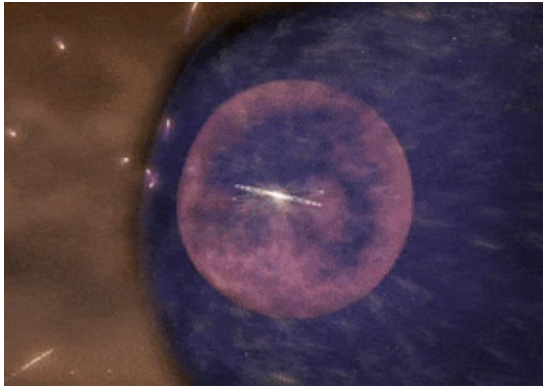
National Aeronautics and Space Administration



Cosmic rays bombarding the heliosphere

Interstellar Mapping and Acceleration Probe

Heliophysics Investigations by Dr. Hilarie Davis

10/7/25 Heliophysics Education Community Meeting

NASA Heliophysics Education Activation Team

IMAP Will Map the Heliosphere in Greater Detail

- IMAP will help researchers better understand the boundary of the heliosphere and allow for better prediction of dangerous space weather.
- IMAP will be stationed at Lagrange point 1 for an unobstructed view of the solar wind and the interstellar medium. The balanced gravitational forces at L1 also allow the spacecraft to remain in position using minimal fuel.
- IMAP has 10 instruments to provide a comprehensive view of the heliosphere's interaction with the interstellar medium, including energetic neutral atom imagers, a telescope, a charged particle detector, a dust detector, a magnetometer and experiments on dust, solar wind, ions, and solar wind structure.

Framework for Heliophysics Education (FHE)

Developed by NASA HEAT in 2022

https://science.nasa.gov/learn/heat/big-ideas/

Structured around NASA's Big Heliophysics Questions

1. What are the impacts of the Sun on humanity?
2. How do the Earth, the solar system, and heliosphere respond to changes on the Sun?
3. What causes the Sun to vary?

FHE has Developed Big Ideas for the NASA Questions

1. What are the impacts of the Sun on humanity?

1.1 The Sun is really big and its gravity influences all objects in the solar system. (PS2, ESS1)

1.2 The Sun is active and can impact technology on Earth via space weather. (PS1, PS2, PS4, ESS2, ESS3)

1.3 The Sun's energy drives Earth's climate, but the climate is in a delicate balance and is changing due to human activity. (PS1, PS2, PS3, LS4, ESS2, ESS3)

2. How do the Earth, the solar system, and heliosphere respond to changes on the Sun?

2.1 Life on Earth has evolved with complex diversity because of our location near the Sun. It is just right! (PS3, PS4, LS1, LS2, ESS2)

2.2 The Sun defines the space around it, which is different from interstellar space. (PS2, ESS1, ESS2)

2.3 The Sun is the primary source of light in our solar system. (PS1, PS2, PS3,PS4, ESS1)

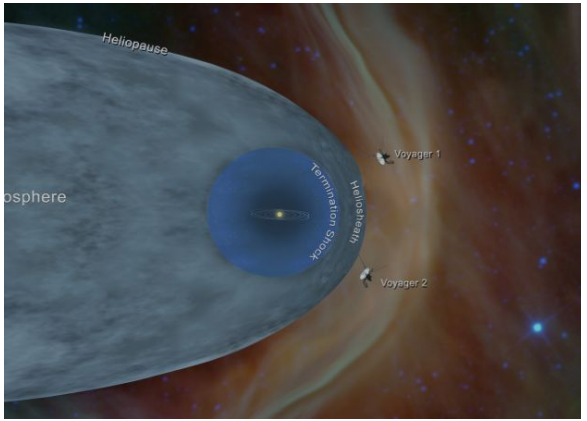
3. What causes the Sun to vary?

3.1 The Sun is made of churning plasma, causing the surface to be made of complex, tangled magnetic fields. (PS1, PS2, ESS1, ESS2)

3.2 Energy from the Sun is created in the core and travels outward through the Sun and into the heliosphere. (PS1, PS3, PS4, ESS1, ESS2, ESS3)

Question 2: How do the Earth, the solar system, and heliosphere respond to changes on the Sun?

2.2 The Sun defines the space around it, which is different from interstellar space. (PS2, ESS1, ESS2)



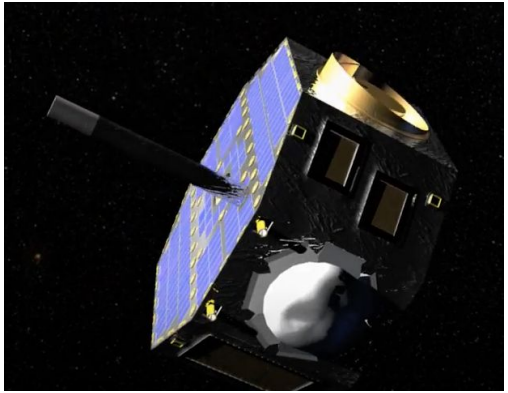
Voyager spacecraft leaving the heliosphere

NASA HEAT

Introductory Level Investigation

The first spacecraft to study interstellar space, called the Interstellar Boundary Explorer, was launched in 2008. What was the plan for it? What did it accomplish?

- What is the "boundary" of our solar system?
- Video about IBEX purpose and launch
- Interstellar Boundary Explorer activity
- IBEX video on five years of discoveries

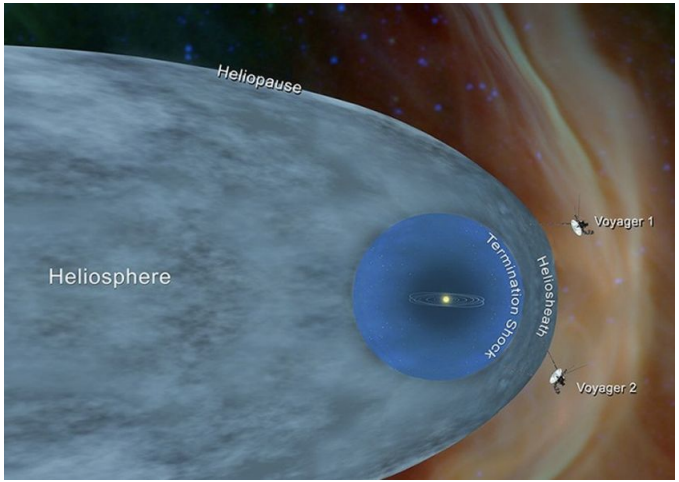


IBEX spacecraft

Intermediate Level Investigation

The Voyager spacecraft left the heliosphere in 2012 and 2018. What have scientists learned about interstellar space from them?

- Only two spacecraft have made it to interstellar space Voyagers 1 & 2
- Five things we learned since Voyager 2 left the heliosphere
- 10 things we learned from going interstellar



The positions of Voyageurs 1 and 2 outside the heliosphere

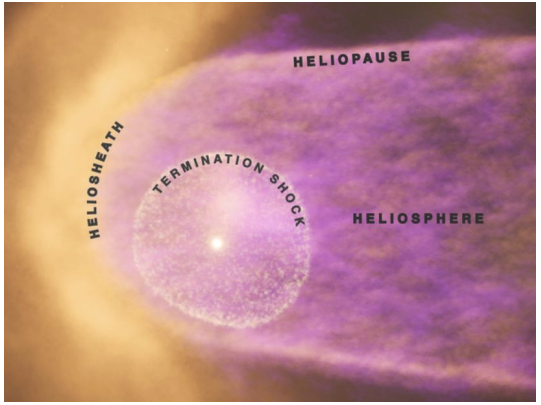
NASA HEAT

Advanced Level Investigation

How do scientists study the interstellar medium? What have they learned?

- Why have a telescope in space?
- ESASky to visualize and download astronomical data
- Molecular clouds in the Interstellar Medium
- A Multi-Wavelength Study of the Hot Component Of The Interstellar Medium

Teachers can find lessons on the ISM on the ESA website



A still graphic showing the heliosphere, the protective bubble that is created by the solar wind and surrounds the solar system.

For more information

IBEX website

Framework for Heliophysics Education

https://science.nasa.gov/learn/heat/big-ideas/