements below to see just how well they correlate.