Tracing the Warming

Read the evidence behind a century of temperature change.

7.ESS3.5 "Obtain, evaluate, and communicate evidence of the factors that have caused changes in global temperatures over the past century."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline evidence that global temperatures have changed, circle evidence about possible causes, and number the causes from 1 to 3. Use your marks to compare how well the evidence supports each cause.

What Is Warming Earth?

1. A thermometer outside your school can tell you whether today is warm, but it cannot measure Earth's climate alone. Scientists combine readings from thousands of land stations with measurements taken over oceans. They compare yearly global averages, not just one hot city or one cold winter. These records show that Earth's average surface temperature has risen about 1.2°C since the late 1800s. Some years are cooler than nearby years, yet recent decades are warmer than earlier decades. Independent ocean measurements help check the pattern seen on land.

2. Burning coal, oil, and natural gas releases carbon dioxide, CO_2, into the air. This gas slows the escape of heat from Earth to space. Air trapped in ancient ice shows about 280 parts per million of CO_2 before large-scale fossil fuel use. Direct measurements now show more than 420 parts per million. Scientists also find that the mix of carbon in the air has shifted in a way expected from burning fossil fuels. Together, these observations connect human activity to an increase in heat-trapping gas.

3. Could nature explain the warming instead? Since satellites began monitoring the Sun in the late 1970s, they have not found a lasting rise in its energy output, while Earth has continued warming. Large volcanic eruptions send particles high into the air that reflect sunlight. After Mount Pinatubo erupted in 1991, global temperatures dipped briefly, then rose again. Solar changes and eruptions affect temperature, but their measured patterns do not explain the sustained warming seen across land and ocean. Comparing several kinds of evidence helps scientists distinguish a short-lived effect from a long-term cause.

2 ANSWER WITH EVIDENCE

Use the passage

1. What evidence shows that the temperature rise is a global pattern rather than a change in one place?

2. Identify two observations that support a link between burning fossil fuels and warming. Explain the link.

3. A student says the Sun caused the continued warming since the late 1970s. How does the evidence challenge that claim?

4. What does the temperature change after the 1991 Mount Pinatubo eruption show about whether eruptions explain long-term warming?

3 YOUR TURN

Your own words

A school poster says, “One unusually cold year proves the century-long warming trend has ended.” Write 4 or 5 sentences evaluating this claim. Use two different kinds of evidence from the passage, and explain what additional temperature evidence you would check.

ANSWER KEY

Tracing the Warming

GRADE 7 · 7.ESS3.5

PART 1 · READ AND MARK

Underline evidence that global temperatures have changed, circle evidence about possible causes, and number the causes from 1 to 3. Use your marks to compare how well the evidence supports each cause. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What evidence shows that the temperature rise is a global pattern rather than a change in one place?	**Scientists combine readings from thousands of land stations with ocean measurements. Global averages show about 1.2°C of warming since the late 1800s.**
2	Identify two observations that support a link between burning fossil fuels and warming. Explain the link.	**CO_2 rose from about 280 to more than 420 parts per million, and the mix of carbon in the air shifted as expected from burning fossil fuels. CO_2 slows the escape of heat.**
3	A student says the Sun caused the continued warming since the late 1970s. How does the evidence challenge that claim?	**Satellite measurements show no lasting rise in the Sun's energy output since the late 1970s, while Earth has continued warming.**
4	What does the temperature change after the 1991 Mount Pinatubo eruption show about whether eruptions explain long-term warming?	**Temperatures dipped briefly after the eruption and then rose again. That short cooling does not explain sustained warming.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

One cold year cannot show that a century-long warming trend has ended. Land stations and ocean measurements show that Earth has warmed by about 1.2°C since the late 1800s, even though some years are cooler than others. Rising CO_2 and the change in the mix of carbon in the air provide evidence of a cause for long-term warming. I would check global temperatures over many years after the cold year to see whether the longer trend changed.

Accept answers that distinguish short-term variation from a global, long-term trend and accurately connect evidence to a possible cause. For the open task, students may choose other relevant evidence from the passage if they explain how it bears on the poster's claim.