Evidence #1: Since 2000, there have been more intense, extreme, weather events around the world. Record rainfall fell in Europe. The southeastern United States had the most active month of tornadoes. The decade from 2000 to 2010 was the warmest ever during the past 1000 years.

Year	Region	Record-breaking event	Impacts
2000	England and Wales	Wettest autumn on record since 1766	$2 billion in damages
2002	Central Europe	Highest daily rainfall record in Germany since 1901	Flooding of Prague and Dresden, with about $15 billion in damages
2003	Europe	Hottest summer in 500 years	Death toll exceeding 70,000
2004	South Atlantic	First hurricane in the South Atlantic since 1970	Three deaths, with about $425 million in damages
2005	North Atlantic	Record number of hurricanes since 1970	Costliest US natural disaster, 1,836 deaths (Hurricane Katrina)
2007	Arabian Sea	Strongest tropical cyclone in the Arabian Sea since 1970	Biggest natural disaster in the history of Oman
2007	England and Wales	May–July wettest since records began in 1766	Major flooding causing about $4 billion in damages
2007	Southern Europe	Hottest summer on record in Greece since 1891	Devastating wildfires
2009	Victoria (Australia)	Heatwave breaking many temperature records	Worst bushfires on record, 173 deaths & 3,500 houses destroyed
2010	Western Russia	Hottest summer since 1500	500 wildfires around Moscow, with 30% losses in grain harvest
2010	Pakistan	Rainfall records	Worst flooding in Pakistan's history, nearly 3,000 deaths, affected 20 million people
2010	Eastern Australia	Highest December rainfall recorded since 1900	Brisbane flooding in January 2011 cost 23 lives and an estimated $2.55 billion in damages
2011	Southern US	Most active tornado month on record (April) since 1950.	Tornado hit Joplin, MO, causing 116 deaths
2011	Texas, Oklahoma	Most extreme July heat and drought since 1880	French grain harvest down by 12%
2011	Western Europe	Hottest and driest spring on record in France since 1880	73 deaths, 20 missing, severe damage
2011	Republic of Korea	Wettest summer on record since 1908	Flooding of Seoul, 49 deaths, 77 missing, 125,000 affected

Table 1. Record-breaking weather events - worldwide between 2000 and 2011. Adapted from Coumou & Rahmstorf (2012).

Table 1 shows extreme weather events from 2000 to 2011.

Evidence #2: Frequency and size of large wildfires have increased in the Western U.S. since 1970. Average spring and summer temperatures have also risen in the Western U.S. during this time.

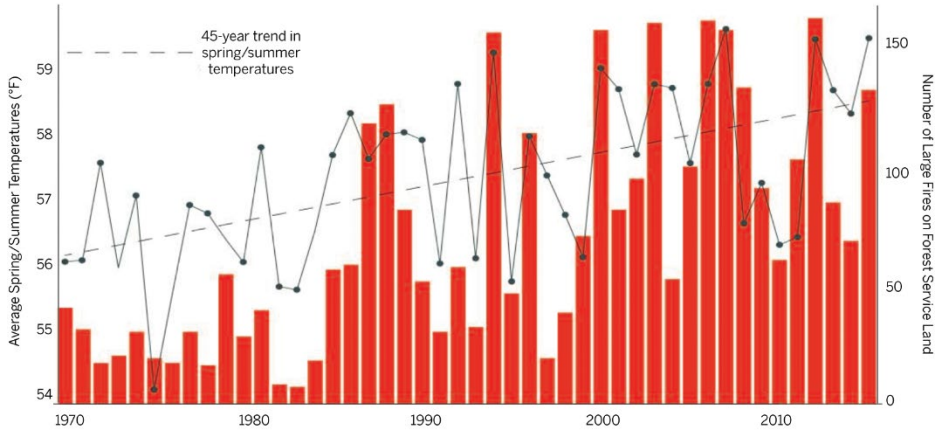

Figure 1. Average annual temperatures overlaid with number of large fires (≥ 1000 acres). Credit: Wright Seneres based on Kenward et al. (2016).

The bars in Figure 1 show the annual number of large fires on U.S. Forest Service land. Most of this land is in the Western U.S. The solid line shows the average spring and summer temperatures on these lands for each year. The dotted line shows an upward trend in these temperatures.

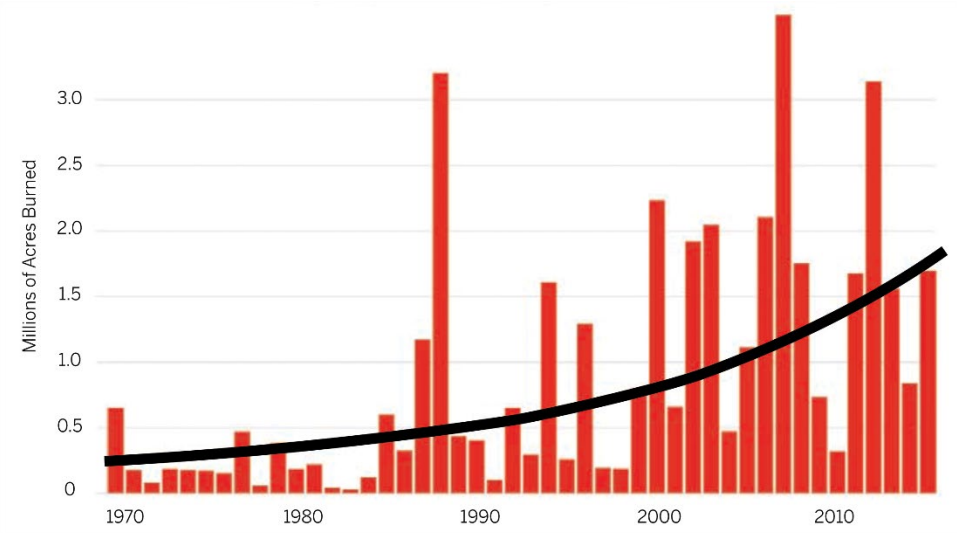

Figure 2. Millions of acres burned by large wildfires. Credit: Wright Seneres based on Kenward et al. (2016).

In Figure 2, the red bars show how many millions of acres have burned each year. The black line in Figure 2 shows the increasing trend of acres burned.

Evidence #3: In the last 100 years, global temperatures have increased. In that same time period, heavy precipitation events have also increased.

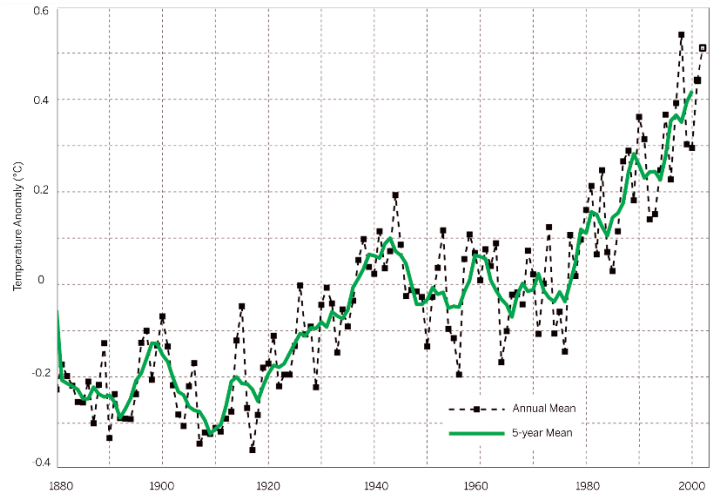

Figure 1. Trend of global annual surface temperature. Credit: Wright Seneres based on NASA data.

The black dotted line in Figure 1 shows annual, average, global temperature anomalies. Anomalies are things that differ from the "normal" or average conditions. "0" on the left axis represents that average. It is the long-term, global, average, temperature between 1951 and 1980. The black dotted line shows that global temperatures have increased since 1951.

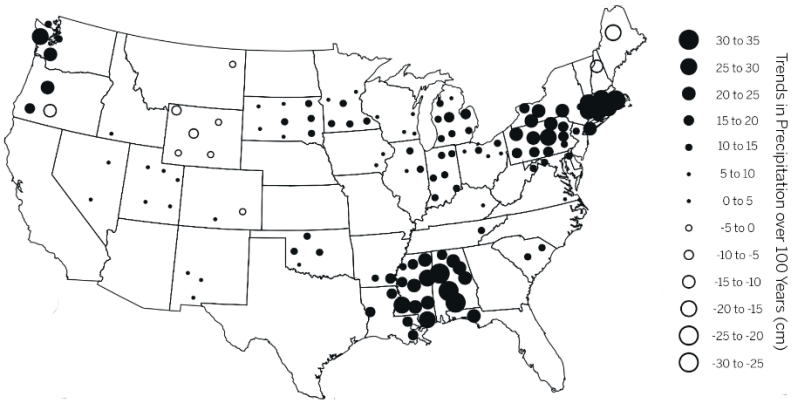

Figure 2. Trends per 100 years for precipitation (cm). Shaded circles represent an increase. Unshaded circles represent a decrease. Credit: Wright Seneres based on Grundstein (2009).

Figure 2 shows changes in precipitation patterns across the U.S. Shaded circles show the amount that has increased over 100 years. This occurred in most parts of the U.S. Unshaded circles show the amount that has decreased over 100 years. This occurred mainly in the Rocky Mountain region.

Evidence #4: Earth's orbit is elliptical. But, the shape of the ellipse is almost a perfect circle. In the Northern Hemisphere, Earth is slightly closer to the Sun in winter than in summer.

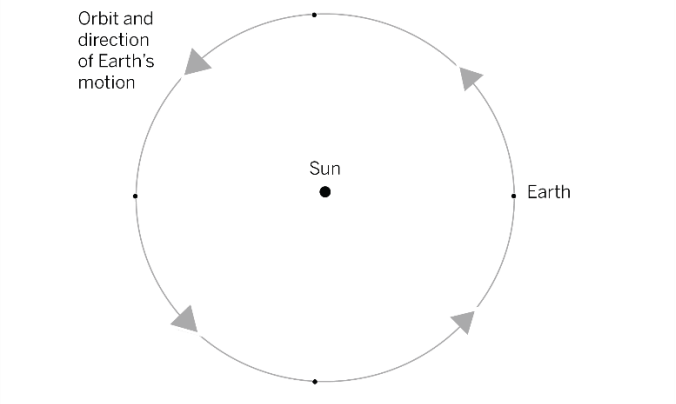

Figure 1. Earth's orbit around the Sun. Credit: Wright Seneres

Figure 1 shows the shape of Earth's orbit around the Sun. This view is looking directly down on the Sun and Earth from above the North Pole. Although the orbit is elliptical, the eccentricity is very small. This means that the orbit is almost a perfect circle, but not exactly. Because Earth's path is not perfectly circular, the amount of energy received from the Sun varies by about 3.5% during the year. The date when Earth is closest to the Sun shifts slightly over time. Currently, Earth is closest to the Sun in the middle of the Northern Hemisphere winter.

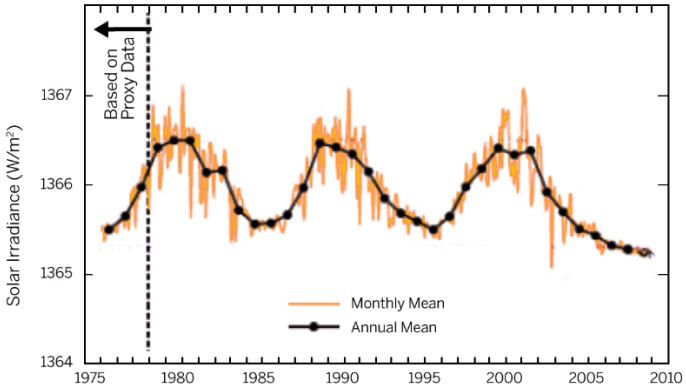

Figure 2. Total solar irradiance as observed directly by satellites. Credit: Wright Seneres based on NASA data.

Energy received from the Sun is called solar irradiance. Figure 2 shows changes in solar irradiance. The orange line shows monthly solar irradiance. The black line shows the smoothed average. The irradiance depends some on Earth's orbital position.