

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)

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* = point of contact.

TITLE/DESCRIPTION: CoastWatch Primary Productivity Data

PRESENTATION/RELEASE DATE: September 1, 2005

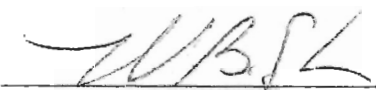
MEDIUM: Internet

PRE-DISSEMINATION REVIEW:

Name and Title of Reviewing Official: Dr. Franklin B. Schwing, Director, NMFS SWFSC, Environmental Research Division

(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

10/2/06
Date

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, fishing men and women, educators, and the interested public.

CoastWatch primary productivity data provide an estimate of net primary productivity due to carbon fixation by phytoplankton. In the ocean, net primary productivity is the amount of organic carbon generated by photosynthesis (or chemosynthesis) in planktonic organisms minus the amount of organic carbon used by these organisms in respiration. Primary producers form the base of the food chain and generate the biomass that sustains all life in the ocean. Primary productivity is a measurement of how much of this biomass is available to higher consumers. It is a crucial measurement for those seeking to understand and manage fisheries on all scales.

The CoastWatch product calculates the primary productivity of photosynthetic plankton near the ocean surface based on satellite measurements. The advantages of satellite measurements, namely their extensive spatial and temporal coverage, are preserved in the primary productivity product. The CoastWatch product calculates primary productivity based on chlorophyll and photosynthetically available radiation (PAR) measurements from the Sea-viewing Wide Field-of-view Sensor (SeaWiFS) on the Orbview-2 satellite, chlorophyll measurements from the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Aqua satellite, and sea surface temperature (SST) measurements from the Advanced Very High Resolution Radiometer (AVHRR) sensors on NOAA's Polar Operational Environmental Satellites (POES).

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?

CoastWatch's primary productivity data product is an experimental product, and is distributed for scientific evaluation. It provides an estimate of primary productivity based on measurements from polar orbiting satellites, and thus has extensive spatial coverage (180 degrees west to 180 degrees east longitude, 75 degrees south to 75 degrees north latitude) and temporal coverage.

Primary productivity data are available in near real time on the Southwest Fisheries Science Center (SWFSC) Environmental Research Division's (ERD) OceanWatch Live Access Server (<http://las.pfeg.noaa.gov/OceanWatch.html>), as well as the NOAA CoastWatch WCRN's website (<http://coastwatch.pfeg.noaa.gov/coastwatch/CWBrowser.jsp>), and can be accessed using any computer with internet access and the appropriate browser. The product is also available via OpenDAP/DODS and ftp server.

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 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), spreadsheet programs (CSV and other simple ASCII files), and technical computing programs (MATLAB binary 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. At the discretion of the user, data may also be displayed and distributed in the units of measurement traditionally used by mariners and marine scientists.

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. Experimental Products

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.

The CoastWatch WCRN provides a primary productivity data product in 8-day and monthly composites using SeaWiFS or MODIS chlorophyll concentration data. The method used to calculate primary productivity follows *Behrenfeld and Falkowski, 1997*. The basic calculation involves a number of variables, including surface chlorophyll concentration, a temperature dependent photoadaptive variable used to determine the photosynthetic rate from chlorophyll concentration, daylength, and an irradiance dependent function which describes how well the light penetrates the water column. CoastWatch WCRN determines these parameters using a number of scientifically established methods.

Surface chlorophyll concentration is retrieved from either the 0.1 degree SeaWiFS chlorophyll concentration v5.0 product from NASA's Goddard Space Flight Center (GSFC), Ocean Color Web (<http://oceancolor.gsfc.nasa.gov/>); or from the 0.1 degree MODIS chlorophyll concentration v4.0 product, also from NASA's GSFC, Ocean Color Web. Both these products are retrieved in 8-day and monthly composites. Information on the processing and validation of SeaWiFS chlorophyll concentration can be found in the CoastWatch SeaWiFS HRPT Ocean Color Data Pre-Dissemination Review and Documentation Form (*Foley and Spence, 2005a*) or at <http://oceancolor.gsfc.nasa.gov/PRODUCTS/>. Information on the processing and validation of MODIS chlorophyll concentration can be found in the NOAA OceanWatch Near Real Time MODIS/Aqua Ocean Color Demonstration for the North Pacific Pre-Dissemination Review and Documentation Form (*Foley and Spence, 2005b*) or at <http://oceancolor.gsfc.nasa.gov/PRODUCTS/>.

The photoadaptive variable used in the primary productivity calculation depends on SST. The SST used in the monthly primary productivity product is retrieved from the 0.1 degree monthly Pathfinder v5.0 SST product from NOAA's National Oceanographic Data Center (NODC). Information on the processing and validation of the Pathfinder v5.0 SST can be found in the

Pathfinder Version 5.0 Global Area Coverage (GAC) Sea Surface Temperature (SST) Data Pre-Dissemination Review (*Foley and Spence, 2006c*) or at <http://www.nodc.noaa.gov/sog/pathfinder4km/>. The SST used in the 8-day primary productivity product is retrieved from the Reynolds Optimally-Interpolated SST (OISST) v2 product from NOAA's National Climatic Data Center (NCDC). The v2 OISST uses a mixture of in situ measurements from ships and buoys and satellite AVHRR SST measurements following *Reynolds et al., 2002*. The mixture of observation platforms allows for the correction of persistent SST biases. More information can be found at <http://www.ncdc.noaa.gov/oa/climate/research/sst/sst.html>.

Daylength is calculated from latitude and date-of-year following *Forsythe et al., 1995*.

The irradiance dependent function is calculated using a measurement of photosynthetically active radiation (PAR). PAR, used by organisms in photosynthesis, is the amount of solar radiation reaching the surface with wavelengths between 400-700nm. The PAR measurement is retrieved from the SeaWiFS PAR product from NASA's GSFC, Ocean Color Web. Processing information for the SeaWiFS PAR product can be found at http://oceancolor.gsfc.nasa.gov/PRODUCTS/SW_PAR.html.

The product shows good agreement with the PAR measurements calculated as part of the International Satellite Cloud Climatology Project (*Bishop et al., 1997*).

As previously noted, this product is available with spatial coverage of 180 degrees west to 180 degrees east longitude, 75 degrees south to 75 degrees north latitude. The product is mapped into images of 8-day and monthly durations. 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 0.1 degrees latitude by 0.1 degrees longitude using simple arithmetic means to produce composite images of 8-day and monthly durations, 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*). All datasets are made available via OpenDAP / DODS.

These products are generated and distributed on an operational basis in near real time. In addition to the efforts WCRN takes to ensure data validity, users are cautioned these products may not be appropriate for many scientific applications. Users interested in scientific applications, which are not time critical, are referred to an appropriate data source, whenever one is available.

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.

Extensive documentation is available for the various source datasets used in the primary productivity calculation. The method used in the processing of the primary productivity end product follows methods published in scientifically established, peer-reviewed journals (*Behrenfeld and Falkowski, 1997*). A complete description of the methods, including the program code used to generate the end products, is available upon request.

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.

This product is distributed for scientific evaluation, and users are cautioned as to the experimental nature of the product. Contact information for CoastWatch personnel is provided for feedback purposes.

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.

This product is distributed for scientific evaluation.

References:

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