Why SWOT?

The SWOT satellite mission with its wide swath altimetry technology is a means of completely covering the world's oceans and freshwater bodies with repeated high resolution elevation measurements. SWOT is a truly multi-disciplinary cooperative international effort.

Hydrology

How Much Water? - SWOT will provide the very first comprehensive view of Earth's freshwater bodies from space and will allow scientists to determine the height and area of fresh water across the globe at an unprecedented resolution. Hydrologists will use the data to calculate the rate of water gained or lost in lakes, reservoirs, and wetlands as well as discharge variations in rivers, globally. These are key for knowing surface water availability and for understanding important water related hazards such as floods.

Oceanography

Ocean Circulation, Weather and Climate -SWOT will measure ocean features with 10 times the resolution of current technologies. Most of the ocean's energy is in currents that occur on scales of 100 kilometers or smaller.

The higher resolution of SWOT is required to resolve these smaller features and compute the velocity and energy of ocean circulation. Small-scale ocean features are key components in the exchange of heat and carbon between the ocean and atmosphere, a major factor in global climate change. Information on the detailed structure of heat storage in the upper ocean is also important to prediction of the strength of a hurricane.

Key Personnel

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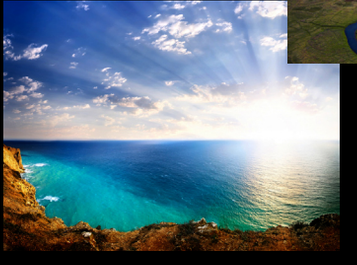

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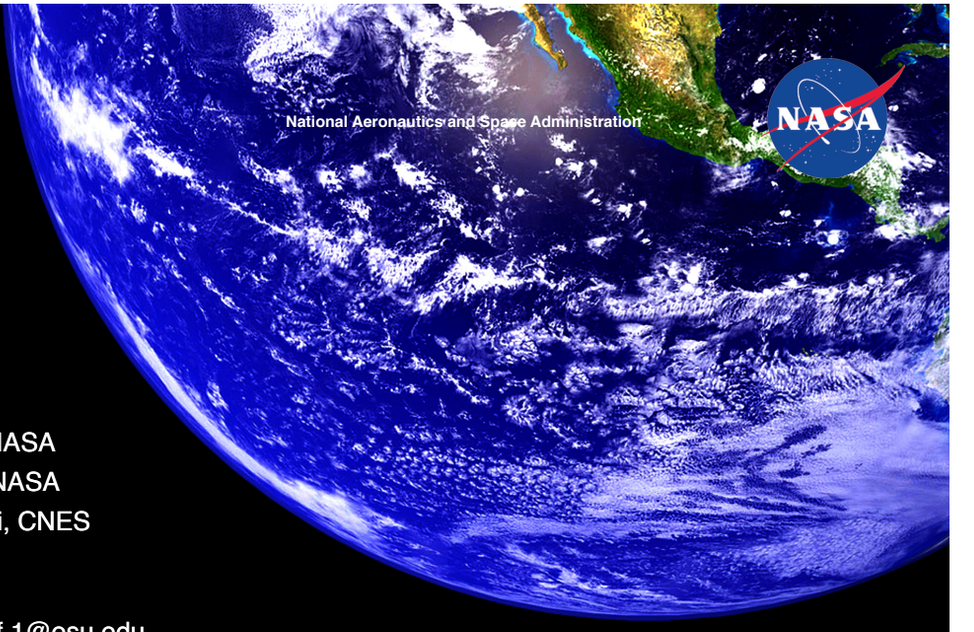
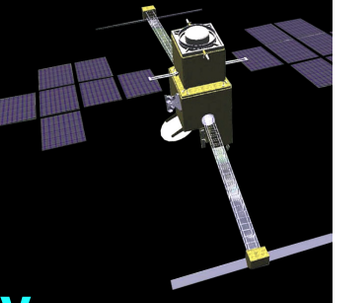
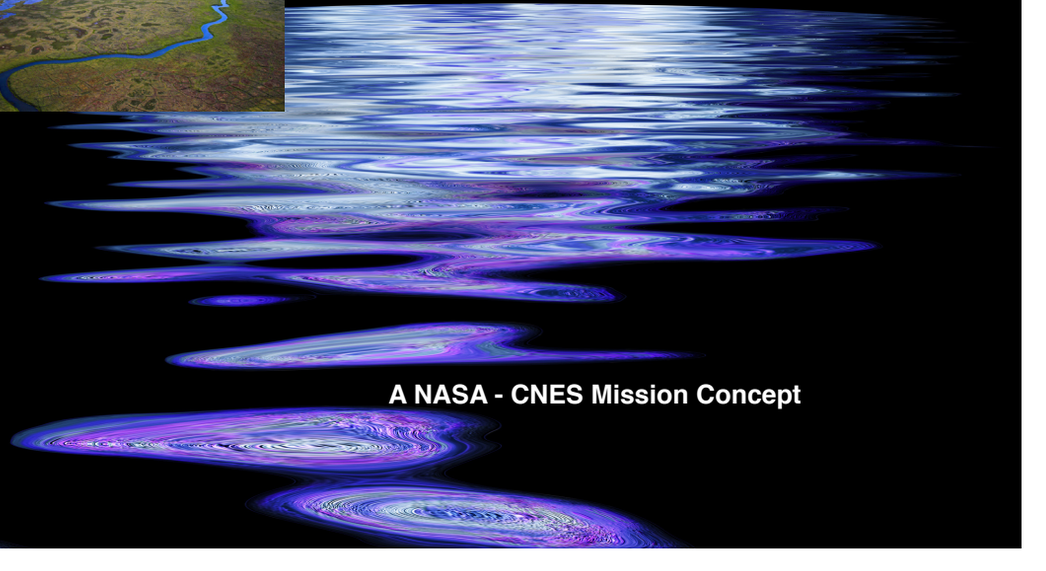


From the watershed - to the global ocean

Surface Water and Ocean Topography (SWOT)





A NASA - CNES Mission Concept

Mission Overview

The Surface Water and Ocean Topography (SWOT) mission brings together two communities focused on a better understanding of the world's oceans and its terrestrial surface waters. U.S. and French oceanographers and hydrologists have joined forces to develop this new space mission to make the first global survey of Earth's surface water, observe the fine details of the ocean's surface topography, and measure how water bodies change over time. SWOT was one of 15 missions listed in the 2007 National Research Council decadal survey of Earth science as missions that NASA should implement in the coming decade.

Hydrology

Given our basic need for fresh water, hydrologic observations of the temporal and spatial variations in water volumes stored in rivers, lakes, and wetlands are extremely important. Unfortunately, our knowledge of the global dynamics of terrestrial surface waters and their interactions with coastal oceans in estuaries is very limited. By measuring water storage changes in all wetlands, lakes, and reservoirs and making it possible to estimate discharge in rivers more accurately, SWOT will contribute to a fundamental understanding of the terrestrial branch of the global water cycle. SWOT will also map wetlands and non-channelized flow.

Oceanography

Where most of the ocean's kinetic energy and its dissipation takes place--at scales shorter than 100 km--our understanding of the oceanic circulation is poor. Circulation at these scales is responsible for transporting half of the heat and carbon from the upper ocean to the deep ocean. Knowing more about this process is critical for understanding global climate change. SWOT will provide high spatial resolution, global measurements of ocean surface topography. These measurements will improve ocean circulation models leading to better prediction of weather and climate as well as variations in ocean currents important for navigation, fisheries, and offshore commercial operations.

Science Goals

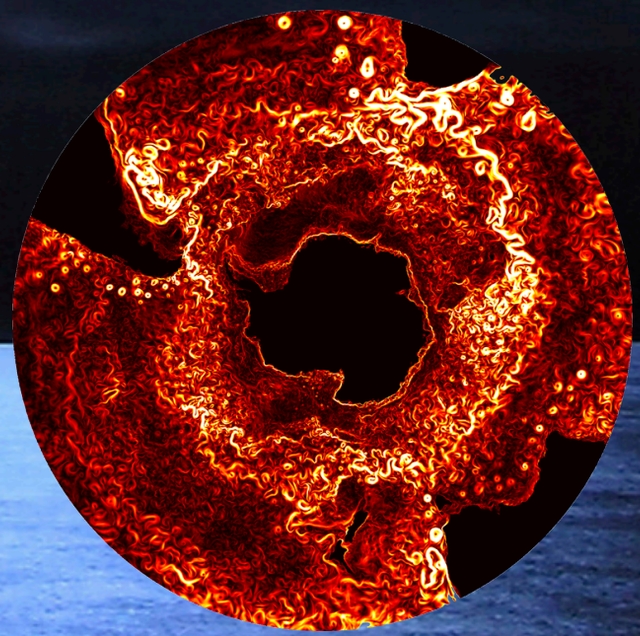
Provide sea surface heights (SSH) and terrestrial water heights over a 120 km wide swath with a ±10 km gap at the nadir track.

Over the deep oceans provide SSH within each swath with a posting every 2 km x 2 km, and a precision better than 0.5 cm when averaged over the area.

Over land, download the raw data for ground processing and produce a water mask able to resolve 100-m rivers and 1-km2 lakes, wetlands, or reservoirs. Associated with this mask will be water level elevations with an accuracy of 10 cm and a slope accuracy of 1 cm/1 km.

Cover at least 90 percent of the globe Gaps are not to exceed 10 percent of Earth's surface.

SWOT will have a mission lifetime of 3 years



Southern Ocean near-surface current speed from ECCO2

Instrument

The Ka-band Radar Interferometer (KaRIN) instrument makes this mission possible. KaRIN contains two Ka-band SAR antennae at opposite ends of a 10-meter boom with both antennae transmitting and receiving the emitted radar pulses along both sides of the orbital track. Look angles are limited to less than 4.5° providing a 120-km wide swath. The 200-MHz bandwidth achieves cross-track ground resolutions varying from about 10 m in the far swath to about 60 m in the near swath. A resolution of about 2 meters in the along track direction is derived by means of synthetic aperture processing.
With its wide swath, SWOT will cover all Earth's lakes, rivers, reservoirs and oceans at least twice every 21 days.

	OSTM/Jason-2	SWOT
Orbit Height	1336 km	970 km
Orbit Type	10-day repeat 66 Deg Inclination	22-day repeat, 78 Deg Inclination
Swath	NA	120 km
Frequency	Ku-band	Ka-band
Height Precision	2 cm	~1 cm @ 1 km resolution
Spatial Resolution	6.2 km along-track; 300 km cross-track	<100 m imaging
Instrument	Nadir Altimeter	Interferometer

The SWOT mission is a joint effort between NASA, Centre National d'Études Spatiales (CNES), and Laboratoire d'Études en Géophysique et Océanographie Spatiales (LEGOS).