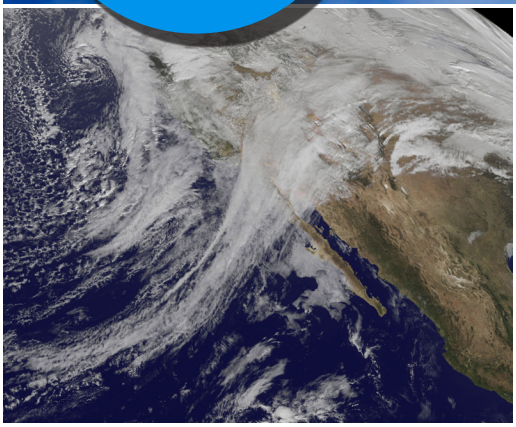
Unmanned Aircraft Systems



Top: An atmospheric river of moisture, defined partly by clouds, sweeps into the U.S. West Coast. NOAA and NASA are poised to send a Global Hawk unmanned aircraft system over the Pacific Ocean, to gather data on such threatening systems.

Below: Preparing the Global Hawk for flight at NASA Dreyden, and the aircraft over California.

Images by NOAA, NASA.

Global Hawk to Probe Winter Storms and the Arctic

NOAA and NASA will send an unmanned aircraft system (UAS) soaring over the Pacific Ocean in January and February, in a two-part mission to improve understanding and prediction of weather systems that threaten the U.S. West Coast and other regions. One focus of the mission—dubbed Winter Storms and Pacific Atmospheric Rivers or WISPAR—will target "atmospheric rivers" of moisture that can sweep great quantities of rain and snow into the U.S. West Coast. Atmospheric rivers fueled a series of storms that battered parts of Southern California in recent months, triggering floods and debris flows and closing major roads. The UAS flights are part of a long-term NOAA effort to better anticipate severe weather in the region.

The 116-foot-wingspan Global Hawk will take flight as early as 27 January 2011, from its home at NASA Dreyden Flight Research Center on the Edwards Air Force Base in California. The unmanned aircraft can soar for about 28 hours, up to 65,000 feet.

Targets

■ **Winter storms**: Global Hawk will collect measurements from otherwise data-sparse regions of the Pacific Ocean, regions that are known to be important for improving forecasts of high-impact weather events in the United States.

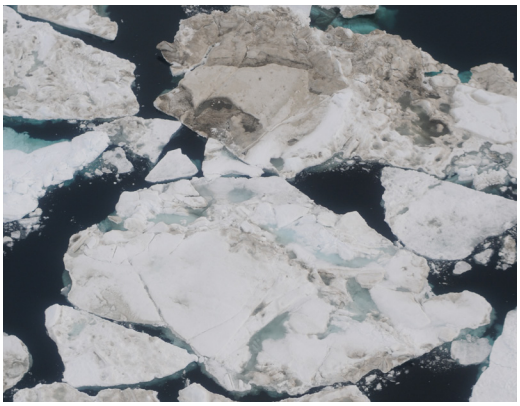
■ **Atmospheric rivers**: Global Hawk will crisscross an atmospheric river that forms during the winter mission. These narrow bands of water vapor can bring intense precipitation to the West Coast, and although satellites can locate them, researchers need to understand more about the variability of water vapor concentration within the bands, and the development of the systems as they approach landfall.

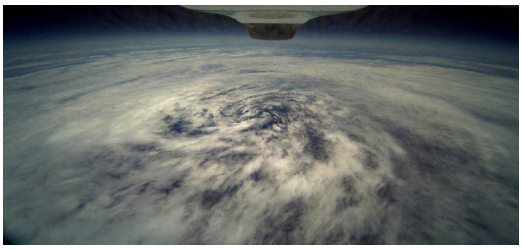
Tools

■ **dropsondes**: miniaturized weather stations released individually by the aircraft take repeated measurements of temperature, pressure, humidity and wind as they drop through the atmosphere, creating vertical profiles of data. The Global Hawk can carry about 90, soda-can-sized dropsondes.

■ **HAMSR**: The "high-altitude MMIC sounding radiometer" HAMSR is a water vapor instrument that can also measure the distribution of liquid water and ice in clouds.

NOAA's UAS Program





Top: Ice floes photographed during a UAS mission to determine the feasibility of monitoring sea ice-dependent seals and their habitat.

Middle: An image captured by UAS during a hurricane mission.

Bottom: A small UAS used to study meltwater lakes in Greenland.

Images by NOAA, NASA.

NOAA's Unmanned Aircraft Systems

Unmanned Aircraft Systems (UAS) can revolutionize NOAA's ability to monitor and understand the global environment. There is a key information gap today between instruments on Earth's surface and on satellites—UAS can bridge that gap. Operated by remote pilots and ranging in wingspan from less than six feet to more than 100 feet, UAS can also collect data from dangerous or remote areas, such as the poles, oceans, wildlands, volcanic islands, and wildfires. Better data and observations improve understanding and forecasts and save lives, property, and resources, advancing NOAA's mission goals.

Recent Accomplishments

- **GloPac: Global Hawk Pacific**

In its first science mission, the Global Hawk flew over the Pacific Ocean last spring, from the equator to the Arctic, gathering atmospheric chemistry data on several long flights. The mission confirmed the value of the unmanned aircraft for science. Piloted from the ground, the aircraft flew through the edge of a dust plume sweeping across the Pacific, and sampled the chemistry and structure of a fragment of polar air that swirled down into the northern Pacific from the Arctic.

- **GRIP: Genesis and Rapid Intensification Project**

NASA and NOAA spent six weeks last fall studying hurricane formation and development in the Gulf of Mexico and the western Atlantic Ocean. Researchers sent the Global Hawk, equipped with a suite of instruments, over hurricanes Earl, Karl, and other storms in the region. The UAS flew multiple times over hurricane eyes, soared above one storm (a record for a unmanned aircraft system), and collected high-resolution data on the storms' wind and cloud structures, particles in the air, lightning strikes and other meteorological variables.

- **And more**. NOAA researchers and collaborators:
  - In 2009, captured tens of thousands of photographs of floating sea ice and ice-dependent seals in the Bering Sea, during a monitoring experiment.
  - In 2008, sent a UAS on 17 flights across Greenland's Jakobshavn glacier, gathering data on meltwater lakes.
  - In 2008, launched and landed a UAS from a ship—NOAA's *Oscar Dyson*, in Puget Sound.
  - In 2008, confirmed that a small UAS could be used to measure evaporation from the ocean surface along the California coast.
  - In 2007, flew a UAS into post-tropical storm Noel, detecting higher winds than found by instruments on conventional platforms.

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