

Evidence #1: Atmospheric greenhouse gas concentrations have been rising for the past 50 years. Human activities have led to greater releases of greenhouse gases. Temperatures have also been rising during these past 50 years.

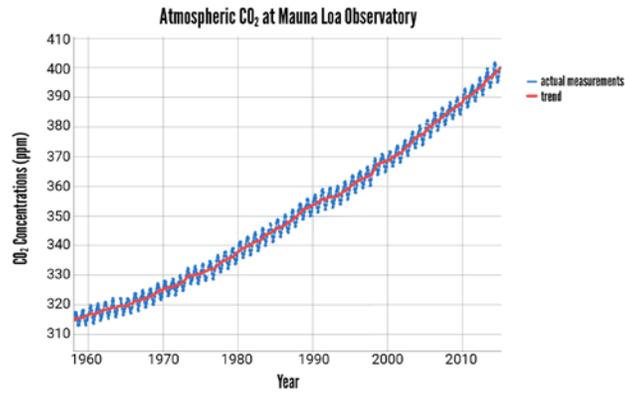


Figure 1. Carbon dioxide levels in the atmosphere. Credit: Wright Seneres

The symbol for carbon dioxide is CO₂. These levels have been increasing (Figure 1). CO₂ in the atmosphere absorbs infrared energy emitted by Earth. People call CO₂ a greenhouse gas because it keeps some of Earth's energy from escaping to space.

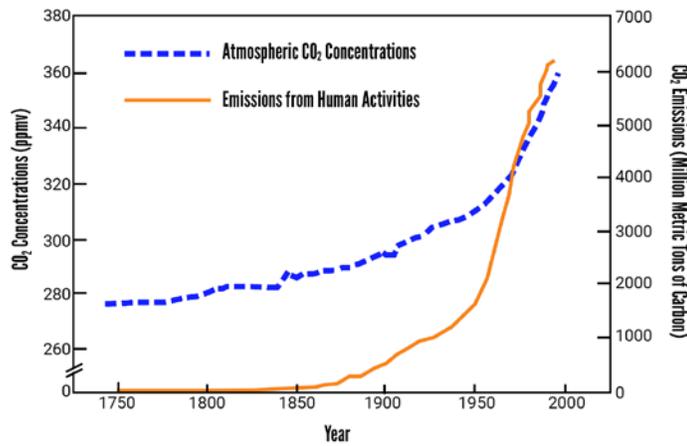


Figure 2. CO₂ released by human activities. Credit: Wright Seneres

Figure 2 shows increasing releases of CO₂ by the human activity of burning fossil fuels, including coal, gasoline, natural gas, and wood. Burning fossil fuels releases CO₂ into the atmosphere.

Evidence #2: Solar activity has decreased since 1970. Lower activity means that Earth has received less of the Sun's energy. But, Earth's temperature has continued to rise.

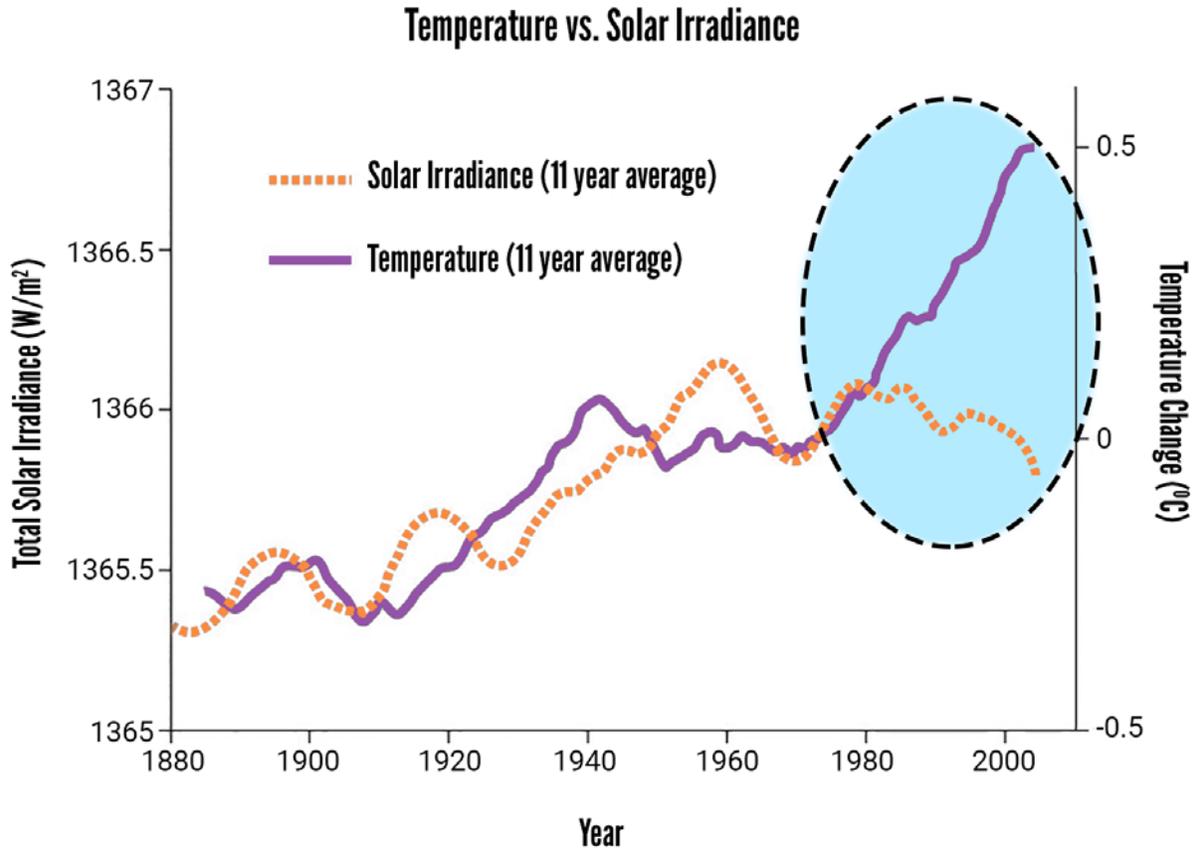


Figure 1. Solar activity levels over time. Credit: Wright Seneres

The Sun's brightness is one way to measure solar activity. In Figure 1, the dashed line shows the Sun's brightness. Since 1970, the Sun's brightness has been decreasing. The solid line on the graph shows Earth's temperature. The graph shows that temperatures are increasing while solar activity is decreasing. The region outlined by the dash-dot oval shows where solar activity is decreasing and temperature is increasing.

Evidence #3: Satellites are measuring more of Earth’s energy being absorbed by greenhouse gases.

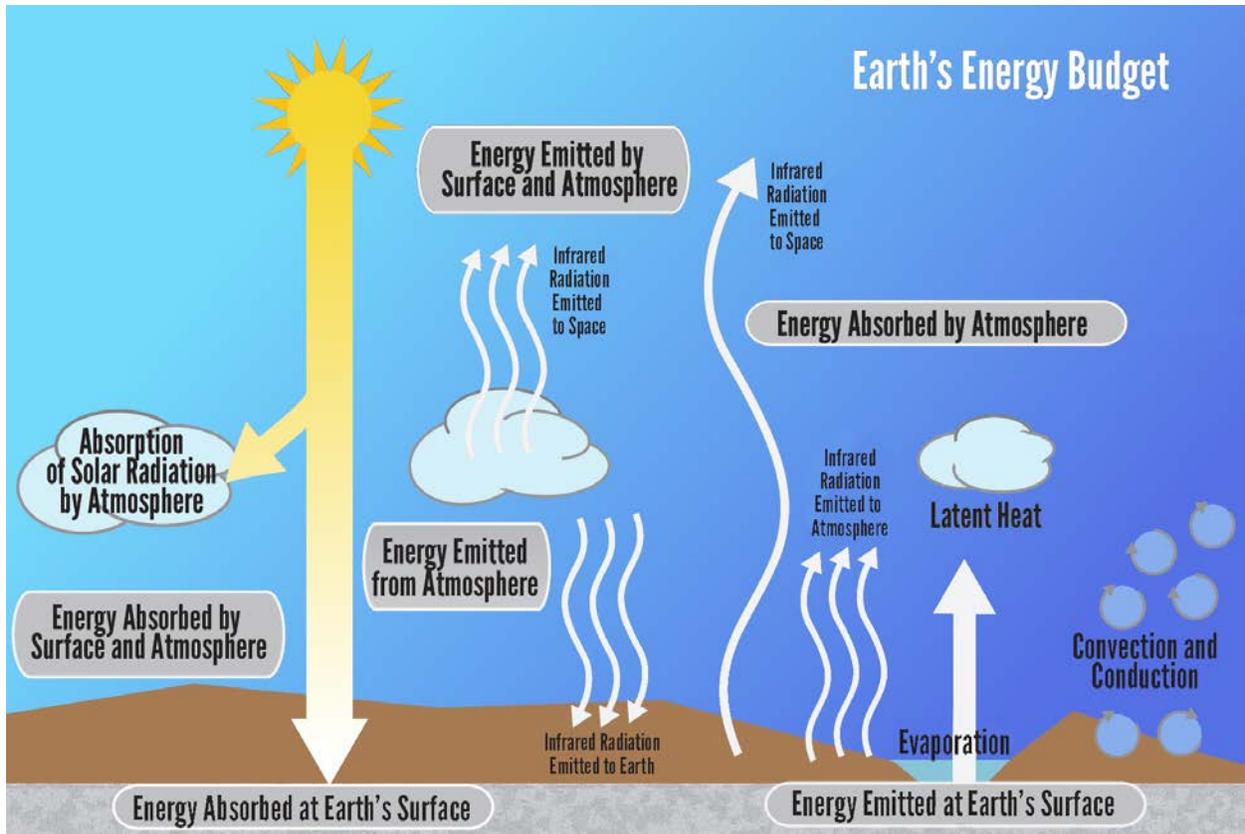


Figure 1. Earth's energy budget. Credit: Wright Seneres

Figure 1 above shows Earth's energy budget. Earth absorbs about half of the Sun's energy. Most of the Sun's energy comes to Earth as visible light. Earth reradiates this absorbed energy as invisible light called infrared. Some of this infrared energy is absorbed by the atmosphere and sent back to Earth. Some escapes into space. Over time, NASA satellites orbiting Earth have recorded less infrared energy leaving Earth's atmosphere.

Evidence #4: Increases and decreases in global temperatures closely matched increases and decreases in solar activity before the industrial revolution.

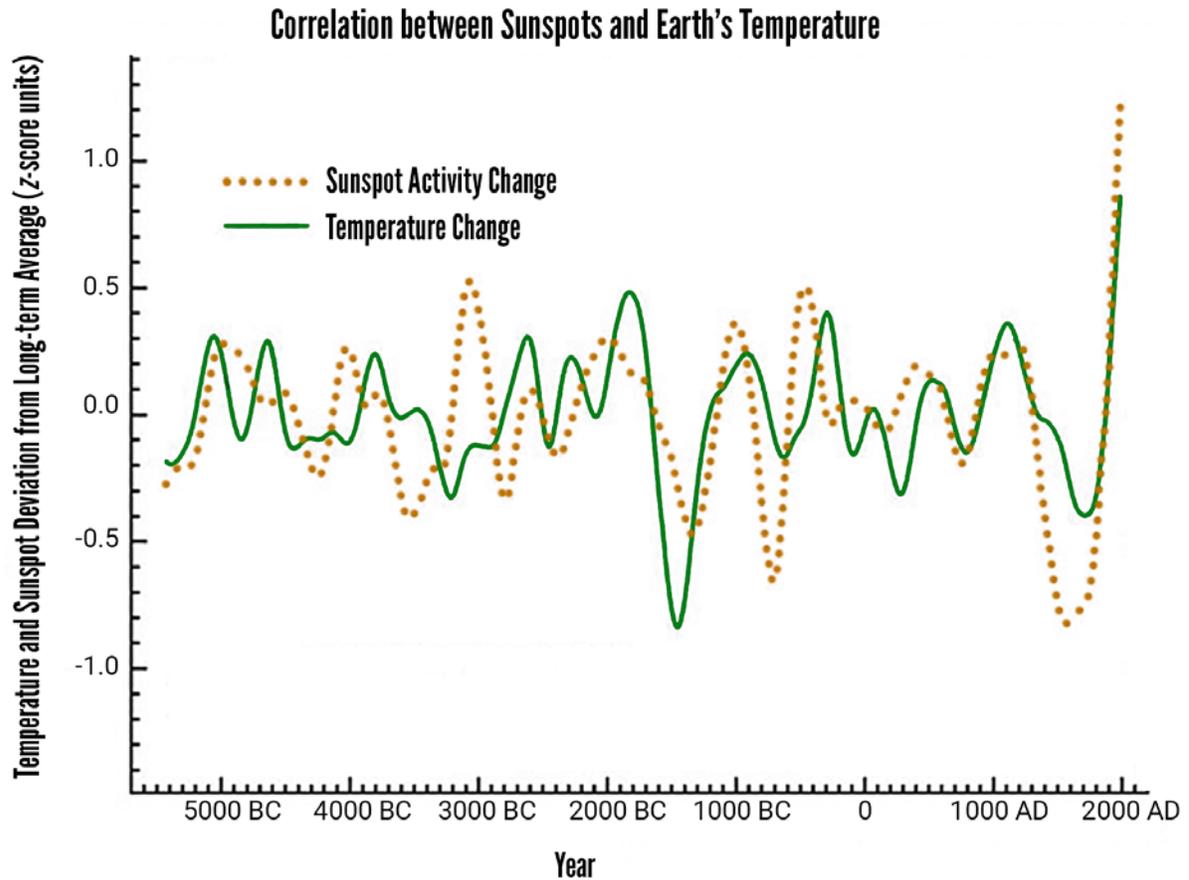


Figure 1. Sunspot activity and temperature over time. Credit: Wright Seneres

In Figure 1, sunspot activity is the dashed line. Solar activity increases when the Sun has more sunspots. The solid line shows temperature. The shapes of the sunspot and temperature curves match closely. Peaks in the temperature are near peaks in sunspot activity. Dips in temperature are near dips in sunspot activity.

These data show sunspot activity and temperature for the past 9000 years. These data are based on evidence collected from tree rings. Some of the tree rings are from trees that are still living. Some of the trees rings are from ancient trees that have died.