Southwest Fisheries Science Center
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
La Jolla, California

SECTION 515 PRE-DISSEMINATION REVIEW & DOCUMENTATION FORM
(5/2003)

AUTHOR/RESPONSIBLE OFFICE:
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TITLE/DESCRIPTION: NOAA OceanWatch Near Real Time MODIS/Aqua Ocean Color Demonstration for the North Pacific.

PRESENTATION/RELEASE DATE: November, 2003 - ongoing

MEDIUM: Internet

PRE-DISSEMINATION REVIEW:
Name and Title of Reviewing Official: Dr. Frank Schwing
(Must be at least one level above person generating the information product)

Pursuant to Section 515 of Public Law 106-554 (the Data Quality Act), this product has undergone a pre-dissemination review.

Signature _____ Date 2/25/05

SECTION 515 INFORMATION QUALITY DOCUMENTATION

I. Utility of Information Product

Explain how the information product meets the standards for utility:

A. Is the information helpful, beneficial or serviceable to the intended user?

The satellite-derived products generated by the NOAA Coastwatch, West Coast Regional Node (WCRN), offer useful information to data customers in easily accessible formats. The products are utilized by a wide range of users, including members of the scientific community, managers, fishers, educators, and the interested public.

The Moderate Resolution Imaging Spectroradiometer (MODIS) is a 36 channel sensor mounted on NASA's Aqua Spacecraft. MODIS ocean color can be used to measure chlorophyll concentration which, in turn, can be used to infer phytoplankton

concentration and primary productivity levels.

The Tagging of Pacific Pelagics (TOPP) program is an international collaborative program between scientists with a goal of better understanding the migration patterns of open ocean animals. Satellite tags placed by TOPP relay the location of the tagged animal, as well as other environmental information. The TOPP program uses MODIS chlorophyll data to optimize efforts at deploying the tags and also in their analysis of the tracks of tagged marine animals. Chlorophyll and primary production data can provide insight into the migratory patterns observed in these animals. MODIS chlorophyll is displayed alongside animal tracking data on the TOPP data distribution website (SWFSC Environmental Research Division's Live Access Server: http://las.pfeg.noaa.gov/TOPP_recent/index.html).

B. Is the data or information product an improvement over previously available information? Is it more current or detailed? Is it more useful or accessible to the public? Has it been improved based on comments from or interactions with customers?

There is presently no other source for near real time ocean color data which covers the entire North pacific ocean.

MODIS ocean color data is made available in near real time on the SWFSC-ERD's website, OceanWatch Live Access Server (http://las.pfeg.noaa.gov/oceanwatch.html). The images can be viewed by any computer with internet access using common internet browsers. The product is also distributed via OpenDAP/DODS.

All venues for accessing CoastWatch data and images include information required to contact CoastWatch personnel. Improvements are continuously being implemented based on feedback from customers, with a focus on increasing usability and accessibility.

C. What media are used in the dissemination of the information? Printed publications? CD-ROM? Internet? Is the product made available in a standard data format? Does it use consistent attribute naming and unit conventions to ensure that the information is accessible to a broad range of users with a variety of operating systems and data needs?

This is an internet product, distributed via simple browser, Live Access Server, and OpenDAP/DODS.

The product is available in formats commonly used by imaging programs (e.g., HDF, netCDF files), GIS programs (ascii grid), and spreadsheet programs (csv and other column ascii files).

All attributes are named in a manner consistent with NASA / NOAA guidelines. All units follow System Internationale (SI) and United Nations Educational, Scientific and Cultural Organization (UNESCO) guidelines.

II. Integrity of Information Product

Explain (Circle) how the information product meets the standards for integrity:

A. All electronic information disseminated by NOAA adheres to the standards set out in Appendix III, _ Security of Automated Information Resources, _ OMB Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

B. If information is confidential, it is safeguarded pursuant to the Privacy Act and Titles 13, 15, and 22 of the U.S. Code (confidentiality of census, business and financial information).

C. Other/Discussion (e.g., Confidentiality of Statistics of the Magnuson-Stevens Fishery Conservation and Management Act; NOAA Administrative Order 216-100 - Protection of Confidential Fisheries Statistics; 50 CFR 229.11, Confidentiality of information collected under the Marine Mammal Protection Act.)

III. Objectivity of Information Product

(1) Indicate which of the following categories of information products apply for this product:

Original Data
Synthesized Products
Interpreted Products
Hydrometeorological, Hazardous Chemical Spill, and Space Weather Warnings, Forecasts, and Advisories
• Experimental Products
Natural Resource Plans
Corporate and General Information

(2) Describe how this information product meets the applicable objectivity standards.
(See the DQA Documentation and Pre-Dissemination Review Guidelines for assistance and attach the appropriate completed documentation to this form.)

SECTION 515 INFORMATION QUALITY DOCUMENTATION

E. <u>Experimental Products</u>

Experimental products are either:
1) disseminated for experimental use, evaluation or feedback, or

2) used in cases where, in the view of qualified scientists who are operating in an urgent situation in which the timely flow of vital information is crucial to human health, safety, or the environment, the danger to human health, safety, or the environment will be lessened if every tool available is used.

Objectivity of experimental products is achieved by using the best science and supporting studies available, in accordance with sound and objective scientific practices, evaluated in the relevant scientific and technical communities, and peer-reviewed where feasible.

Describe the science and/or supporting studies used, the evaluation techniques used, and note any peer-review of the experimental product.

Raw satellite data are received from the Aqua satellite at NASA's Goddard Space Flight Center (GSFC). Information on the Aqua satellite, the MODIS sensor, and NASA's ocean color team, can be found at http://oceancolor.gsfc.nasa.gov/.

The GSFC handles the processing of the data up to level 2 using the SeaWiFS Data Analysis System (SeaDAS) software (e.g., *Fu et al., 1998).* An atmospheric correction is applied to the data to yield a measurement of water leaving radiance (*Gordon and Wang 1994, Shettle and Fenn 1979*). This radiance is processed to chlorophyll a concentration using the NASA developed OC3M algorithm (described in *O'Reilly et al. 2000*). This algorithm is analogous to the OC4v4 algorithm used in the processing of SeaWiFS data, but adjusted for the specific bands available on the MODIS sensor. The algorithm is considered provisional, and not science quality. Furthermore, certain assumptions are made during the atmospheric correction in order to process the data in a timely manner.

Calibration and validation of the MODIS sensor is accomplished in partnership with the Marine Optical Buoy (MOBY) program and the Marine Optical Characterization Experiment (MOCE) (see http://www.orbit.nesdis.noaa.gov/sod/orad/mot/moce/overview.html). In addition, MODIS has on-board calibrators for in-flight calibration of the sensors. Detailed information regarding the calibration of MODIS can be found on the validation section of NASA's OceanColor Web page: http://oceancolor.gsfc.nasa.gov/ocvalidation.html.

Chlorophyll concentrations are retrieved from NASA by the WCRN, where they are mapped and compiled into composite images. The methods employed in the mapping and composite image generation are consistent with techniques in the published literature. The data are mapped to an equal angle grid of 0.025 degrees by 0.025 degrees for the Northern Pacific region, and a grid of 0.0125 degrees by 0.0125 degrees for the west coast region. The mapping process uses simple arithmetic means to produce individual and composite images of various durations (e.g., 1, 3, 8, and 14-days), following the recommendations of the International Ocean-Colour Coordinating Group (*Antoine et al., 2004*) and using methods described by *Smith and Wessel, 1990*. Graphical end products are generated using the Generic Mapping Tools software (*Wessel and Smith, 1998*). Analogous products of sea surface temperature, chlorophyll a concentration, and the diffuse attenuation coefficient at 490 wavelength are also made available on 0.05 degree by 0.05 degree global grids.

Through an iterative process, provisional documentation of theory and methods are prepared, including the various assumptions employed, the specific analytic methods applied, the data used, and the statistical procedures employed.

NASA has not verified the OC3M algorithm for use with Aqua / MODIS ocean color data. NASA studies have compared MODIS ocean color data to the established SeaWiFS data (*Blondeau-Patissier 2004.* See also the NASA Ocean Discipline Processing Group's study at http://seawifs.gsfc.nasa.gov/staff/franz/l3trend/modisa_seawifs/). Intensive studies aimed at validating the data and establishing its limitations are currently underway at NASA, NOAA, and a number of academic institutions.

Where experimental products are disseminated for experimental use, evaluation or feedback in the form of comment or criticism, the products are accompanied by explicit limitations on their quality or by an indicated degree of uncertainty.

Potential users are made aware of the product limitations via internet-based disclaimers such as the one at the CoastWatch home page (http://coastwatch.noaa.gov/modis_ocolor_overview.html).

Where experimental products are used by NOAA in support of other NOAA products in urgent situations where the timely flow of vital information is critical, they are used by qualified scientists in conjunction with accepted non-experimental scientific methods and tools, and taking into account all available information.

With the exception of the algorithm and atmospheric correction used, the processing of MODIS chlorophyll data is accomplished using documented, non-experimental scientific methods. In addition, the main application of Coastwatch MODIS chlorophyll is the identification and tracking of ocean features. The data are well suited for this application. Data limitations are typically directed towards applications that require more quantitative data, and are clearly identified to potential users.

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