Finding Invisible Leaks

Read a technical explanation and trace its claims, evidence, and limits.

CCSS.ELA-Literacy.RST.11-12.10 "By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB As you read, underline each major claim, circle the evidence or method that supports it, and number words or phrases that limit certainty, so you can track how this technical text builds a careful conclusion.

Tracking Methane From Space

1 Methane is a greenhouse gas that absorbs infrared radiation leaving Earth's surface. Over a twenty-year period, a kilogram of methane causes far more warming than a kilogram of carbon dioxide, although methane remains in the atmosphere for only about a decade on average. This contrast makes methane leaks an important near-term target for climate policy. Yet leaks are difficult to locate because pipelines, wells, landfills, and livestock facilities are spread across large areas. Scientists therefore use instruments that can identify methane from a distance before field crews visit.

2 One approach uses satellite sensors that measure how Earth's surface reflects sunlight at particular wavelengths. Methane absorbs some of that light, leaving a pattern in the measured spectrum. Computer models compare the observed pattern with expected patterns under different atmospheric conditions. A localized enhancement can indicate a plume, but it does not by itself prove the source or the emission rate. Clouds, bright surfaces, water vapor, and wind can complicate interpretation. Researchers combine satellite observations with wind data and measurements closer to the ground to estimate where gas was released.

3 Detection is not the same as reduction. When a monitoring system identifies a likely plume, operators must inspect equipment, determine whether the release is accidental or intentional, and repair or alter the process when feasible. This sequence matters because some facilities vent methane during specific operations, while others may leak continuously from damaged components. Repeated measurements can show whether a repair lowered emissions, but changing wind or instrument sensitivity may also change the apparent plume. For that reason, analysts report uncertainty and avoid treating one image as conclusive evidence of a facility's typical emissions.

2 ANSWER WITH EVIDENCE

Use the passage

1. How does paragraph 1 use the contrast between methane's warming effect and its atmospheric lifetime to frame the problem of methane leaks?

2. Trace the reasoning in paragraph 2 from a satellite measurement to an estimate of where methane was released.

3. According to paragraph 2, what does a localized enhancement fail to prove, and which four factors can make it difficult to interpret?

4. Why does the author end paragraph 3 by warning against treating one image as conclusive evidence of typical emissions?

3 YOUR TURN

Your own words

Write a three-sentence evidence-based annotation evaluating whether one satellite image can establish a facility's typical methane emissions. State a claim, use two details from the passage, and explain how the details support your claim.

ANSWER KEY

Finding Invisible Leaks

HIGH SCHOOL · RST.11-12.10

PART 1 · READ AND MARK

As you read, underline each major claim, circle the evidence or method that supports it, and number words or phrases that limit certainty, so you can track how this technical text builds a careful conclusion. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How does paragraph 1 use the contrast between methane's warming effect and its atmospheric lifetime to frame the problem of methane leaks?	**Methane produces much stronger near-term warming than carbon dioxide but lasts only about a decade, so finding and reducing leaks can be an important near-term climate action.**
2	Trace the reasoning in paragraph 2 from a satellite measurement to an estimate of where methane was released.	**Sensors measure reflected sunlight at specific wavelengths, methane absorption creates a spectral pattern, models compare that pattern with expected conditions, and researchers combine the observation with wind and ground-level data to estimate the release location.**
3	According to paragraph 2, what does a localized enhancement fail to prove, and which four factors can make it difficult to interpret?	**It does not prove the source or emission rate. Clouds, bright surfaces, water vapor, and wind can complicate interpretation.**
4	Why does the author end paragraph 3 by warning against treating one image as conclusive evidence of typical emissions?	**A single image may be affected by changing wind or instrument sensitivity, and it may capture a temporary vent or leak rather than a facility's usual emissions. Repeated measurements provide stronger evidence.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

A single satellite image cannot establish a facility's typical methane emissions. Although a localized enhancement can indicate a plume, it does not prove the source or emission rate, and wind can change the apparent plume. Repeated measurements are needed to test whether emissions persist or fall after a repair.

Accept responses that identify a defensible claim about the limits of one image, use at least two accurate passage details, and explain the connection between the details and the claim. Students may choose different evidence, including uncertainty, temporary venting, changing conditions, or the value of repeated measurements.