

Meteorite Records Investigation

Analyze meteorite records, evaluate sampling bias, and use age evidence from meteorites and ancient materials to reconstruct early solar-system history.

NGSS: HS-ESS1-6 - use evidence from meteorites, ancient Earth materials, and planetary surfaces to construct an account of Earth's formation and early history; SEP focus: constructing explanations from multiple lines of evidence.

Name: _____ **Class / Period:** _____ **Date:** _____

Driving Question

What can meteorite evidence tell us - and not tell us - about where meteorites are recorded and about the early history of Earth and the solar system?

Before You Begin

1. What is the difference between an observed fall and a later find? Why might those two groups produce different map patterns?
2. The model preserves records with missing location, mass, or year. Why is keeping incomplete records scientifically useful?

Part A - Observe the Global Pattern

Start with All records. Identify three visible clusters or gaps. Describe only what the map shows before explaining why the pattern may exist.

Location / region	Cluster or gap?	What do you observe?

Part B - Compare Falls and Finds

View	Describe the strongest pattern	One location that stands out
Observed falls		
Later finds		

3. What pattern remains similar in both views?
4. What pattern changes when you switch between observed falls and later finds?

Part C - Evaluate Missing and Filtered Evidence

The model contains 45,716 total records, 32,186 mapped records, and 13,529 records with unknown map locations.

5. Calculate the approximate percent of records that cannot be placed on the Earth map. Show your setup.

6. How could the unknown-location records change or weaken a conclusion made from the map alone?

Choose any three individual meteorites or filtered records to inspect.

Name	Class / group	Fall or find	Mass	Year	Location / note

7. List two non-meteorite factors that could create a mapped concentration of finds (for example, search effort, preservation, recognition, or reporting).

Map-Evidence Conclusion

8. Does the mapped dataset by itself accurately represent where meteorites fall? Support your answer with two pieces of evidence.

Part D - Construct an Account of Early Solar-System History

The map shows where meteorites were recorded, but HS-ESS1-6 requires age evidence too. Use the rounded classroom evidence below to construct a timeline. Ages are approximate.

Evidence source	Approx. age	What the evidence suggests
Calcium-aluminum-rich inclusions in primitive meteorites	4.567 billion years	Among the earliest known solids formed in the solar system
Asteroidal meteorites	about 4.5-4.56 billion years	Many asteroid parent bodies formed very early in solar-system history
Ancient lunar crust	about 4.4 billion years	The Moon developed a solid crust early in solar-system history
Jack Hills zircon grains from Earth	about 4.4 billion years	Earth had solid crust by this time

9. Place the evidence in time order. What sequence of early solar-system and planetary events does it support?

10. Why is combining meteorite ages with ancient Earth and lunar evidence stronger than using only one evidence source?

Claim - Evidence - Reasoning

Claim: What do meteorites and other ancient materials show about when the solar system and early Earth formed?

Claim: State your answer in one clear sentence.

Evidence: Use at least three specific observations, measurements, or data values from the investigation.

Reasoning: Explain why your evidence supports the claim using the science ideas from the investigation.

Sources for age evidence: NASA meteorite and lunar science resources; U.S. Geological Survey Jack Hills zircon resources. Values are rounded for classroom use.