

NASA to investigate climate impacts of Arctic sea ice loss

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NASA's C-130 aircraft will carry scientists over the Arctic starting this month from northern Greenland and Fairbanks, Alaska. Credit: NASA

A new NASA field campaign will begin flights over the Arctic this summer to study the effect of sea ice retreat on Arctic climate. The Arctic Radiation IceBridge Sea and Ice Experiment (ARISE) will conduct research flights Aug. 28 through Oct. 1, covering the peak of summer sea ice melt.

ARISE is NASA's first Arctic airborne campaign designed to take simultaneous measurements of ice, clouds and the levels of incoming and outgoing radiation, the balance of which determines the degree of climate warming. The campaign team will fly aboard NASA's C-130

aircraft from Thule Air Base in northern Greenland the first week and from Eielson Air Force Base near Fairbanks, Alaska, through the remainder of the campaign.

In recent years the Arctic has experienced increased summer [sea ice](#) loss. Scientists expect the exposure of more open water to sunlight could enhance warming in the region and cause the release of more moisture to the atmosphere. Additional moisture could affect [cloud formation](#) and the exchange of heat from Earth's surface to space. Researchers are grappling with how these changes in the Arctic affect global climate.

"A wild card in what's happening in the Arctic is clouds and how changes in clouds, due to changing sea-ice conditions, enhance or offset warming," said Bill Smith, ARISE principal investigator at NASA's Langley Research Center in Hampton, Virginia.

ARISE was planned over the last year to take advantage of NASA's existing capabilities for gathering data about ongoing changes in the Arctic. Satellites provided some information about clouds and the energy balance in the Arctic, but the multiple instruments flown during ARISE should provide further insight.

"The clouds and surface conditions over the Arctic as we observe them from satellites are very complex," Smith said. "We need more information to understand how to better interpret the satellite measurements, and an aircraft can help with that."

The array of instruments on ARISE should help scientists better observe how sea ice loss is affecting Arctic cloud formation and therefore the balance of incoming and outgoing radiation. Low-level clouds typically reflect more sunlight and offset warming, while higher [clouds](#) are typically less reflective and act to trap more heat in the atmosphere.

"It's a complex business, but it depends on a lot of things we can, in fact, measure," said Hal Maring, program manager for radiation sciences in the Earth Science Division at NASA Headquarters in Washington.

ARISE researchers will fly survey missions that target different cloud types and surface conditions, such as open water, land ice and sea ice. The missions will be timed to fly under the orbit paths of key satellite instruments, such as the Clouds and the Earth's Radiant Energy Systems (CERES) instruments on multiple NASA satellites. Each morning, mission planners will look at satellite timings and weather forecasts to design flight plans that meet the most objectives of the campaign.

The NASA C-130, based at the Wallops Flight Facility in Virginia, will carry instruments that measure solar (incoming) and infrared (outgoing) radiation, ice surface elevation and cloud properties such as cloud particle size. This will be the first time that many of these instruments, including the mission's laser altimeter, have flown together.

The ARISE campaign is a joint effort of the Radiation Sciences, Cryospheric Sciences and Airborne Sciences programs of the Earth Science Division in NASA's Science Mission Directorate in Washington.

NASA monitors Earth's vital signs from land, air and space with a fleet of satellites and ambitious airborne and ground-based observation campaigns. NASA develops new ways to observe and study Earth's interconnected natural systems with long-term data records and computer analysis tools to better see how our planet is changing. The agency shares this unique knowledge with the global community and works with institutions in the United States and around the world that contribute to understanding and protecting our home planet.

More information: www.nasa.gov/earthrightnow

Provided by NASA

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