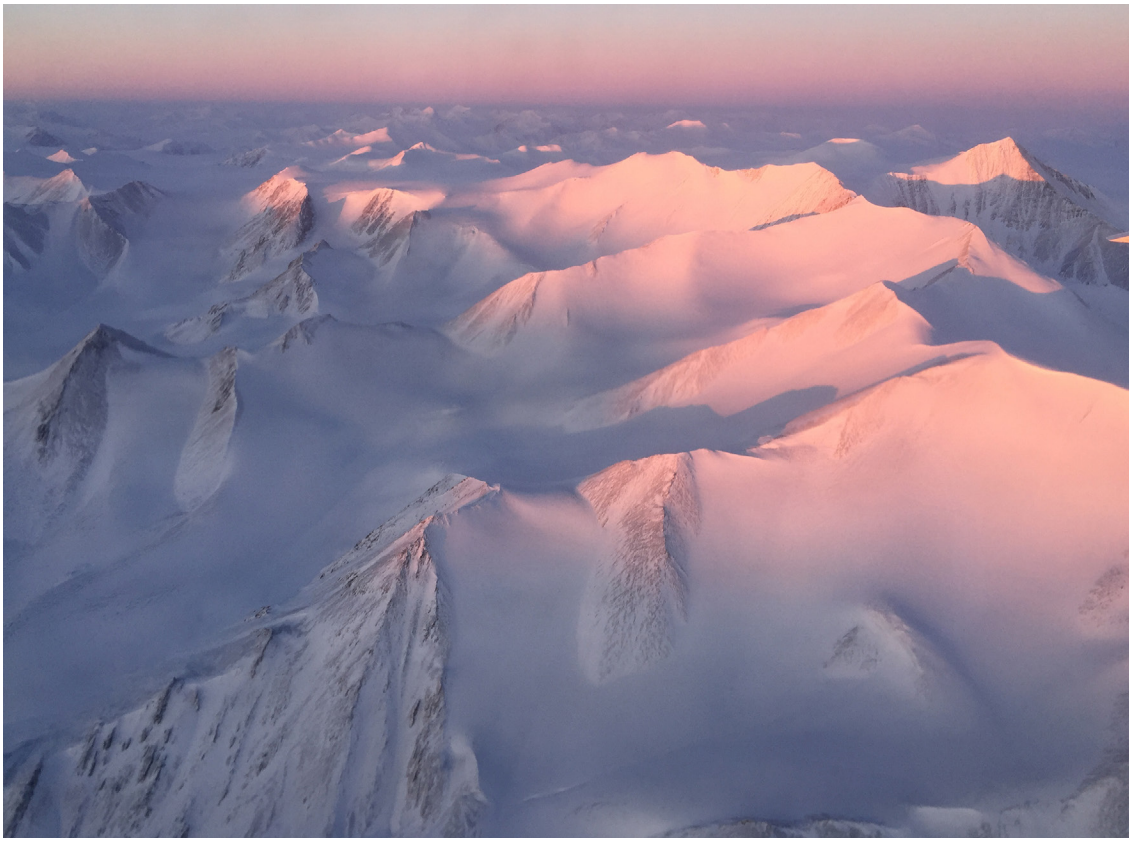
NASAfacts

PREFIRE

Polar Radiant Energy in the Far InfraRed Experiment

Illuminating how the poles influence Earth's changing climate



PREFIRE will study the heat emitted as far-infrared radiation from the Arctic (pictured) and Antarctica. Credit: NASA

NASA's Polar Radiant Energy in the Far-InfraRed Experiment (PREFIRE) will fill in a big gap in our understanding of how much heat the Arctic and Antarctic radiate into space. Earth's polar regions help to regulate the planet's climate by shedding a lot of the heat, or thermal energy, initially absorbed at the tropics back into space. But less than half of the energy emitted at the poles as far-infrared radiation has been systematically measured, obscuring important information about the changing polar environments and their effects on Earth's climate.

PREFIRE, composed of two shoebox-size CubeSats outfitted with specialized miniature heat sensors, will give researchers a more accurate picture of how much heat Earth emits into space. This information will help to improve climate and ice models and provide better predictions of how the planet's sea level and weather are likely to change in the future.

Expected Mission Timeline

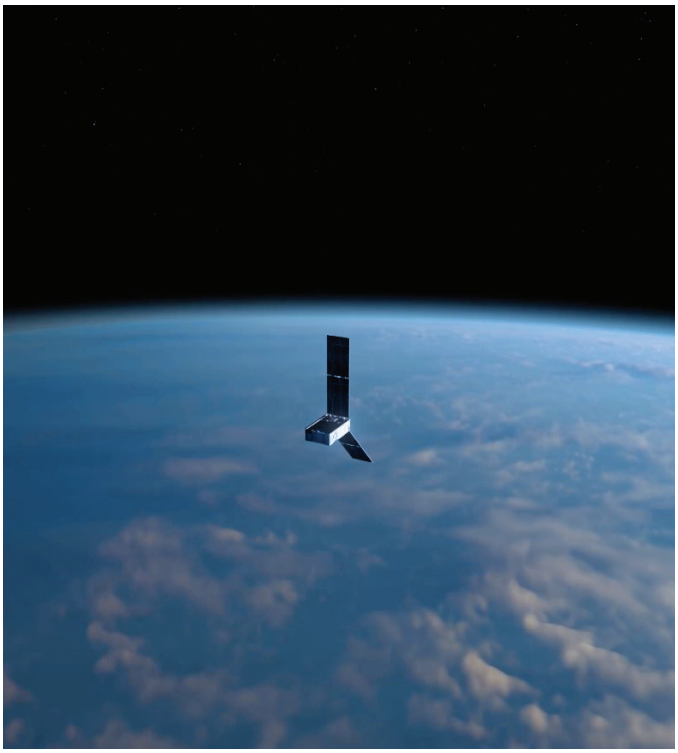
- **May 2024:** PREFIRE launches the first of its two CubeSats no earlier than May 22 from Rocket Lab Launch Complex 1 in New Zealand aboard an Electron launch vehicle. The second CubeSat is targeting a launch in the days following the first launch.
- **Ten months:** Duration of the prime mission, when the two PREFIRE CubeSats collect science data. This starts after a 30-day commissioning period.

Key Objectives

- Determine how much heat — in the form of far-infrared radiation — snow and ice surfaces emit into space and how the amount varies from month to month.
- Measure the amount of far-infrared radiation trapped by atmospheric water vapor and clouds in the Arctic and Antarctica and how this influences the greenhouse effect at the poles.
- Use data from PREFIRE to update far-infrared emission estimates in climate models to more accurately reflect observations and improve projections for Arctic warming and sea ice loss.
- After improving far-infrared emission estimates in climate models, assess how well models simulate ice sheet processes like melt rates.

Science Instrument

- Thermal Infrared Spectrometer (TIRS): Each CubeSat contains a thermal infrared spectrometer to measure the amount of infrared and far-infrared radiation Earth's polar regions lose to space. The instrument includes specially shaped mirrors and detectors for splitting and measuring infrared light. Miniaturized for use in CubeSats, the TIRS instrument weighs less than 6 pounds (2.7 kilograms) and uses less than 6 watts of power.



This artist's concept depicts one of the PREFIRE CubeSats in low Earth orbit. Credit: NASA/JPL-Caltech

PREFIRE CubeSat

Each PREFIRE spacecraft is a 6U CubeSat that is about 35 inches (90 centimeters) tall and a little less than 50 inches (120 centimeters) wide when the solar panel arrays are deployed. The solar panels provide between 92 to 108 watts of power. The CubeSats will operate in a near-polar orbit (98 degrees inclination) at an altitude of roughly 328 miles (525 kilometers).

Mission Partners

The mission is being jointly developed by NASA and the University of Wisconsin-Madison. NASA's Jet Propulsion Laboratory manages the mission for the agency's Science Mission Directorate and provided the spectrometers. Blue Canyon Technologies built the CubeSats and the University of Wisconsin-Madison will process the data the instruments collect. The launch services provider is Rocket Lab USA Inc. of Long Beach, California.

Mission Website

https://science.nasa.gov/mission/prefire/

National Aeronautics and Space Administration
www.nasa.gov

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