



PROMOTING OCEAN AND CLIMATE LITERACY:

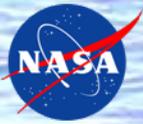
**2008-2009 JPL OCEAN SURFACE TOPOGRAPHY
EDUCATION AND PUBLIC OUTREACH
ACTIVITIES**

Annie Richardson

**Jet Propulsion Laboratory, California Institute of
Technology**

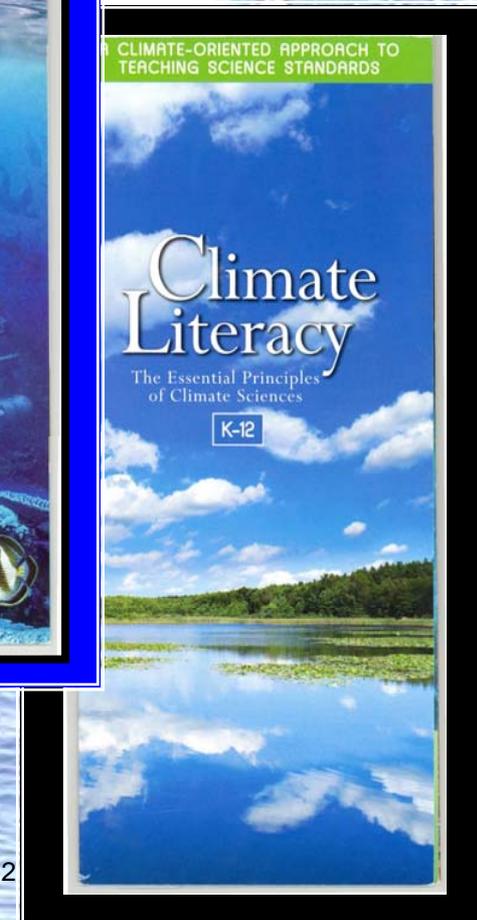
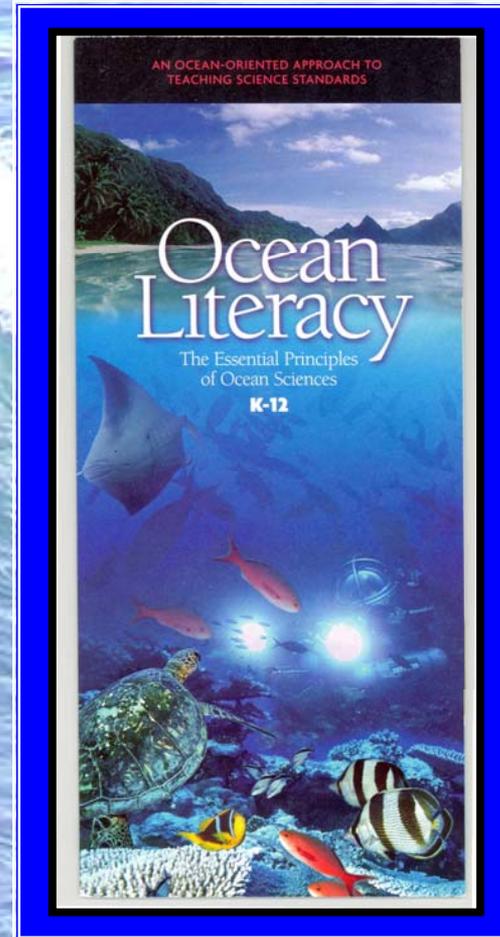
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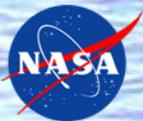
OSTST, Nice, France



Ocean and Climate Literacy

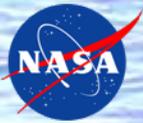
- Last year, introduced the Ocean Literacy Network, a consortium of scientists and educators interested in using the ocean to teach science
- Similar consortium formed for climate literacy; determined seven essential principles and fundamental concepts to know about climate
- JPL team is using ocean and climate literacy as our EPO focus areas





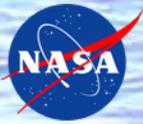
Ocean Literacy Essential Principles

1. Earth has one big ocean with many features.
2. The ocean and life in the ocean shape the features of Earth.
3. The ocean is a major influence on weather and climate.
4. The ocean makes Earth habitable.
5. The ocean supports a great diversity of life and ecosystems.
6. The ocean and humans are inextricably linked.
7. The ocean is largely unexplored.



Climate Literacy Essential Principles

1. Life on Earth has been shaped by, depends on, and affects climate.
2. We increase our understanding of the climate system through observation and modeling.
3. The sun is the primary source of energy for the climate system.
4. Earth's weather and climate systems are the result of complex interactions.
5. Earth's weather and climate vary over time and space.
6. Evidence indicates human activities are impacting the climate system.
7. Earth's climate system is influenced by human decisions involving economic costs and social values.



Ocean and Climate Education Activities Support

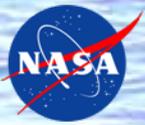
- Scope and sequence development for ocean literacy essential principles
- Multinational Youth Studying Practical Applications of Climatic Events (M.Y.S.P.A.C.E)
- Jefferson Middle School GATE Program on Global Climate Issues



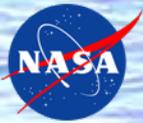


Climate Day 2008

- Educational event to promote awareness of global climate issues
- Hosted in conjunction with the Centers for Ocean Science Education Excellence-West and the East San Gabriel Valley Regional Occupational Program/Technical Center
- Held on the ROP campus in West Covina, California, on March 18th
- Informed participants of the role of satellite oceanography in our understanding of the global ocean and its role in weather and climate
- Included lectures, career discussions, hands-on activities, and exhibits
- Approximately 950 high-school students and 25 teachers participated.

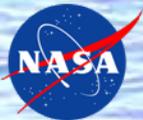


Climate Day 2008 Video

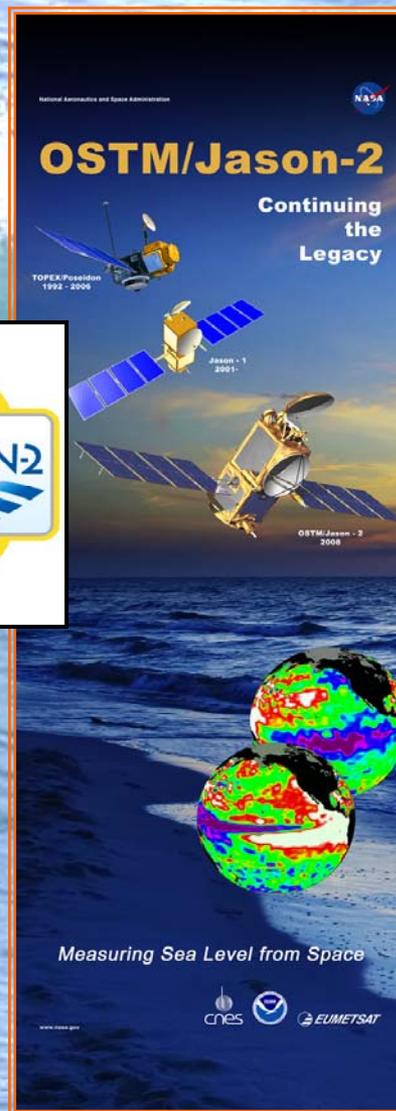


Climate Day 2009

- Multi-Agency (NASA, NOAA), Multi-Partner (JPL, COSEE-West, Aquarium of the Pacific, City of Pasadena (proposed))
- Pasadena Convention Center (proposed)
- Two days: 1 for schools, 1 for the community
- Expanded school participation (PUSD, LAUSD, LCUSD)
- Inclusion of ocean and climate literacy essential principles
- Inclusion of city departments and community organizations



Banners, Decals, Pins, Shirts





Displays/Exhibits

National Aeronautics and Space Administration



The Ocean Surface Topography Mission on Jason-2

Satellite Altimetry Applications

Earth's oceans are vital to all life.

Covering 70 percent of the planet's surface they are stirred and mixed by mighty currents that distribute their heat across the globe and regulate our climate.

An international suite of altimeter missions measure global ocean surface topography. These measurements, along with ocean temperature and salinity data, are critical in understanding Earth's delicate climate balance.

Society Benefits from Ocean Altimetry

Altimetry data are used by these groups:

- Fisheries
- Offshore oil
- Shipping
- Marine researchers
- Weather forecasters

<http://sealevel.jpl.nasa.gov>



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The Ocean Surface Topography Mission on Jason-2

Satellite Altimetry: Observing Sea Level from Space

OSTM/Jason-2

Earth's oceans drive global climate. We can observe global-scale ocean changes from space. NASA and its partners have been measuring sea surface height using satellite altimeters since 1992. OSTM/Jason-2 will extend the sea level data record to two decades.

A Sea of Change

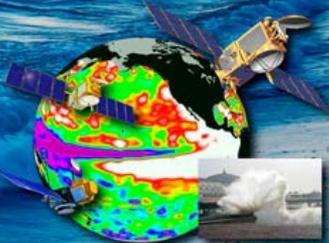
Sea level changes can be important indicators of climate change. Satellite altimeters provide long-term data about sea level, improving our understanding of the ocean's role in climate.

Rising Seas

Global sea level is rising bringing more storm damage to coastal zones. Ocean heating and melting ice contribute to the rise measured by altimeters.

Data and information from ocean altimetry satellites are now being routinely used for research, applications, and science education. OSTM/Jason-2 is a four-partner collaboration between NASA, NOAA, CNES, and Eumetsat.

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The Ocean Surface Topography Mission on Jason-2

Promoting Ocean Literacy

What Should You Know About The Ocean?

OSTM/Jason-2 supports the development of an ocean literate society. Start your journey toward ocean literacy by knowing these...

...7 Essential Principles

1. Earth has one big ocean with many features.
2. The ocean and life in the ocean shape the features of Earth.
3. The ocean is a major influence on weather and climate.
4. The ocean makes Earth habitable.
5. The ocean supports a great diversity of life and ecosystems.
6. The ocean and humans are inextricably linked.
7. The ocean is largely unexplored.

An ocean-literate person:

- understands the 7 Essential Principles, as well as fundamental concepts about how the ocean functions.
- can communicate about the ocean in a meaningful way.
- is able to make informed and responsible decisions regarding the ocean and its resources.

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National Aeronautics and Space Administration



Understanding Surface Water Characteristics and Ocean Dynamics

The Surface Water Ocean Topography (SWOT) Mission Concept

Most of Earth's water is in the ocean. The majority of the remaining fresh water is locked up in glaciers and ice caps or is below ground. The tiny portion found on the surface in rivers, lakes, and reservoirs is what we use in our everyday lives.

The proposed Surface Water Ocean Topography (SWOT) mission brings together two science communities - oceanographers and hydrologists - to focus on a better understanding of Earth's ocean and its terrestrial surface water.

SWOT draws its heritage from a series of successful satellite missions that use radar altimetry to measure ocean surface topography. Ocean surface topography is one of our most important tools for understanding global climate and how it is changing. The SWOT mission will use improved radar technology to achieve wider coverage and increased resolution to provide surface topography measurements for both the ocean and Earth's freshwater bodies.

For the first time, SWOT will allow oceanographers to use direct measurements of the sea surface to create two-dimensional maps of small-scale ocean eddies. These eddies contain most of the ocean's kinetic energy and are responsible for transporting and dissipating heat in the ocean. SWOT will also revolutionize the measurement of ocean circulation in coastal zones, particularly important for the billions of people who live along coastlines or work in fishing and shipping industries. SWOT's global observations will let hydrologists see changes in surface water stored in lakes, wetlands, and reservoirs and evaluate the discharge rate of rivers. The result will be a much better idea of how much fresh water there is and if there will be enough for us to drink in the future.

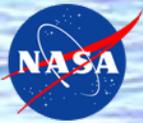
Both scientific communities will benefit from knowledge of interactions at ocean-terrestrial boundaries.

Early tests, including those in the Sacramento River, help scientists understand how the instrument will function from space. In the future SWOT will provide the first global assessment of changes in Earth's freshwater supplies, a critical issue for humanity's welfare.

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Current sea level rise

From Wikipedia, the free encyclopedia
(Redirected from [Sea level rise](#))

This article is about the current and future rise in sea level associated with climate change.

Sea level has been rising at a rate of around 1.8mm per year for the past century; measurements from the period 1993-2000 indicated a massive increase in the rate of rise, and it is expected that the rate will continue to increase; measurements from the period 1993-2000 indicated a massive increase in the rate of rise, and it is expected that the rate will continue to increase. The contribution from thermal expansion of seawater is currently the dominant contributor to sea level rise, and to the predicted future rise. Only if glacial melt substantially increases will it become the largest contributor. A rise of 120 meters in sea level would result in a 120 meters rise in sea level.

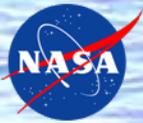
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- 3 Future sea level rise
 - 3.1 Intergovernmental Panel on Climate Change results
 - 3.1.1 Uncertainties and criticisms regarding IPCC results

Satellite Measurement of Sea Level

Trend of Sea Level Change (1993-2008)

Red and white show where sea level has risen the most rapidly. Purple and blue where it has dropped.



Ocean Surface Topography in Wikipedia

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TOPEX/Poseidon

From Wikipedia, the free encyclopedia
(Redirected from TOPEX)

Launched in 1992, **TOPEX/Poseidon** was the first ocean surface topography mission. The first great oceanographic observations. The distinguished oceanographic observations.

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Description

Before TOPEX/Poseidon, scientists had only provided the first continuous global coverage of ice-free ocean to an accuracy of 3.3 centimeters. The mission's most important achievement was to measure the Sun, ocean circulation is a driving force to improve climate predictions.^[2]

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Jason 1

From Wikipedia, the free encyclopedia

Jason-1^[1] is a satellite oceanography mission to monitor global ocean circulation, study the ties between the ocean and the atmosphere, improve global climate forecasts and predictions, and monitor events such as El Niño and ocean eddies.^[2]

It is a follow-on to the TOPEX/Poseidon^[3] mission, which measured ocean surface topography from 1992 through 2005. Like its predecessor, Jason-1 is a joint project between the NASA (United States) and CNES (France) space agencies. Jason-1's successor, the Ocean Surface Topography Mission^[4] on the Jason-2 satellite, was launched in June 2008. These satellites provide a unique global view of the oceans that is impossible to acquire using traditional ship-based sampling.

Jason-1 was designed to measure climate change through very precise millimeter-per-year measurements of global sea level changes. As did



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Ocean Surface Topography Mission

From Wikipedia, the free encyclopedia

This article or section documents a current or recent spaceflight. Details may change as the mission progresses.

The Ocean Surface Topography Mission (OSTM) on the Jason-2 satellite^[1] is an international Earth observation satellite mission that continues the sea surface height measurements begun in 1992 by the joint NASA/CNES TOPEX/Poseidon mission^[2] now being made by the NASA/CNES Jason-1 mission launched in 2001.^[3]

Like its two predecessors, OSTM/Jason-2 uses high-precision ocean altimetry to measure the distance between the satellite and the ocean surface to within a few centimeters. These very accurate observations of variations in sea surface height—also known as ocean topography—provide information about global sea level, the speed and direction of ocean currents, and heat stored in the ocean.

Scientists consider the 15-plus-year climate data record that this mission will extend critical understanding how ocean circulation is linked to global climate change.

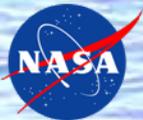
OSTM/Jason-2 was launched at 07:46 UTC on June 20, 2008, from Space Launch Complex 2W at the Vandenberg Air Force Base in California, USA, by a Delta II 7320 rocket.^[4] The spacecraft separated from the rocket 55 minutes later.^[5]

It is now in a 1,336 km (830 mi) circular, non-sun-synchronous orbit at an inclination of 66 degrees to Earth's equator, allowing it to monitor 95 percent of Earth's ice-free ocean every 10 days. OSTM/Jason-2 is flying in line with Jason-1 (approximately 55 seconds or 300 miles behind) while scientists compare the operation and accuracy of both satellites' instruments and data products. Once this cross-calibration and validation is complete, Jason-1 will be moved to a parallel position, so the two spacecraft can operate in a tandem mode, doubling the amount of ocean data collected.



Artist's interpretation of the Jason-2 satellite





Acknowledgements

My thanks go to the following individuals and organizations:

- Rosemary Sullivant
- Margaret Srinivasan
- Jason and OSTM/Jason-2 Projects
- You!