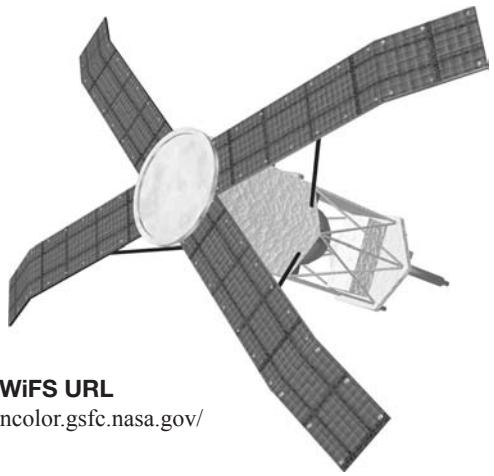
Orbview-2/SeaWiFS

OrbView-2 / Sea-viewing Wide Field-of-view Sensor



SeaWiFS URL
oceancolor.gsfc.nasa.gov/

Key Orbview-2/SeaWiFS Facts

Orbit:
Type: Sun-synchronous
Altitude: 705 km
Equatorial Crossing: Noon ± 20 mins
Inclination: 98.2°
Period: 99 minutes

Design Life: 5 years

Operating Status: Operational

Summary

The purpose of the SeaWiFS Mission is to provide quantitative data on global ocean bio-optical properties to the Earth science community. Subtle changes in ocean color signify various types and quantities of marine phytoplankton (microscopic marine plants), the knowledge of which has both scientific and practical applications.

Instruments

- Sea-viewing Wide Field-of-view Sensor (SeaWiFS)

Points of Contact

- *SeaWiFS Project Scientist:* Chuck McClain, NASA Goddard Space Flight Center
- *SeaWiFS Project Manager:* Gene Feldman, NASA Goddard Space Flight Center

Mission Type

Earth Observing System (EOS) Systematic Measurements

Launch

- *Date and Location:* August 1, 1997, from Vandenberg Air Force Base, California
- *Vehicle:* Pegasus XL launch vehicle from a Lockheed L-1011 aircraft

Relevant Science Focus Areas

(see NASA's Earth Science Program section)

- Carbon Cycle, Ecosystems and Biogeochemistry
- Climate Variability and Change
- Water and Energy Cycles

Related Applications

(see Applied Sciences Program section)

- Carbon Management
- Coastal Management

OrbView-2/SeaWiFS Science Goal

The purpose of SeaWiFS data is to examine oceanic factors that affect global change and to assess the oceans' role in the global carbon cycle, as well as other biogeochemical cycles, through a comprehensive research program. The SeaWiFS Project aims to obtain accurate ocean color data from the world's oceans, to process these data in conjunction with ancillary data into meaningful biological parameters, such as photosynthesis rates, and to make these data readily available to researchers.

OrbView-2/SeaWiFS Mission Background

The oceanographic community considers ocean-color data critical for the study of ocean primary production and global biogeochemistry. 'Primary production' refers to the organic material in the sea that is produced by primary producers. These primary producers, i.e., algae and some bacteria, exist at the lowest levels of the food chain and use sunlight or chemical energy, rather than

other organic material, as sources of energy. It is thought that marine plants remove carbon from the atmosphere at a rate equivalent to terrestrial plants, but knowledge of interannual variability is very poor.

The concentration of microscopic marine plants, called phytoplankton, can be derived from satellite observation and quantification of ocean color. This is because the color in most of the world's oceans in the visible light region (400–700 nm) varies with the concentration of chlorophyll and other plant pigments present in the water, i.e., the more phytoplankton present, the greater the concentration of plant pigments and the greener the water.

OrbView-2 (OV-2—formerly known as SeaStar) is a satellite system developed by Orbital Science Corporation. It carries NASA's Sea-viewing Wide Field-of-view Sensor (SeaWiFS) as its only instrument. OV-2's orbit allows SeaWiFS to acquire approximately 15 pole-to-pole swaths of data per day, and approximately 90% of the ocean surface is scanned every two days.

SeaWiFS ocean-color data thus constitute a valuable resource for determining the abundance of ocean biota on a global scale. The data can also be used to assess the ocean's role in the global carbon cycle and the exchange of other critical elements and gases between the atmosphere and the ocean.

History

SeaWiFS is a follow-on sensor to the Coastal Zone Color Scanner (CZCS), which ceased operations in 1986. In the first arrangement of its kind, the U.S. Government procured space-based environmental remote-sensing data for research purposes from a commercial operator. Orbital Sciences Corporation (OSC) built and launched the SeaStar satellite carrying SeaWiFS on August 1, 1997. Following launch, the satellite's name was changed to OrbView-2 and operations were turned over to ORBIMAGE, a spin-off of OSC. ORBIMAGE markets the data for commercial and operational use. OV-2 is not provided by or operated by NASA. NASA purchases the data.

SeaWiFS data have been used to help clarify the magnitude and variability of chlorophyll and primary production by marine phytoplankton and to determine the distribution and timing of spring blooms, i.e., the time of highly abundant growth. The scientific and technical experience gained in the SeaWiFS mission provided valuable preparation for the design and application of the Earth Observing System's Moderate Resolution Imaging Spectroradiometer (MODIS) instruments flying on both Terra and Aqua and also for future sensors such as the Visible Infrared Imaging Radiometer Suite (VIIRS) on the National Polar-orbiting Operational Environmental Satellite System (NPOESS).

SeaWiFS

The SeaWiFS instrument has scanning mechanisms to drive an off-axis folded telescope and a rotating half-angle mirror. Incoming scene radiation is collected by the folded telescope and reflected onto the rotating half-angle mirror. The collected radiation is then relayed through dichroic beam splitters to separate the radiation into four wavelength intervals—each wavelength interval encompassing two of the eight SeaWiFS spectral bands. Four corresponding aft-optics direct the radiation in the four separate wavelength intervals through two separate spectral band-pass filters that further separate the radiation into eight SeaWiFS spectral bands. The aft-optics assemblies also image each of the resultant defined bands of radiation onto four detectors that are aligned in the scan direction. Monitoring of sensor calibration over periods of a few orbits, to several months or years, is accomplished using solar calibration for the former and lunar calibration for the latter. Solar calibration uses a solar-radiation diffuser and an input port located in a fixed position outside of the 58.3º SeaWiFS scene-scan interval. Lunar calibration is accomplished by a spacecraft maneuver to view the moon when the spacecraft is in the nighttime portion of its orbit.

The eight SeaWiFS spectral bands are as follows:

Band	Wavelength
1	402–422 nm
2	433–453 nm
3	480–500 nm
4	500–520 nm
5	545–565 nm
6	660–680 nm
7	745–785 nm
8	845–885 nm

SeaWiFS Data Products

The NASA SeaWiFS Team has developed, and operates, a data system that processes, calibrates, validates, archives, and distributes SeaWiFS data for research. Prior to December 23, 2004, access to SeaWiFS data was provided to a number of SeaWiFS Authorized Research Users strictly for research and educational use. The data from SeaWiFS, primarily intended for use by marine researchers, provides information that can be used to investigate biological productivity in the ocean, marine optical properties, and the human influence on the oceanic environment.

As of December 23, 2004, the agreement that allowed NASA to acquire SeaWiFS data expired. NASA and ORBIMAGE have been unable to reach a mutually acceptable arrangement that would allow data acquisition to

continue beyond that date. Therefore, as of December 23, 2004, any ocean color researchers who wish to continue to use SeaWiFS data must contact ORBIMAGE directly to arrange for continued access to the data. There is a link on the ORBIMAGE website (www.orbimage.com) that provides details for the data access policies and pricing for both commercial and research uses of SeaWiFS (OV-2) data. All current NASA-authorized receiving stations must also contact ORBIMAGE directly to arrange for continued access to decryption keys.

SeaWiFS Data Set Start Date: September 1, 1997

Additional information about the data is available at: daac.gsfc.nasa.gov/data/dataset/SEAWIFS/.