SeaWiFS Technical Report Series

Stanford B. Hooker and Elaine R. Firestone, Editors

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Final Cumulative Index

Elaine R. Firestone and Stanford B. Hooker

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The SeaWiFS Project was officially established at Goddard Space Flight Center (GSFC) on March 29, 1991, with the award of an Ocean Color Data Mission contract to Orbital Sciences Corporation (OSC). It was originated as a cooperative effort between the government and industry, and had a spacecraft launch date of 31 July 1993. In this case, GSFC and OSC would share the costs of the mission. GSFC would specify the data that was needed and buy the research rights to these data, maintaining insight, but not oversight rights, with their industrial partner. GSFC would also provide calibration and validation for these data. OSC would provide the spacecraft and instrument, launch services, and spacecraft operations to provide data for five years at a fixed price of $43 million. OSC would retain the operational and commercial rights to these data. In order to protect OSC's data rights, research data release would be delayed, unless timely release is necessary for calibration and validation activities.

Because of the focus on data products, the Project structure is different from classic flight projects at GSFC. It is housed within the Earth science organization, where the majority of the staff are scientists. The majority of the engineering support is matrixed into the organization on an as-needed basis. During the development and early operations phase, the Project was under team leadership by the Project Manager (an engineer), and the Project Scientist (an oceanographer). After the spacecraft was launched and it entered routine operations, the Project management was turned over to the Project Scientist. Data collection is specified by the Mission Operations Element, who control the SeaWiFS instrument on the spacecraft. The global data are received at Wallops Flight Facility and are then transferred to GSFC. At GSFC, the Data Processing Element receives these data and generates standard global ocean color data products. This process includes calibration and validation of these data and quality assurance, which is provided by the Calibration and Validation Element, which also includes a Field Program for in situ work. Local area coverage data and back-up global data are also collected at GSFC. The Project Office Staff provide support and a buffer for the technical staff. The Project Office is virtually located on the World Wide Web, and that has made coordination of a global project infinitely easier.

The original schedule specified certified data delivery by December 1, 1993. During spacecraft development, numerous delays were encountered, and data delivery was delayed until December 20, 1997. The delay was extremely painful for everyone involved, but it did allow for significant refinement and documentation of our work. This prelaunch technical memorandum series will conclude with this 43rd volume, considerably larger than was originally anticipated. The excellence of the series was recognized by a NASA Group Achievement Award presented to the Series Editors, Stanford B. Hooker and Elaine R. Firestone. Although the instrument was optimized for ocean imaging, the SeaWiFS instrument was modified to decrease stray light effects. That change allowed the instrument to produce good land imagery as well. With the addition of the land data, the Project that was tasked with providing regular global ocean color data, was able to produce regular global biospheric data for the first time in history.

The Project thanks everyone who invested their time and energy in this effort. The research facilitated by these data will hopefully exceed all expectations—those same expectations that kept everyone going through the development phase.

"With that said, I will now turn the SeaWiFS Project over to the Project Scientist, Chuck McClain. It has been a pleasure and an inspiration to work with all of you."

Greenbelt, Maryland
February 1998

— M. L. Cleave
Project Manager
ABSTRACT

The Sea-viewing Wide Field-of-view Sensor (SeaWiFS) is the follow-on ocean color instrument to the Coastal Zone Color Scanner (CZCS), which ceased operations in 1986, after an eight-year mission. SeaWiFS was launched on 1 August 1997, on the OrbView-2 satellite, built by Orbital Sciences Corporation (OSC). The SeaWiFS Project at the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC), undertook the responsibility of documenting all aspects of this mission, which is critical to the ocean color and marine science communities. This documentation, entitled the SeaWiFS Technical Report Series, is in the form of NASA Technical Memorandum Number 104566 and 1998-104566. All reports published are volumes within the series. This particular volume, which is the last of the so-called Pre-launch Series serves as a reference, or guidebook, to the previous 42 volumes and consists of 6 sections including: an addenda, an errata, an index to key words and phrases, lists of acronyms and symbols used, and a list of all references cited. The editors have published a cumulative index of this type after every five volumes. Each index covers the reference topics published in all previous editions, that is, each new index includes all of the information contained in the preceding indexes with the exception of any addenda.

1. INTRODUCTION

This is the seventh, and final volume, in a series of indexes, published as a separate volume in the Sea-viewing Wide Field-of-view Sensor (SeaWiFS) Technical Report Series, and includes information found in the first 42 volumes of the series. The Report Series was written under the National Aeronautics and Space Administration’s (NASA) Technical Memorandum (TM) Number 104566 and 1998–104566. The volume numbers, authors, and titles of the volumes covered in this index are:


Vol. 7: Darzi, M., Cloud Screening for Polar Orbiting Visible and IR Satellite Sensors.


Vol. 21: Acker, J.G., *The Heritage of SeaWiFS: A Retrospective on the CZCS NIMBUS Experiment Team (NET) Program*.


This final volume serves as a reference, or guidebook, to the entire Prelaunch Series. It consists of the four main sections included with the all of the indexes published: a cumulative index to key words and phrases, a glossary of acronyms, a list of symbols used, and a bibliography of all references cited in the series. In addition, as in some
of the other index volumes, an errata section has been
added to address issues and needed corrections which have
come to the editors’ attention since the volumes were first
published. Also, an addenda section has been added to
include the proceedings of various workshops, which are
too short in length to warrant a separate volume within
the series.

The nomenclature of the index is a familiar one, in
the sense that it is a sequence of alphabetical entries, but
it utilizes a unique format since multiple volumes are in-
volved. Unless indicated otherwise, the index entries refer
to some aspect of the SeaWiFS instrument or project, for
example, the mission overview index entry refers to an
overview of the SeaWiFS mission. An index entry is com-
posed of a keyword or phrase followed by an entry field
that directs the reader to the possible locations where a
discussion of the keyword can be found. The entry field
is normally made up of a volume identifier shown in bold
face, followed by a page identifier, which is always enclosed
in parentheses:

keyword, volume(pages).

If an entry is the subject of an entire volume, the volume
field is shown in slanted type without a page field:

keyword, Vol. #.

An entry can also be the subject of a complete chapter. In
this instance, both the volume number and chapter number
appear without a page field:

keyword, volume(ch. #).

Figures or tables that provide particularly important sum-
mary information are also indicated as separate entries in
the page field (even if they fall within an already specified
page range). In this case, the figure or table number is
given with the page number on which it appears.

keyword, volume(Fig. # p. #).
or

keyword, volume(Table # p. #).

2. ERRATA

Note: Since the issuance of previous volumes, a num-
ber of the references cited have changed their publication
status, e.g., they have gone from “submitted” or “in press”
to printed matter. In other instances, some part (or parts)
of the citation, e.g., the title or year of publication, has
changed or was printed incorrectly. Listed below are the
references in question as they were cited in one or more of
the first 42 volumes in the series, along with how they now
appear in the references section of this volume.

Original Citation
Behrenfeld, M.J., and P.G. Falkowski, 1997: A con-
sumers guide to primary productivity models. Lim-
nol. Oceanogr., 42, 1,479–1,491.

Revised Citation
Behrenfeld, M.J., and P.G. Falkowski, 1997: A con-
sumers guide to primary productivity models. Lim-
nol. Oceanogr., 42, 1,479–1,491.

Original Citation
Bidigare, R.R., L. Campbell, M.E. Ondrusek, R. Lete-
lie, D. Vaulot and D.M. Karl, 1995: Phytoplankton
community structure at station ALOHA (22° 45'N,

Revised Citation
Andersen, R.A., R.R. Bidigare, M.D. Keller, and M.
Latasa, 1996: A comparison of HPLC pigment sig-
natures and electron microscopic observations for
oligotrophic waters of the North Atlantic and Pa-

Original Citation
Carder, K.L., S.K. Hawes, and Z. Lee, 1996: SeaWiFS
algorithm for chlorophyll a and colored dissolved or-
ganic matter in subtropical environments. J. Geo-

Revised Citation
Carder, K.L., S.K. Hawes, Z. Lee, and F.R. Chen
1997: MODIS Ocean Science Team Algorithm The-
oretical Basis Document Case 2 chlorophyll a.
ATBD-Mod. 19, Version 4, 15 August 1997 [World
nasa.gov/MODIS/MODIS.html NASA Goddard
Space Flight Center, Greenbelt, Maryland.

Original Citation
Early, E.A., and B.C. Johnson, 1996: Calibration and
Characterization of the Goddard Space Flight Cen-
ter Sphere. NASA Tech. Memo. 105566, S.B. Hook-
er and E.R. Firestone, Eds., NASA Goddard Space
Flight Center, Greenbelt, Maryland, (accepted).

Revised Citation
and Characterization of the GSFC Sphere.” In: E-

n. Yeh, R.A. Barnes, M. Darzi, L. Kumar, E.A.
Early, B. Carol Johnson, J.L. Mueller, and C.C.
Trees, 1997: Case Studies for SeaWiFS Calibra-
tion and Validation, Part 4 NASA Tech. Memo.
104,566, Vol. 41, S.B. Hooker and E.R. Firestone,
Eds., NASA Goddard Space Flight Center, Green-
belt, Maryland, 3–17.

Original Citation
Johnson, B.C., C.L. Cromer, and J.B. Fowler, 1996:
The SeaWiFS Transfer Radiometer (SXR). NASA
Tech. Memo. 104,566, S.B. Hooker and E.R. Fire-
stone, Eds., NASA Goddard Space Flight Center,
Greenbelt, Maryland, (accepted).
Revised Citation

Original Citation

Revised Citation

Original Citation

Revised Citation

3. ADDENDA

This section presents a summary of the SeaWiFS Bio-optical Algorithm Mini-workshop (SeaBAM) which was held 21–24 January 1997; submitted by C. McClain. In addition, it presents a summary of the proceedings from the Second SeaWiFS Science Team Meeting held at the Omni Hotel in Baltimore, Maryland, 6–8 January 1998.

3.1 SeaBAM Abstract

One of the primary goals of the SeaWiFS Project is to routinely generate global chlorophyll a and Coastal Zone Color Scanner (CZCS) pigment concentrations with an accuracy of ±35% (Hooker et al. 1992). Since its inception in 1991, the SeaWiFS Calibration and Validation Program has undertaken a number of initiatives to help ensure that this goal is met, e.g., measurement protocol development, calibration round-robin, a bio-optical data archive, and bio-optical algorithm workshops. After the seventh bio-optical algorithm workshop held in Halifax, Nova Scotia on 21 October 1996, it was clear that algorithm and data quality issues remained that could not be adequately addressed in the standard workshop format. A more interactive analysis (data sets and algorithms) workshop was deemed necessary in order to focus on specific problems. As a result, the first SeaWiFS Bio-optical Algorithm Mini-workshop (SeaBAM) was hosted by D. Siegel at the University of California at Santa Barbara (UCSB) during 21–24 January 1997. This chapter provides an overview of the workshop background, organization, approach, and results from the workshop and other associated activities.

3.1.1 Introduction

The rationale behind the CZCS pigment product (chlorophyll a plus phaeophytin) is to provide a data set that can be compared to products derived from CZCS for studies of decadal scale variability. Early comparisons of in situ and CZCS global products (Balch et al. 1992) indicated that this goal was feasible for most of the global ocean. Subsequent studies, however, noted significant differences even in clear water environments (Arrigo et al. 1994). The CZCS algorithm was based on 55 bio-optical stations in coastal US waters (Clark 1981; usually referred to as the Nimbus Experiment Team, or NET, data set) and even by 1991, that data set was the only data set generally available for algorithm development. As a result, the SeaWiFS Calibration and Validation Program initiated several activities directed at improving the quality of bio-optical data collected by the ocean optics community. These activities included the establishment of measurement protocols (Mueller and Austin 1992 and 1995), the SeaWiFS Interëlaboration Round-Robin Experiments (SIREXs, e.g., Johnson et al. 1996), the SeaWiFS Bio-optical Archive and Storage System (SeaBASS; Hooker et al. 1994), the SeaWiFS Transfer Radiometer (SRX) and the SeaWiFS Quality Monitor (SQM; Shaw et al. 1996, Hooker and Aiken 1998, and Johnson et al. 1998). In addition, seven bio-optical algorithm workshops have been held, brief proceedings of which are published in the SeaWiFS Technical Report Series cumulative indexes Volumes 12, 18, 24, and 36 (Firestone and Hooker 1993, 1994, 1995, and 1996).

The bio-optical algorithm workshops have been open events and have provided a forum for presentation and detailed discussions on protocols, data collection, and algorithm issues. Early in the deliberations on algorithm development, it was decided to avoid switching algorithms, such as was used in the global CZCS reprocessing (Gordon et al. 1983) and to use a semi-analytical chlorophyll algorithm. Switching algorithms tend to produce bimodal frequency distributions as an artifact of the switching logic (Denman and Abbott 1988 and Müller-Karger et al. 1990). Semi-analytical algorithms (Carder et al. 1991, Garver and Siegel 1997, and Carder et al. 1997) would allow more physical insight into the optical processes that determine oceanic reflectance, thus providing a mechanism for incorporating strategies to account for regional and temporal variability in the algorithm.
The discussions at the workshops were very constructive in highlighting the differences in perceptions and approaches to algorithm development. The CZCS pigment product, for example, raised several questions. Should the algorithm be chlorophyll \(a\), or chlorophyll \(a\) plus phaeophytin [as it was just as easy to develop an empirical algorithm for chlorophyll \(a\) (Aiken et al. 1995)]. If just chlorophyll \(a\), why is a CZCS pigment product needed? Should the CZCS pigment product be based only on CZCS bands (SeaWiFS equivalents), and should it be derived using a CZCS atmospheric correction? The issue is that if the CZCS atmospheric correction scheme (uses 670 nm) and bio-optical band limitations (443, 520, and 550 nm) introduce a systematic bias in the pigment product that is not reproduced in subsequent ocean color data sets, the interpretation of decadal-scale change will be compromised. Another question is what measurements of pigments should be used in defining the CZCS pigment product given the evolution in measurement techniques [fluorometric, high performance liquid chromatography (HPLC), etc.], and is consistency with the original NET CZCS data set necessary? In the end, the general consensus, though not unanimous, was to continue using the original product definition, but to use the best algorithms possible, i.e., the SeaWiFS atmospheric correction and no restriction on the bands to be used for the bio-optical algorithms.

With regard to the bio-optics subgroup’s recommendation to pursue semi-analytical algorithms for operational use, it has become clear that the existing semi-analytical algorithms are limited to Case-1, relatively low pigment waters. The main issues are a paucity of data on scattering and the variability in spectral absorption. While new methods and instrumentation for measuring the backscattering coefficient hold promise, little is currently available. Also, the measurement of spectral absorption, let alone a way of parameterizing its variability, remains an issue. In response to this problem, the SeaWiFS Calibration and Validation Program funded a workshop at the Scripps Institute of Oceanography, hosted by G. Mitchell and A. Bricaud in December 1996, to compare and evaluate different methods. The results of the workshop are not available as yet; thus, at the present time, the semi-analytical algorithms are inherently empirical, at a different level, and some resort to strictly empirical relationships at high concentrations (Carder et al. 1997). The limitations, at the present time, reside in the determination of the various absorption and backscattering coefficients, i.e., measurement methodologies, parameterizations, etc. Despite these limitations, semi-analytical algorithms do generate reasonable chlorophyll \(a\) values for most of the global ocean as well as a number of other quantities that could be routinely produced by the SeaWiFS Project, if required by the science community. Also, they can be easily adapted to any combination of wavelengths commensurate with any satellite sensor. Therefore, whether or not the initial SeaWiFS algorithms are semi-analytical, their development should continue because the original rationale remains valid and justified.

Finally, another issue which complicates the algorithm evaluation process stems from differences in reflectance measurement methodologies, i.e., above- versus below surface. Both methods have limitations. Above-surface measurements are contaminated by skylight, glint, polarization, and plaque bidirectional reflectance effects. Below-surface measurements require absolute radiance calibrations, an extrapolation through the air–sea interface, and a correction for instrument self-shading in turbid water. The Carder et al. (1997) algorithm uses above-surface measurements, but the bulk of the data available for independent algorithm verification are below-surface observations. No systematic comparison of the two methods has been conducted; the protocol for making above-surface reflectance measurements (Mueller and Austin 1995) is considered by many to be inadequate. The SeaWiFS Project sponsored a workshop on Case-2 measurement protocols in the spring of 1996 (Firestone and Hooker 1996) with the objective of refining the existing protocols, but the workshop coordinators have not completed the document that was outlined at the meeting. The Sensor Intercomparison and Merger for Biological and Interdisciplinary Studies (SIMBIOS) Project plans to sponsor focused field experiments designed to clarify, and hopefully, resolve this issue.

After the seventh bio-optical algorithm meeting in October 1996, it was clear that convergence on the operational algorithms was not happening in a satisfactory manner. Indeed, the primary candidate algorithms for chlorophyll \(a\) (Carder et al. 1997) and CZCS pigment (Aiken et al. 1995) were seriously inconsistent at moderate and high concentrations, i.e., chlorophyll \(a\) \(\gg\) CZCS pigment. It is with all the above-mentioned considerations in mind that SeaBAM was initiated. The consensus was that further progress would result only if the participants work collectively with open access to data and codes (data processing and algorithm codes) in a similar fashion to the data analysis round-robin held at UCSB in 1994 (Siegel et al. 1995c). The following sections outline the workshop strategy including pre- and post-workshop activities and a summary of the findings derived as a result of the SeaBAM process. It is the philosophy of the SeaWiFS Project not to develop the operational algorithms, but to expedite algorithm development via whatever mechanisms are possible and to provide an independent and objective evaluation. From the SeaWiFS Project’s perspective, SeaBAM has achieved more than was initially hoped for because of the enthusiasm and openness of all the participants. Data and software were freely exchanged, errors were revealed and corrected (without angst), and substantial improvements in almost all the evaluated algorithms were made. Last, but not least, a consistent set of chlorophyll \(a\) and CZCS pigment algorithms were identified using a large bio-optical data set representing a diversity of bio-optical provinces.
Table 1. Participants in SeaBAM held 21–24 January 1997 at UCSB in Santa Barbara, California.

<table>
<thead>
<tr>
<th>Participants</th>
<th>Affiliation</th>
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</thead>
<tbody>
<tr>
<td>K. Carder</td>
<td>Univ. of South Florida</td>
</tr>
<tr>
<td>S. Garver†</td>
<td>Univ. of California, Santa Barbara</td>
</tr>
<tr>
<td>S. Hawes</td>
<td>Univ. of South Florida</td>
</tr>
<tr>
<td>M. Kahru</td>
<td>Scripps Institution of Oceanography</td>
</tr>
<tr>
<td>S. Maritorena</td>
<td>SeaWiFS Project, NASA/GSFC</td>
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<tr>
<td>C. McClain</td>
<td>SeaWiFS Project, NASA/GSFC</td>
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<tr>
<td>G. Mitchell</td>
<td>Scripps Institution of Oceanography</td>
</tr>
<tr>
<td>G. Moore</td>
<td>Plymouth Marine Laboratory</td>
</tr>
<tr>
<td>J. Mueller</td>
<td>San Diego State University</td>
</tr>
<tr>
<td>J. O’Rielly</td>
<td>NOAA/National Marine Fisheries Service</td>
</tr>
<tr>
<td>D. Siegel</td>
<td>Univ. of California, Santa Barbara</td>
</tr>
<tr>
<td>B. Schieber</td>
<td>SeaWiFS Project, NASA/GSFC</td>
</tr>
</tbody>
</table>

† S. Garver is now affiliated with California State Polytechnic University, Pomona, California.

3.1.3 Objectives and Approach

Given that the primary objective was to finalize and deliver the operational SeaWiFS chlorophyll a and CZCS pigment algorithms in a relatively short time, it was agreed by the participants (Table 1) that a successful workshop would require a substantial amount of pre-workshop preparation, and the free and rapid dissemination of data, code, and results. It also required that all those involved be willing to assist one another, work out problems and differences of opinion internally, and to recognize that all options were open with regard to the final algorithm selections. The strategy was to have a balanced, but small, group of participants, including representatives from the SeaWiFS Project and others who had been active in the bio-optics subgroup as algorithm developers (empirical and semi-analytic), and bio-optical data providers. It was also agreed that D. Siegel would host the workshop at UCSB and that he would assume responsibility for providing a workshop environment that efficiently accommodated both group discussion and presentation sessions and a heterogeneous computing and data storage environment. GSFC would coordinate pre- and post-workshop activities including maintenance of an access-restricted SeaBAM web page where data, results, and electronic mail (e-mail) would be posted and archived. Both S. Maritorena (GSFC) and S. Garver (UCSB) had been developing data sets of water-leaving radiances (and other related quantities) with associated pigment data for the purposes of independent evaluation and algorithm development, respectively (Garver and Siegel 1997 and O’Reilly et al. 1998). They would continue the refinement and expansion of these data sets, coordinate their activities, e.g., exchange data, in preparation for the mini-workshop, and provide the data sets to the other participants. The initial version of the O’Reilly et al. data set, which was presented at the Halifax workshop, consisted of approximately 90–100 clear-sky stations. It was agreed that this condition was too restrictive and that other data should be incorporated. Finally, it was agreed that all groups would provide documentation on their evaluations, and results would be combined into a SeaWiFS technical memorandum.

To establish a framework for SeaBAM, an initial set of issues, tasks and goals were outlined, which included the following:

1) Settle on the definition of “CZCS pigments.” This question is the result of the differences in measurement methodologies.

2) Establish a clear definition of accuracy and identify the appropriate statistical parameter(s) for quantification of accuracy as it applies to algorithms.

3) Establish criteria for final selection of the “best” algorithm for both pigment parameters.

4) Identify the algorithms to be compared and identify probable reasons for differences. Ultimately, the algorithms included the following:

   a) Aiken et al. (1995);
   b) Carder et al. (1997);
   c) Clark (1997);
   d) Garver and Siegel (1997);
   e) Mitchell and Kahru (California Cooperative Fisheries Institute [CalCOFI], unpublished);
   f) Morel (1996);
   g) New empirical (e.g., one based on the evaluation data set);
   h) Gordon et al. (1983);
   i) Ocean Color and Temperature Scanner (OCTS) operational chlorophyll a; and
   j) Polarization and Directionality of the Earth’s Reflectance (POLDER) operational algorithm.

5) Establish data set selection guidelines. Considerations included:

   a) Blending of HPLC pigments with fluorometric pigments;
b) SeaWiFS measurement protocols compliance;

c) Blending of in-water and above-water estimates of $R_{rs}$ or $L_{WN}$; and

d) Consistency in analyses used to derive $L_W$ from in-water measurements.

6) Select the data sets to be used for the comparisons. The individual data sets were:

a) Carder et al. (above-water observations);

b) Garver and Siegel (in-water observations);

c) O’Reilly et al. evaluation data set (in-water observations); and

d) Mitchell and Kahru (CalCOFI, in-water observations)

All issues were eventually addressed.

### 3.1.4 The UCSB Meeting

Prior to the workshop, a global evaluation data set was assembled by combining a number of data sets contributed, primarily, by the participants. J. O’Reilly and S. Maritorena used this data set to complete an initial comparison of all algorithms prior to the meeting. The first day of the meeting consisted of briefings by all of the groups to provide updates on all preparations and results stemming from pre-workshop activities. During the presentations, an issues and analysis action item list was developed and reviewed at the end of the session. Thereafter, the groups conducted hands-on analyses to address the action items and periodically reconvened to report their progress and register any additional issues that needed to be tracked. On the last day, a plenary session was held to review the final status of all action items and to outline the post-workshop activities and schedule. To provide some insight into what the action items were and how they were resolved, several are described in Section 3.1.6.

### 3.1.5 Final Results and Conclusions

As discussed above, all the original issues were addressed, as well as a number of others that developed during SeaBAM. Conducting algorithm development in this fashion greatly expedited resolution of many questions. Most of the algorithms and the evaluation data set were improved as a result of SeaBAM. The most important results are the final recommendations on the operational SeaWiFS algorithms which are summarized below.

1. **Chlorophyll a**: Because the evaluation data set has the most bio-optical diversity of the data sets listed above, and was quality controlled and processed in a consistent manner (O’Reilly et al. 1998), it was used to obtain the “best” algorithm possible. Therefore, it evolved from being an independent data set to one used to develop empirical algorithms as well. Not only were all final versions of the algorithms as submitted by the developers considered, but also, for the empirical algorithms, these and other algorithmic forms (band ratio combinations) were fit to the evaluation data to see what improvements were possible. The algorithm that gave the best overall result, based on the selection criteria outlined in O’Reilly et al. (1998), uses only a ratio of 490 nm to 555 nm, i.e.,

$$ C = -0.040 + 10^{(0.341 - 3.001X + 2.811X^2 - 2.041X^3)}, $$

where $C$ is defined as chlorophyll $a$ pigment concentration, and where

$$ X = \log_{10} \frac{R_{rs}(490)}{R_{rs}(555)}. $$

This result is consistent with the Aiken et al. (1995) finding that a 490-555 band ratio yielded the highest correlation ($R^2 = 0.95$) for the data sets in their analysis.

2. **CZCS pigment**: As discussed in O’Reilly et al. (1998), there are a number of options for this product, not all of which follow the original guideline of using an algorithm that uses only the CZCS bands. Clearly, there should be reasonable consistency between the two pigment products. Also, an evaluation data set for CZCS, comparable to the one just completed for SeaWiFS, needs to be generated. For the at-launch algorithm, the recommendation is the following relationship which is based on an empirical relationship of chlorophyll $a$, and chlorophyll $a$ plus phaeopigments, concentrations derived from the SeaBASS pigment database, i.e.,

$$ \text{CZCS}_\text{pigment} = 1.34C_{a}^{0.98}. $$

It is important to note that the SeaWiFS Project plans to periodically reprocess the entire SeaWiFS data set as algorithms (atmospheric, bio-optical, mask, and flag), sensor calibration, and product suites are updated. Thus, it is critical that the SeaBAM activity be continued.

### 3.1.6 Workshop Action Items

In order to emphasize the benefits of conducting workshops that are oriented around data analysis and real-time algorithm evaluation, the following list of results stemming from action items are provided below. This meeting format expedited, even forced, the resolution of questions and issues, usually at the meeting. In the typical meeting format, questions often go unresolved resulting in continued debate and misunderstanding.

**Action Item**: 1. State succinctly the practical definitions of CZCS pigments and chlorophyll $a$ with rationale for the choices.

**Definition of CZCS pigment**: A fluorometric pigment concentration (chlorophyll $a$ plus phaeopigments) that can be calculated using bands comparable to the CZCS wavelengths (443, 520, and 550). Note that the SeaWiFS protocols need to be more detailed on this topic. The purpose
of generating this product is to provide a means of comparing products that can be derived from CZCS to those from later missions for examining decadal scale variability. Restricting the algorithm to the CZCS wavelengths minimizes biases introduced in the products that are artifacts of the algorithm form. It is assumed that the global CZCS data set will be reprocessed using an updated pigment algorithm that is consistent with the SeaWiFS pigment algorithm. S. Maritorena will evaluate the assumption that the differences between fluorometric and HPLC bio-optical data sets are indistinguishable using the evaluation data set.

The issue of how to validate the reprocessed CZCS products using simultaneous measurements was discussed. Given that algorithms being developed at this time are based on different pigment measurement methodologies which yield different values, validation using historical data will require some adjustment in the historical values.

Status: Post-workshop examination of the SeaBASS data sets showed that there are a very limited number of stations available having the CZCS bands and chlorophyll \( a \) plus phaeophytin concentrations on which to base a global algorithm (O’Reilly et al. 1998) and alternative strategies are outlined in O’Reilly et al. (1998).

**Definition of Chlorophyll \( a \):** Any fluorometric or HPLC concentration identified as chlorophyll \( a \) by the provider. While there are differences in the values obtained by the two techniques, globally the difference has been shown to be of the order of 10% (analysis by C. Trees). Also, at least for the time being, both HPLC and fluorometric data have been combined in order to have a data set sufficiently large, with enough diversity, to cover the broad range of chlorophyll concentrations required for development of a general chlorophyll algorithm. Debate continues as to what pigments should be, or are being, summed and reported as “chlorophyll” concentration in the data sets being submitted to SeaBASS.

Status: Because other sources of variability in the bio-optical data sets (e.g., data processing methods and calibration) have been found to be as great, and in order to have enough data over a large dynamic range to develop and evaluate algorithms, this definition was adopted.

**Action Item 2.** Reconcile the differences in the \( L_w \) spectral shapes of CalCOFI-2, as obtained independently by S. Garver and M. Kahru. The problem is an elevated shoulder at 490 nm relative to 443 nm in the Kahru analysis.

**Status:** The anomalous spectral shoulder was found to be a typographical error in a table used in the transformation of subsurface \( L_w(443) \) to the above-surface \( L_W(443) \).

**Action Item 3.** Resolve a problem S. Garver and D. Siegel observed with some of C. Trees’ North Atlantic Bloom Experiment (NABE) optical data.

**Status:** J. Mueller checked the scaling factor Garver and Siegel were using and the problem was a misinterpretation of the scaling factor format. NABE is consistent with other data sets.

**Action Item 4.** Determine the reason why the 412 nm surface reference values in G. Cota’s Resolute Bay data are inconsistent with values in the profile data (a 2–4 fold difference was found in all profiles for all three cruises, each in a different year).

**Status:** G. Cota was contacted and will try to develop a time series of his calibration data. The 412 nm filters were replaced in both instruments after the 1995 field campaign. As a result, the 1994 and 1995 data were excluded from the evaluation data set, but the 1996 data were retained.

**Action Item 5.** Verify a constant offset between the evaluation data set and D. Clark’s algorithm (the algorithm had the highest \( R^2 \) when compared with the evaluation data set).

**Status:** J. Mueller and S. Maritorena spoke with D. Clark after the workshop. The source of the offset could not be readily identified, so further evaluation of the Clark algorithm was deferred until an update is made available.

**Action Item 6.** Examine the impact of data with 565 nm rather than 555 nm on the algorithm comparisons. The World Ocean Circulation Experiment (WOCE) and the early Bermuda Atlantic Time-Series Station (BATS) data have 565 nm measurements rather than 555 nm. Both data sets are from low pigment waters. Given the significant slope in water absorption spectrum at these wavelengths, the data should be corrected or omitted from the SeaWiFS algorithm evaluations.

**Status:** S. Maritorena analyzed several data sets and derived a correction factor for transforming 565 nm to 555 nm radiances. The corrected data were retained in the evaluation data set.

**Action Item 7.** Investigate what appears to be anomalous 412 nm data in J. Marra’s WOCE data set. Some 412 nm data appears to be very high, even for very clear water.

**Status:** J. Mueller did the calibration on J. Marra’s marine environmental radiometer (MER) and followed up on this question. As a result, the 1991 data was removed from the evaluation data set because of concerns about the calibration, but the data from 1993 and 1994 were retained.

### 3.2 SeaWiFS Science Team Meeting

The Second SeaWiFS Science Team Meeting was held at the Omni Hotel in Baltimore, Maryland, 6–8 January 1998. The team members and invited guests are listed in Table 2.
The objectives of the meeting were to:

1) Heighten the awareness of the science team as to the organization and functionality of the SeaWiFS Project,
2) Inform the science team of the quality and availability of the SeaWiFS data set, and
3) Encourage information exchange and collaboration among science team members.

The first day was dedicated to briefings by members of the SeaWiFS Project, and other related activities. The remainder of the meeting consisted of break-out sessions on a variety of topics so as to get input from the science community and to help focus on particular issues confronting the Project and the NASA Biogeochemistry Program. All investigators were invited to display posters in the foyer of the meeting complex for the entire duration of the meeting; most investigators took advantage of the opportunity.

A. Tuesday Morning: General Session

1. Introductory Talks
   a. Welcome and Meeting Schedule/Objectives (C. McClain)
   b. Meeting Logistics (G. Valenti)
   c. NASA Biogeochemistry Program Status and HQ Perspective (J. Campbell)
   d. Overview of science team investigations (J. Campbell)

2. Project Report
   a. SeaWiFS Project Overview (M. Cleave)
   b. Data Processing Overview (G. Feldman)
   c. Calibration and Validation Program Overview (C. McClain)
   d. Real-Time Cruise Support (A. Isaacman)

B. Tuesday Afternoon

1. Project Reports (continued)
   a. Project Science (C. McClain)
   b. Science Team Working Groups and Executive Council (C. McClain)
   c. Report by the GSFC Distributed Active Archive Center (DAAC) (G. Leptoukh)
   d. Discussion on SeaWiFS Data Policy (M. Cleave)

2. Reports from Other Projects
   a. MODIS (W. Esaias)
   b. SIMBIOS Project (C. McClain)
   c. SeaWiFS Data Applications in Other Disciplines
      i. Land (C.J. Tucker)
      ii. Clouds (M. Wang)
      iii. Smoke Index (E. Vermote)

C. Wednesday Morning: Working Sessions

1. General Plenary and Organization Session (C. McClain)

2. Break-out session on algorithm performance and product validation (Chair: C. McClain)
3. SeaDAS and SeaBASS updates and demonstrations (Chair: M. Darzi)
4. Break-out session of the Primary Productivity Working Group (Chair: W. Esaias)

D. Wednesday Afternoon

1. Break-out session on revising the archive product suite (Chair: G. Feldman)
2. SeaDAS and SeaBASS updates and demonstrations (Chair: M. Darzi)
3. Break-out session of the Executive Council (Chair: J. Campbell)

E. Thursday Morning

1. General session on science team coordination and organization (Chair: J. Campbell)
2. General session on OCTS and CZCS reprocessing (Chair: J. Yoder)
3. Meeting wrap-up and break-out session summaries (Chair: C. McClain)
4. Break-out session reports
   a. Algorithm evaluation (C. McClain)
   b. Primary Productivity (W. Esaias)
   c. Data products (G. Feldman and M. Darzi)
   d. CZCS and OCTS processing (J. Yoder)
   e. Working groups and team coordination (J. Campbell and C. McClain)
   f. Executive Council (C. McClain)

3.2.1 SeaWiFS Executive Council

Because of the size of the Science Team, both NASA HQ and the SeaWiFS Project felt that a smaller group to serve as advisors to the SeaWiFS Project and the Biogeochemistry Program was needed. Specifically, the group would:

1) Work with the Ocean Biogeochemistry Program (OBP) Manager to represent the SeaWiFS Science Team interests within NASA and at the national and international program levels;
2) Preserve, promote, and wherever possible, expand mission science goals;
3) Foster interaction between the SeaWiFS Project and the science community;
4) Enhance public awareness of scientific results derived from SeaWiFS data products;
5) Provide timely advice on issues concerning the Project, e.g., data products;
6) Present science community issues and desires to the Project and the OBP;
7) Assist in representing the Project and the OBP at national and international meetings; and
Table 2. The team members of the Second SeaWiFS Science Team Meeting, held 6–8 January 1998 at the Omni Hotel in Baltimore, Maryland. Participants are identified with a checkmark (√).  

<table>
<thead>
<tr>
<th>Team Members</th>
<th>Present</th>
<th>Team Members</th>
<th>Present</th>
<th>Team Members</th>
<th>Present</th>
<th>Team Members</th>
<th>Present</th>
</tr>
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<tbody>
<tr>
<td>S. Ackleson</td>
<td>√</td>
<td>P. Falkowski</td>
<td>√</td>
<td>D. Kiefer</td>
<td>√</td>
<td>J. O'Reilly</td>
<td>√</td>
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<tr>
<td>R. Arnone</td>
<td>√</td>
<td>M. Fang</td>
<td>√</td>
<td>M. Kishino</td>
<td>√</td>
<td>D. Robinson</td>
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<tr>
<td>K. Arrigo</td>
<td>√</td>
<td>R. Frouin</td>
<td>√</td>
<td>O. Kopelevich</td>
<td>√</td>
<td>K. Shifrin</td>
<td>√</td>
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<tr>
<td>R. Barber</td>
<td>√</td>
<td>H. Fukushima</td>
<td>√</td>
<td>R. Kudela</td>
<td>√</td>
<td>D. Siegel</td>
<td>√</td>
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<tr>
<td>M. Behrenfeld</td>
<td>√</td>
<td>S. Gallegos</td>
<td>√</td>
<td>J. Marra</td>
<td>√</td>
<td>H. Sosik</td>
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<tr>
<td>R. Bidigare</td>
<td>√</td>
<td>C. Garcias</td>
<td>√</td>
<td>J. Marshall</td>
<td>√</td>
<td>P. Stegmann</td>
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<tr>
<td>J. Bisagni</td>
<td>√</td>
<td>G. Gaxiola-Castro</td>
<td>√</td>
<td>C. McClain</td>
<td>√</td>
<td>A. Thomas</td>
<td>√</td>
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<tr>
<td>J. Bishop</td>
<td>√</td>
<td>R. Glazman</td>
<td>√</td>
<td>D. McGillicuddy</td>
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<td>U. Unliiata</td>
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<td>P. Bissett</td>
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<td>D. Glover</td>
<td>√</td>
<td>A. Miller</td>
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<td>C. Vorosmarty</td>
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<td>J. Brock</td>
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<td>J. Gower</td>
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<td>B.G. Mitchell</td>
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<td>A. Weidemann</td>
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<td>C. Brown</td>
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<td>W. Gregg</td>
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<td>B. Monger</td>
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<tr>
<td>J. Campbell</td>
<td>√</td>
<td>D. Halpern</td>
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<td>M-E. Carr</td>
<td>√</td>
<td>L. Harding</td>
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<td>J. Mueller</td>
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<td>S. Yvon-Lewis</td>
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<tr>
<td>P. Coble</td>
<td>√</td>
<td>E. Hofmann</td>
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<td>F. Müller-Karger</td>
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<td>E. Zalewski</td>
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<tr>
<td>G. Cota</td>
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<td>F. Hoge</td>
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<td>R. Najjar</td>
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<td>J.R. Zaneveld</td>
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<tr>
<td>A. Cracknell</td>
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<td>J. Irish</td>
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<td>J. Nelson</td>
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<td>G. Zibordi</td>
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<td>R. Iturriaga</td>
<td>√</td>
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<td>S. Doney</td>
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<td>P. Kamynkowski</td>
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<td>J. Nihoul</td>
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<tr>
<td>W. Esaia</td>
<td>√</td>
<td>L. Kantha</td>
<td>√</td>
<td>P. Niiler (J. Moison)</td>
<td>√</td>
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</table>

8) Serve as liaisons to other science programs on behalf of the SeaWiFS Project and the OBP.

The initial Executive Council membership is meant to represent a cross-section of the science team with flexible tenures based on participation and interest. The members include representatives from NASA activities and the larger ocean color community (Table 3).

3.2.2 Working Groups

The SeaWiFS Science Team, consisting of 88 members, represents a large community with diverse scientific interests. Since the whole team will meet at most once a year (probably less frequently), most activities within the team will need to be carried out by smaller working groups.

A number of focus areas were identified that had sufficient interest to warrant the formation of a working group, and a leader was appointed who will be responsible for soliciting members and coordinating the first meeting of the group. Working groups will meet as frequently as necessary to carry out their respective goals. Reports from the various working groups will be presented at SeaWiFS Science Team meetings as appropriate.

The purpose of a working group is to facilitate team interaction and coordination in an area of special interest. There are two types of working groups:

1) Formal working groups whose objectives are necessary for the SeaWiFS Project; and

2) Ad hoc working groups whose objectives are largely of value to its members.

Working groups focusing on regional activities would be ad hoc, whereas groups such as the Ocean Primary Productivity Working Group (OPPWG) belong to the former. Ad hoc working groups can be more flexible in terms of how frequently they meet or whether their activities are largely carried out via electronic mail. Formal working groups will act in an advisory capacity to the SeaWiFS Project, and will be expected to make formal recommendations on issues to be decided by the Science Team.

At this time, the OPPWG is the only formal working group. The identified ad hoc groups are the following (the chairs are listed in parentheses):

a) Modeling and Data Assimilation (E. Hofmann)
b) CZCS Reprocessing (J. Yoder)
c) Gulf of Maine and Georges Bank (A. Thomas)
d) North Atlantic (D. Siegel)
e) Continental Margins (F. Müller-Karger)
f) Eastern North Pacific and Gulf of Alaska (B.G. Mitchell)
g) Absorption and Pigments (B.G. Mitchell and R. Bidigare)
h) Surface photosynthetically available radiation (PAR) (J. Bishop)
i) Biogenic Gas Fluxes (to be determined)

3.2.2.1 Ad Hoc Group Descriptions

The following descriptions of two of the ad hoc working groups were provided by their chairs.
**Table 3.** Participants in SeaWiFS Executive Council Meeting held during the SeaWiFS Science Team Meeting in January 1998, in Baltimore, Maryland.

<table>
<thead>
<tr>
<th>Participants</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>NASA Members</td>
<td></td>
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<tr>
<td>J. Cambell</td>
<td>NASA HQ</td>
</tr>
<tr>
<td>W. Essias</td>
<td>MODIS Project</td>
</tr>
<tr>
<td>C. McClain</td>
<td>SeaWiFS Project</td>
</tr>
<tr>
<td>External Members</td>
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<tr>
<td>R. Barber</td>
<td>Duke University</td>
</tr>
<tr>
<td>J. Brock</td>
<td>NOAA</td>
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<tr>
<td>M.E. Carr</td>
<td>Jet Propulsion Laboratory</td>
</tr>
<tr>
<td>P. Falkowski</td>
<td>Brookhaven National Laboratory</td>
</tr>
<tr>
<td>E. Hoffmann</td>
<td>Old Dominion University</td>
</tr>
<tr>
<td>B.G. Mitchell</td>
<td>Scripps Institution of Oceanography</td>
</tr>
<tr>
<td>D. Siegel</td>
<td>Univ. of California, Santa Barbara</td>
</tr>
<tr>
<td>A. Thomas</td>
<td>Univ. of Maine</td>
</tr>
<tr>
<td>C. Yentsch</td>
<td>Bigelow Laboratory</td>
</tr>
<tr>
<td>J. Yoder</td>
<td>Univ. of Rhode Island</td>
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</tbody>
</table>

1. **Gulf of Maine Ocean Color Working Group**

The Gulf of Maine Ocean Color Working Group was formed at the January 1998 SeaWiFS Science Team Meeting, as a forum in which ocean color interests with a geographic focus on the greater Gulf of Maine region could communicate. The purpose of the Working Group will be interactive and elastic, defined by the Working Group members. The overall goals are to:

1. Facilitate communication among principal investigators carrying out ocean color related research in the Gulf of Maine region; and
2. Where possible or desirable, foster collaboration (i.e., share geographically specific knowledge, data sets, and onerously data processing and archiving tasks).

As initial goals, the following modest strawmen were posed:

1. To identify the community carrying out ocean color related research in the Gulf of Maine;
2. To communicate the goals and approaches of their respective research efforts; and
3. To identify available data sets and data processing activities.

These are just a starting point. Input is welcome and encouraged. The Working Group can be as active or as inactive as the members choose. The SeaWiFS Project is simply looking for mechanisms to maximize the scientific output and productivity resulting from satellite ocean color data.

A World Wide Web site has been established as a point of reference and communication. Through this site, the members will first aim at the above goals and proceed from there. The universal resource locator (URL) [http://wavy.umeoce.maine.edu/seawifs.html](http://wavy.umeoce.maine.edu/seawifs.html) is active, although it is still under construction.

The membership is completely open, but carries the assumption of a willingness to communicate and interact. As there are a plethora of other science working groups related to Gulf of Maine research, this Working Group will stay closely focused on issues, data, and people with active ocean color interests and research. Being a NASA funded principal investigator (PI) is not a prerequisite.

An initial list of members was started at the Second SeaWiFS Science Team Meeting and are listed below, however, it is not a complete list. If other researchers would like to be a participant in this Working Group, please send an e-mail message to A. Thomas (thomas@maine.maine.edu) with a brief note including: name, address, telephone number, e-mail address, and URL, along with a few notes (in bullet-form) on the title, goals, and focus of the ocean color related research. In addition, the researchers should send a few notes on the approach, and the satellite data or ocean color related data sets they have, or will create. The current members are W. Balch, J. Bisagni, J. Irish, B. Monger, J. O'Reilly, J. Salisbury, A. Thomas, and C. Yentsch.

2. **Continental Margins**

This forum serves to exchange information on continental margins and coastal zones. The goal is to define scientific goals for remote sensing of continental margins. The geographical domain includes global continental margins, coastal zones, zones of riverine influence, upwelling zones, marginal seas, island waters, and Great Lakes and other major inland waters. Among topics of discussion may be the relevance of continental margins in global cycles of carbon and other elements, general oceanography, resource management, advantages and limitations of remote sensing technologies and applications, developing time series of
in situ observations, and planning joint research efforts. A goal is to generate feedback for various international satellite missions and projects on regional and time-dependent algorithms for ocean color products, atmospheric correction, and developing strategies for merging various data (satellite and in situ) into coherent scientific products.

The Land Ocean Margins Server (LOMAS) was established for exchanging e-mail for this forum. The forum is open to anyone interested in the topic outlined above. To subscribe, please send an e-mail message to listproc@marine.usf.edu, with the message subscribe lomas FirstName LastName in the body of the text (not in the subject area).

Please note that the live feature of the list server is disabled, so disregard the password offered by the list server in reply to an initial request for subscription.

Some initial topics of discussion were proposed:

a. The ultimate goal of this discussion group is to enable global analyses of continental margins in a remote sensing context.

b. Should the group aim at defining provinces for enabling such analyses?

c. How will the group identify provinces?

d. The group needs to link up and establish a liaison with regional groups, both those defined as SeaWiFS Science Team discussion groups (e.g., Gulf of Maine and Gulf of California), and others. The group may develop a strategy of using such areas as validation for global studies.

e. How will the group include time series data, and can the group develop a strategy to support additional series in continental margins? The group currently has the Carbon Retention in a Colored Ocean (CARIACO), CalCOFI, and the European series in the Adriatic.

f. What testable hypotheses can be defined?

3.4 Participants’ Addresses

Following are the names and addresses of participants of the SeaBAM workshop and/or the SeaWiFS Science Team Meeting. Members of the various teams and panels are identified with their team names(s) shown in slanted type face.

Mark Abbott
Oregon State University
College of Oceanic and Atmospheric Sciences
Corvallis, OR 97331-5509
USA
Voice: 541-737-4045
Fax: 541-737-2064
Net: mark@oce.orst.edu

Steven Ackleson
SeaWiFS Science Team
Ocean Optics Program, Code 3233
Office of Naval Research
800 N. Quincy Street
Arlington, VA 22217-1906
USA
Voice: 703-696-4732
Fax: 703-696-4884
Net: ackless@onr.navy.mil

Robert Arnnone
SeaWiFS Science Team
Naval Research Laboratory
Mail Code 7243
Multispectral Sensing Section
Stennis Space Center, MS 35929-5004
USA
Voice: 601-688-5268
Fax: 601-688-4149
Net: arnnone@nrlssc.navy.mil

Kevin Arrigo
SeaWiFS Science Team
NASA/GSFC/Code 971
Greenbelt, MD 20771-0001
USA
Voice: 301-286-9634
Fax: 301-286-0240
Net: kevin@shark.gsfc.nasa.gov

Karen Baith
SeaWiFS Project
SAIC General Sciences Corporation
NASA/GSFC/Code 970.2
Greenbelt, MD 20771-0001
USA
Voice: 301-286-4759
Fax: 301-286-1775
Net: settle@shark.gsfc.nasa.gov

William Balch
Bigelow Laboratory
P.O. Box 475, McKown Point
West Boothbay Harbor, ME 04575-9999
USA
Voice: 207-633-9600
Fax: 207-633-9641
Net: bbalch@bigelow.org

James Acker
Goddard DAAC
Raytheon STX
NASA/GSFC/Code 902.2
Greenbelt, MD 20771-0001
USA
Voice: 301-614-5435
Fax: 301-614-5268
Net: acker@daac.gsfc.nasa.gov

Susan Banahan
NOAA Coastal Ocean Program
1315 East–West Highway
Room 9608
Silver Spring, MD 20910-3282
USA
Voice: 301-713-3338 ext. 115
Fax: 301-713-4044
Net: sbanahan@cop.noaa.gov
E.R. Firestone and S.B. Hooker

Robert Barnes
SAIC General Sciences Corporation
NASA/GSFC/Code 970.2
Greenbelt, MD 20771–0001
USA
Voice: 301–286–0501
Fax: 301–286–1775
Net: rbarnes@calval.gsfc.nasa.gov

William Barnes
NASA/GSFC/Code 970
Greenbelt, MD 20771–0001
USA
Voice: 301–286–8670
Fax: 301–286–1761
Net: wbarnes@neptune.gsfc.nasa.gov

Michael Behrenfeld
BNL/OAS Division
Bldg. 318
Upton, NY 11973–5000
USA
Voice: 516–344–3069
Fax: 516–344–3246
Net: mb@warrior.das.bnl.gov

Juli Berwald
Univ. of Southern California
University Park
Dept. of Biological Sciences
Los Angeles, CA 90089–0373
USA
Voice: 213–740–5813
Fax: 213–740–8123
Net: berwald@scf.usc.edu

Robert Bidigare
Univ. of Hawaii
Manoa Department of Oceanography
1000 Pope Road
Honolulu, HI 96822–2336
USA
Voice: 808–936–6567
Fax: 808–936–9516
Net: bidigare@iniki.soest.hawaii.edu

James Bisagni
Univ. of Massachusetts
Dartmouth/CMST
285 Old Westport Road
Dartmouth, MA 02747–2300
USA
Voice: 508–999–8359
Fax: 508–999–8197
Net: bisagni@fish1.gso.uri.edu

James Bishop
Columbia University
Lamont Doherty Geological Observatory
Armstrong Hall
2880 Broadway
New York, NY 10025–7886
USA
Voice: 212–678–5620
Fax: 212–678–5622
Net: cojkb@io.giss.nasa.gov

Paul Bissett
SeaWiFS Science Team
Code 7212
Naval Research Laboratory
4555 Overlook Avenue
Washington, DC 20375–5351
USA
Voice: 202–767–8278
Fax: 202–404–8894
Net: bissett@rsd.nrl.navy.mil

John Brock
NOAA Coastal Services Center
2234 South Hobson Avenue
Charleston Naval Base
Charleston, SC 29405–2413
USA
Voice: 803–974–6239
Fax: 803–974–6224
Net: jbrock@esc.noaa.gov

Christopher Brown
SeaWiFS Science Team
NOAA/NESDIS E/RA3
NSC Room 105
Washington, DC 20233–0001
USA
Voice: 301–763–8102
Fax: 301–763–8020
Net: chrisb@orbit.nesdis.noaa.gov

Robert Caffrey
SIMBIOS Project
NASA/GSFC/Code 970.2
Greenbelt, MD 20771–0001
USA
Voice: 301–286–0846
Fax: 301–286–1775
Net: bcaffrey@seawifs.gsfc.nasa.gov

Janet Campbell
SeaWiFS Science Team
UNH/OPAL/EOS
142 Morse Hall
39 College Road
Durham, NH 03824–2524
USA
Voice: 603–862–1070
Fax: 603–862–0188
Net: campbell@kelvin.unh.edu

Kendall Carder
MODIS Science Team
Univ. of South Florida
Dept. of Marine Science
140 Seventh Avenue, South
St. Petersburg, FL 33701–5016
USA
Voice: 813–553–3952
Fax: 813–553–1148
Net: kcarder@monty.marine.usf.edu

Mary-Elena Carr
SeaWiFS Science Team
MS 300–323
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, CA 91109–8099
USA
Voice: 818–354–5097
Fax: 818–393–6720
Net: mec@pacific.jpl.nasa.gov
SeaWiFS Prelaunch Technical Report Series Final Cumulative Index

Fransisco Chavez
MBARI
P.O. Box 628
7700 Sandholdt Road
Moss Landing, CA 95039–0628
USA
Voice: 408-775–1709
Fax: 408-775–1645
Net: chfl@mbari.org

James Christian
Univ. Space Research Association
NASA/GSFC/Code 970.2
Greenbelt, MD 20771–0001
USA
Voice: 301–286-9011
Fax: 301–286-1775
Net: jrc@bluefin.gsfc.nasa.gov

Mary Cleave
SeaWiFS Project
NASA/GSFC/Code 970.2
Greenbelt, MD 20771–0001
USA
Voice: 301–286-1404
Fax: 301–286-1775
Net: mary@seawifs.gsfc.nasa.gov

Paula Coble
SeaWiFS Science Team
Department of Marine Science
Univ. of South Florida
140 Seventh Avenue, South
St. Petersburg, FL 33701–5016
USA
Voice: 813-553–1631
Fax: 813-553–1189
Net: pcoble@marine.usf.edu

Glenn Cota
SeaWiFS Science Team
Center for Coastal Physical Oceanography
Old Dominion University
768 West 52nd Street
Norfolk, VA 23529–2026
USA
Voice: 804–683–5835
Fax: 804–683–5550
Net: cota@ccpo.odu.edu

Arthur Cracknell
SeaWiFS Science Team
Univ. of Dundee
Applied Physics and Electrical and Mechanical Engineering
Perth Road
Dundee, Scotland DD1 4HN
UNITED KINGDOM

Michael Darzi
SeaWiFS Project
SAIC General Sciences Corporation
NASA/GSFC/Code 970.2
Greenbelt, MD 20771–0001
USA
Voice: 301–286–9150
Fax: 301–286–1775
Net: darzi@calval.gsfc.nasa.gov

Curtiss Davis
SeaWiFS Science Team
Naval Research Laboratory
Code 7212
4555 Overlook Avenue, SW
Washington, DC 20357–5320
USA
Voice: 202–767–9296
Fax: 202–404–8894
Net: davis@rsd.nrl.navy.mil

Pierre-Yves Deschamps
Université de Lille1
Laboratoire d’Optique Atmosphérique
F–59655 Villeneuve d’Ascq
FRANCE
Fax: 33–3–20–43–43–42
Net: pyd@loa.univ.lille1.fr

Tom Dickey
Univ. of California at Santa Barbara
ICESS and Dept. of Geography
Santa Barbara, CA 93106–3060
USA
Voice: 805–893–7354
Fax: 805–893–2578
Net: tommy@icess.ucsb.edu

Gene Eplee
SeaWiFS Project
SAIC General Sciences Corporation
NASA/GSFC/Code 970.2
Greenbelt, MD 20771–0001
USA
Voice: 301–286–0953
Fax: 301–286–1775
Net: eplee@calval.gsfc.nasa.gov

Wayne Esaias
SeaWiFS Science Team
NASA/GSFC/Code 971
MODIS Science Team
Greenbelt, MD 20771–0001
USA
Voice: 301–286–5465
Fax: 301–286–0240
Net: wayne@petrel.gsfc.nasa.gov

Robert Evans
MODIS Science Team
MPO/RSMAS/Univ. of Miami
4600 Rickenbacker Causeway
Miami, FL 33149–1098
USA
Voice: 305–364–4064
Fax: 305–361–4799
Net: bob@rsmas.miami.edu

Paul Falkowski
SeaWiFS Science Team
BNL/OAS Division
Bldg. 318
Upton, NY 11973–5000
USA
Voice: 516–344–2861
Fax: 516–344–3246
Net: falkowski@bnl.gov
SeaWiFS Prelaunch Technical Report Series Final Cumulative Index

Robert Green
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, CA 95039-0628
USA
Voice: 818–354–913
Fax: 818–354–4406
Net: rogh@gomez.jpl.nasa.gov

Watson Gregg
SeaWiFS Science Team
NASA/GSFC/Code 971
Greenbelt, MD 20771–0001
USA
Voice: 301–286–3464
Fax: 301–286–0240
Net: gregg@smoc1.gsfc.nasa.gov

Marilna Gégoire
GHER University of Liege
BS Saxt-tiilman
400 Liege
BELGIUM
Voice: 32-4-43-66-33-54
Fax: 32–4–36–23–55
Net: mggregore@plug.ac.bc

David Halpern
SeaWiFS Science Team
Jet Propulsion Laboratory
MS 300–323
4800 Oak Grove Drive
Pasadena, CA 91109–8099
USA
Voice: 818–354–5327
Fax: 818–393–6720
Net: halpern@pacific.jpl.nasa.gov

Lawrence Harding
SeaWiFS Science Team
Univ. of Maryland System
Horn Point Environmental Laboratory
P.O. Box 775
Center for Environmental and Estuarine Studies
Cambridge, MD 21613–0775
USA
Voice: 410–221–8297
Fax: 410–221–8990
Net: larry@kestrel.umd.edu

Steven Hawes
Univ. of South Florida
Dept. of Marine Science
140 Seventh Avenue, South
St. Petersburg, FL 33701–5016
USA

Eileen Hofmann
SeaWiFS Science Team
Old Dominion University
Center for Coastal Physical Oceanography
Crittenton Hall
768 West 52nd Street
Norfolk, VA 23529–2026
USA
Voice: 757–683–5334
Fax: 757–683–5550
Net: hofmann@ccpo.odu.edu

† Address as of the date of the SeaBAM Workshop

Stanford Hooker
SeaWiFS Project
NASA/GSFC/Code 970.2
Greenbelt, MD 20771–0001
USA
Voice: 301–286–9503
Fax: 301–286–1775
Net: stan@ardbeg.gsfc.nasa.gov

James Irish
SeaWiFS Science Team
Woods Hole Oceanographic Institution
Dept. of Applied Ocean Physics and Engineering
Mail Stop 17
86 Water Street
Woods Hole, MA 02543–1052
USA
Voice: 508–289–2732
Fax: 508–457–2195
Net: jirish@whoi.edu

Alice Isaacman
SeaWiFS Project
SAIC General Sciences Corporation
NASA/GSFC/Code 970.2
Greenbelt, MD 20771–0001
USA
Voice: 301–286–7108
Fax: 301–286–1775
Net: alice@akumal.gsfc.nasa.gov

Rodolfo Iturriaga
SeaWiFS Science Team
USC, University Park
Hancock Institute for Marine Studies
Los Angeles, CA 90089–0371
USA
Voice: 213–740–5769
Fax: 213–740–8123
Net: iturriag@mizar.usc.edu

Mati Kahr
Scripps Institution of Oceanography
2208 Sverdrup Hall
La Jolla, CA 92038–0218
USA
Voice: 619–534–8947
Fax: 619–534–997
Net: mati@spode.ucsd.edu

Daniel Kamykowski
SeaWiFS Science Team
North Carolina State University
Dept. of Marine, Earth, and Atmospheric Science
Jordan Hall, Room 1125
P.O. Box 8208
Raleigh, NC 27695–0001
USA
Voice: 919–515–7894
Fax: 919–515–7802
Net: dan_kamykowski@ncsu.edu

Lakshmi Kantha
SeaWiFS Science Team
Univ. of Colorado, Boulder
Dept. of Aerospace Engineering Sciences
Campus Box 431, CCAR
Boulder, CO 80309–0431
USA
Voice: 303–492–3014
Fax: 303–492–2825
Net: kantha@colorado.edu
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# Glossary

## A
- **A-band** Absorption Band
- **A/D** Analog-to-Digital (also written as AD)
- **A&M** (Texas) Agriculture and Mechanics (University)
- **AC** Alternating Current
- **ACC** Antarctic Circumpolar Current
- **ACRIM** Active Cavity Radiometer Irradiance Monitor
- **ACS** Attitude Control System
- **ADC** Analog-to-Digital Converter
- **ADCP** Acoustic Doppler Current Profiler
- **ADEOS** Advanced Earth Observation Satellite (Japan)
- **AE** Ångström Exponent
- **AIBOP** Automated and Interactive Bio-Optical Processing
- **ALSCAT** ALPHA and Scattering Meter [Note: the symbol \( \alpha \) corresponds to \( c(\lambda) \), the beam attenuation coefficient, in present usage.]
- **AM-1** Not an acronym, used to designate the morning platform of EOS.
- **AMC** Angular Momentum Compensation
- **AMT** Atlantic Meridional Transect
- **AMT-1** The First AMT Cruise
- **ANSI** American National Standards Institute
- **AOCl** Airborne Ocean Color Imager
- **AOL** Airborne Oceanographic Lidar
- **AOP** Apparent Optical Property
- **AOS/LOS** Acquisition of Signal/Loss of Signal
- **APL** Applied Physics Laboratory
- **APT** Automatic Picture Transmission
- **ARGOS** Not an acronym, but the name given to the data collection and location system on the NOAA Operational Satellites.
- **ARI** Accelerated Research Initiative
- **ARS** Airborne Remote Sensing
- **ASCII** American Standard Code for Information Interchange
- **ASI** Italian Space Agency
- **ASR** Absolute Spectral Response
- **AT** Along-Track
- **ATBD** Algorithm Theoretical Basis Document
- **ATLAS** Auto-Tracking Land and Atmosphere Sensor
- **ATM** Airborne Thematic Mapper
- **ATSR** Along-Track Scanning Radiometer
- **AU** Astronomical Unit
- **AVHRR** Advanced Very High Resolution Radiometer
- **AVIRIS** Advanced Visible and Infrared Imaging Spectrometer
- **AXBT** Airborne Expendable Bathythermograph

## B
- **BAOPW-1** First Bio-optical Algorithm and Optical Protocols Workshop
- **BAOPW-2** Second Bio-optical Algorithm and Optical Protocols Workshop
- **BAOPW-3** Third Bio-optical Algorithm and Optical Protocols Workshop
- **BAOPW-4** Fourth Bio-optical Algorithm and Optical Protocols Workshop
- **BAOPW-5** Fifth Bio-optical Algorithm and Optical Protocols Workshop
- **BAOPW-6** Sixth Bio-optical Algorithm and Optical Protocols Workshop
- **BAOPW-7** Seventh Bio-optical Algorithm and Optical Protocols Workshop
- **BAS** British Antarctic Survey
- **BATS** Bermuda Atlantic Time-Series Station
- **BBOP** Bermuda Bio-Optical Profiler
- **BBR** Band-to-Band Registration
- **BCRS** Dutch Remote Sensing Board
- **BEP** Benguela Ecology Programme
- **BER** Bit Error Rate
- **BIOS** Biophysical Interactions and Ocean Structure (NERC research program)
- **BMFT** Minister for Research and Technology (Germany)
- **BNL** Brookhaven National Laboratory
- **BNSC** British National Space Center
- **BOAWG** Bio-Optical Algorithm Working Group
- **BODC** British Oceanic Data Center
- **BOFS** British Ocean Flux Study
- **BOMS** Bio-Optical Moored Systems
- **BOFS** Bio-Optical Profiling System
- **bps** bits per inch
- **BPM** Bedford Production Model
- **BRDF** Bidirectional Reflectance Distribution Function
- **BSI** Biospherical Instruments, Incorporated
- **BSIXR** BSI's Transfer Radiometer
- **BSM** Bio-Optical Synthetic Model
- **BTD** Bright Target Detection
- **BTR** Bright Target Recovery
- **BUV** Backscatter Ultraviolet Spectrometer
- **BWI** Baltimore-Washington International (airport)
- **C/N** Carbon-to-Nitrogen (ratio)
- **CalCOFI** California Cooperative Fisheries Institute
- **Cal/Val** Calibration and Validation
- **CALVAL** Calibration and Validation
- **Case-1** Water whose reflectance is determined solely by absorption.
- **Case-2** Water whose reflectance is significantly influenced by scattering.
- **CASI** Compact Airborne Spectrographic Imager
- **CCD** Charge Coupled Device
- **CCFO** Center for Coastal Physical Oceanography (Old Dominion University)
- **CDF** (NASA) Common Data Format
- **CDOM** Colored Dissolved Organic Material
- **CD-ROM** Compact Disk-Read Only Memory
- **CDR** Critical Design Review
- **CEC** Commission of the European Communities
- **CENR** Committee on Environment and Natural Resources
- **CHN** Carbon, Hydrogen, and Nitrogen
- **CHORS** Center for Hydro-Optics and Remote Sensing (San Diego State University)
- **C.I.** confidence interval
- **CICESE** Centro de Investigación Científica y de Educación Superior de Ensenada (Mexico)
- **CLIMEL** Not an acronym, but the name of a sun photometer manufacturer.
- **CIRES** Cooperative Institute for Research in Environmental Sciences
SeaWiFS Prelaunch Technical Report Series Final Cumulative Index

COADS Comprehensive Ocean–Atmosphere Data Set
COARE Coupled Ocean–Atmosphere Response Experiment
COAST Coastal Ocean Atmosphere Data Set
COOP Coastal Ocean Optics Program
COTS Commercial Off-The-Shelf (software)
CPR Continuous Plankton Recorder
cpu Central Processing Unit
CRM Contrast Reduction Meter
CRN Italian Research Council
CRSEO Center for Remote Sensing and Environmental Optics (University of California at Santa Barbara)
CRT Calibrated Radiance Tapes or Cathode Ray Tube (depending on usage).
CRTT CZCS Radiation and Temperature Tape
CSIRO Commonwealth Scientific and Industrial Research Organization (of Australia)
CSC Computer Sciences Corporation
CSL Computer Systems Laboratory
CT Cross-Track
CTD Conductivity, Temperature, and Depth
ev. coefficient of variation
cvT Calibration and Validation Team
CW Continuous Wave
CWL Center Wavelength
CWR Clear Water Radiance
CXR CHORS Transfer Radiometer
CZCS Coastal Zone Color Scanner

DAAC Distributed Active Archive Center
DAO Data Assimilation Office
DARR Data Analysis Round-Robin
DARR-94 First Data Analysis Round-Robin
DARR-2 Second Data Analysis Round-Robin
DAT Digital Audio Tape
DC Direct Current or Digital Count (depending on usage).
DCF Data Capture Facility
DCM Deep Chlorophyll Maximum
DCOM Dissolved Colored Organic Material
DCP Data Collection Platform
DEC Digital Equipment Corporation
DIM Depth Integrated Model
DIN Dissolved Inorganic Nitrogen
DPF Dissolved Inorganic Phosphate
DIW Distilled Water
DML Dunstaffnage Marine Laboratory (Scotland)
DMS dimethyl sulfide
DOC Dissolved Organic Carbon
DoD Department of Defense
DOE Department of Energy
DOM Dissolved Organic Matter
DON Dissolved Organic Nitrogen
dos Disk Operating System
dsp Not an acronym, but an image display and analysis package developed at RSMAS—University of Miami.
DU Dobson Units
DUT Device Under Test
dxw Not an acronym, but a lamp designator.

— E —
E&P Eppley and Peterson (compilation)
E-mail Electronic Mail
EAFB Edwards Air Force Base
EC Excluding CHORS (data)
ECF Earth-Centered Earth-Fixed
ECMWF European Centre for Medium Range Weather Forecasts
ECS EOSDIS Core System
ECT Equator Crossing Time
EDMED European Directory of Marine and Environmental Data
EDT Eastern Daylight Time
EEZ Exclusive Economic Zone
EG&G Not an acronym, but a shortened form of EG&G-Gamma Scientific (now known simply as Gamma Scientific).
ENSO El Niño Southern Oscillation
ENVISAT Environmental Satellite
EOF Empirical Orthogonal Function
EOS Earth Observing System
EOSAT Earth Observation Satellite Company
EOSDIS EOS Data Information System
EPA Environmental Protection Agency
EP-TOMS Earth Probe–Total Ozone Mapping Spectroradiometer
EqPac Equatorial Pacific (Process Study)
ER-2 Earth Resources-2
ERBE Earth Radiation Budget Experiment
ERBS Earth Radiation Budget Sensor
ERDAS Not an acronym, but a trade name for an image analysis system
ÉRL (NOAA) Environmental Research Laboratories
ERS Earth Resources Satellite
ERS-1 European Remote Sensing Satellite
ESA European Space Agency
EST Eastern Standard Time
EURASEP European Association of Scientists in Environmental Pollution
EUVE Extreme Ultraviolet Explorer

— F —
FASCAL Fast Calibration (Facility)
FDII Fiber Data Distribution Interface
FEL Not an acronym, but a lamp designator.
FGGE First GARP Global Experiment
FLUPAC (Geochemical) Fluxes in the Pacific (Ocean)
FNC Fleet Numerical Oceanography Center
FORTRAN Formula Translation (computer language)
FOV Field-Of-View
FPA Focal Point Assembly
FRD Federal Republic of Deutschland (Germany)
FRRF Fast Repetition Rate Fluorometer
ftp File Transfer Protocol
FWHM Full-Width at Half-Maximum
FY Fiscal Year

— G —
GAC Global Area Coverage, coarse resolution satellite data with a nominal ground resolution at nadir of approximately 4 km.
GARP Global Atmospheric Research Program
GASM General Angle Scattering Meter
\textbf{gcc} GNU C Compiler
\textbf{GF/F} Not an acronym, but a specific type of glass fiber filter manufactured by Whatman.
\textbf{GIN} Greenland, Iceland, and Norwegian Seas
\textbf{GIS} Geographical Information System
\textbf{GISS} Goddard Institute for Space Studies
\textbf{GLI} Global Imager
\textbf{GLOBEC} Global Ocean Ecosystems dynamics
\textbf{GMT} Greenwich Mean Time
\textbf{GNU} GNU’s Not UNIX
\textbf{GOES} Geostationary Operational Environmental Satellite
\textbf{GOFS} Global Ocean Flux Study
\textbf{GOMEX} Gulf of Mexico Experiment
\textbf{GP} Global Processing (algorithm)
\textbf{GPM} General Perturbations Model
\textbf{GPS} Global Positioning System
\textbf{GRGS} Groupe de Recherche de Geodesie Spatial
\textbf{GRIB} Gridded Binary
\textbf{GRIDTOMS} Gridded TOMS (data set)
\textbf{GSFC} Goddard Space Flight Center
\textbf{GSO} Graduate School of Oceanography (University of Rhode Island)
\textbf{G/T} System Gain/Total System Noise Temperature
\textbf{GUI} Graphical User Interface
\textbf{HAPEX} Hydrological Atmospheric Pilot Experiment
\textbf{HDDT} High Density Data Tape
\textbf{HDF} Hierarchical Data Format
\textbf{HEI} Hoffman Engineering, Incorporated
\textbf{HeNe} Helium-Neon
\textbf{HHCIM} Hand-Held Contrast Reduction Meter
\textbf{HIRIS} High Resolution Imaging Spectrometer
\textbf{HN} (Polaroid) Not an acronym, but a linear sheet polarizer used to check the polarization sensitivity of SeaWiFS bands 7 and 8.
\textbf{HOTS} Hawaiian Optical Time Series
\textbf{HP} Hewlett Packard
\textbf{HPGL} Hewlett Packard Graphics Language
\textbf{HPLC} High Performance Liquid Chromatography
\textbf{HQ} Headquarters
\textbf{HR} (Polaroid) Not an acronym, but a linear sheet polarizer used to check the polarization sensitivity of SeaWiFS bands 1–6.
\textbf{HRPT} High Resolution Picture Transmission
\textbf{HST} Hawaii Standard Time
\textbf{HYDRA} Hydrographic Data Reduction and Analysis
\textbf{I/O} Input/Output
\textbf{IAPSO} International Association for the Physical Sciences of the Ocean
\textbf{LAU} International Astrophysical Union
\textbf{IBM} International Business Machines
\textbf{ICARUS} Instrumentation Characterizing Aerosol Radii Using Sun photometry
\textbf{ICD} Interface Control Document
\textbf{ICES} International Council on Exploration of the Seas
\textbf{ICESS} Institute for Computational Earth System Science (University of California at Santa Barbara)
\textbf{IDL} Interactive Data Language
\textbf{IDS} Integrated Data System
\textbf{IFOV} Instantaneous Field of View
\textbf{IGBP} International Geosphere–Biosphere Programme
\textbf{ILS} Incident Light Sensor
\textbf{IMS} Information Management System
\textbf{IOP} Inherent Optical Property
\textbf{IOSDL} Institute of Oceanographic Sciences, Deacon Laboratory (UK)
\textbf{IP} Internet Protocol
\textbf{IPD} Image Processing Division
\textbf{IR} Infrared
\textbf{IRIX} Not an acronym, but a computer operating system.
\textbf{ISA} Integrating Sphere Accessory
\textbf{ISCCP} International Satellite Cloud Climatology Project
\textbf{ISIC} Integrating Sphere Irradiance Collector
\textbf{ISTP} International Solar Terrestrial Program
\textbf{IUCRM} Inter-Union Commission on Radio Meteorology
\textbf{IUE} International Ultraviolet Explorer
\textbf{J} JAM JYACC Application Manager
\textbf{JARE} Japanese Antarctic Research Expedition
\textbf{JCR} (RRS) James Clark Ross
\textbf{JGOFS} Joint Global Ocean Flux Study
\textbf{JHU} Johns Hopkins University
\textbf{JPL} Jet Propulsion Laboratory
\textbf{JRC} Joint Research Center
\textbf{JYACC} Not an acronym, but the name of the company that makes JAM.
\textbf{K} \textit{KQ} $K_d$ Quality (flag)
\textbf{L} L&N Leeds & Northrup
\textbf{LAN} Local Area Network
\textbf{LANDSAT} Land Resources Satellite
\textbf{LCD} Least Common Denominator (file)
\textbf{LDEO} Lamont–Doherty Earth Observatory (Columbia University)
\textbf{LDGO} Lamont–Doherty Geological Observatory (Columbia University)
\textbf{LDTNLR} Local Dynamic Threshold Nonlinear Raleigh
\textbf{Level 0} Raw data.
\textbf{Level 1} Calibrated radiances.
\textbf{Level 2} Derived products.
\textbf{Level 3} Gridded and averaged derived products.
\textbf{LMCE} \textit{Laboratoire de Modélisation du climat et de l’Environnement} (France)
\textbf{LOC} Local Time
\textbf{LODYC} \textit{Laboratoire d’Océanographie et de Dynamique du climat} (France)
\textbf{LOICZ} Land Ocean Interaction in the Coastal Zone
\textbf{LOIS} Land–Ocean Interaction Study
\textbf{LOMAS} Land Ocean Margins Server
LPCM Laboratoire de Physique et Chimie Marines (France)
LRER Long-Range Ecological Research
LSB Least Significant Bits
LSF Line Spread Function
LUT Look-Up Table

– M –
MAFF Ministry of Agriculture, Fisheries, and Food (UK)
MARAS Marine Radiometric Spectrometer
MAREX Monterey Bay Aquarium Research Institute
MARMAP Marine Resources Monitoring, Assessment, and Prediction
MARS Multispectral Airborne Radiometer System
MASS Mass Multi-Agency Ship-Scheduling for SeaWiFS
MBARI Monterey Bay Aquarium Research Institute
MCMC Markov Chain Monte Carlo
MEM Maximum Entropy Method
MER Marine Environmental Radiometer
MERIS Medium Resolution Imaging Spectrometer
METEOSAT Meteorological Satellite
MF Major Frame
mF Minor Frame
MIPS Millions of Instructions Per Second
MIT Massachusetts Institute of Technology
MIZ Marginal Ice Zone
MLE Maximum Likelihood Estimator
MLML Moss Landing Marine Laboratory (San Jose State University)
MO Magneto-Optical
MOBY Marine Optical Buoy
MOCE Marine Optical Characterization Experiment
MODARCH MODIS Document Archive
MODIS Moderate Resolution Imaging Spectroradiometer
MODIS-N Nadir-viewing MODIS instrument
MODIS-T Tilted MODIS instrument to minimize sun glint
MOS Marine Optical Spectroradiometer
MOU Memorandum of Understanding
MRF Meteorological Research Flight
MSB Most Significant Bits
MS/DOS Microsoft/Disk Operating System (also written as MS-DOS)
MTF Modulation Transfer Function
MTPE Mission to Planet Earth
MVDS Multichannel Visible Detector System
Myr Millions of Years

– N –
NABE North Atlantic Bloom Experiment
NAS National Academy of Science
NASA National Aeronautics and Space Administration
NASCOM NASA Communications
NASDA National Space Development Agency (Japan)
NASIC NASA Aircraft/Satellite Instrument Calibration
NAVSPASUR Naval Space Surface Surveillance
NCAR National Center for Atmospheric Research
NCCOSC Navy Command, Control, and Ocean Surveillance Center
NCDC (NOAA) National Climatic Data Center
NCDS NASA Climate Data System
NCSA National Center for Supercomputing Applications
NCSU North Carolina State University
NDBC National Data Buoy Center
NDVI Normalized Difference Vegetation Index
NEAT Northeast Atlantic
NECC North Equatorial Counter Current
NEEL Noise Equivalent Differential Spectral Radiance
NEAT Noise Equivalent Delta Temperature
NED Noise Equivalent delta Radiance
NER Noise Equivalent Radiance
NERC Natural Environment Research Council (UK)
NESDIS National Environmental Satellite Data Information Service
NESS National Environmental Satellite Service
NET NIMBUS Experiment Team
netCDF (NASA) Network Common Data Format
NFS Network File System
NGDC National Geophysical Data Center
NIMBUS Not an acronym, but a series of NASA experimental weather satellites containing a wide variety of atmosphere, ice, and ocean sensors.
NIR Near-Infrared
NIST National Institute of Standards and Technology
NMC National Meteorological Center
NMFS National Marine Fisheries Service
NOAA National Oceanic and Atmospheric Administration
NOARL Naval Oceanographic and Atmospheric Research Laboratory
NODC National Oceanographic Data Center
NORAD North American Air Defense (Command)
NOPS NIMBUS Observation Processing System
NOS National Ocean Service
NRA NASA Research Announcement
NRD Naval Research and Development
NRIFSF National Research Institute of Far Seas Fisheries (Japan)
NRL Naval Research Laboratory
NRT Near-Real Time
NSCAT NASA Scatterometer
NSF National Science Foundation
NSSDC National Space Science Data Center

– O –
OAM Optically Active Materials
OBP Ocean Biogeochemistry Program
OCDM Ocean Color Data Mission
OCEAN Ocean Colour European Archive Network
OCI Ocean Color Irradiance (sensor)
OCR Ocean Color Radiance (sensor)
OCS Ocean Color Scanner
OCTS Ocean Color and Temperature Sensor (Japan)
ODAS Ocean Data Acquisition System
ODEX Optical Dynamics Experiment
ODU Old Dominion University
OFS Optical Free-Fall Instrument
OI Original Irradiance
OL Optroinics Laboratories
OLIPAC Oligotrophy in the Pacific (Ocean)
OMEX Ocean Marine Exchange
OMP-8 Not an acronym, but a type of marine anti-
biofouling compound.
ONR Office of Naval Research
OPC Optical Plankton Counter
OPPWG Ocean Primary Productivity Working Group
OPT Ozone Processing Team
OrbView-2 Not an acronym, but the name of the satellite
(formerly known as SeaStar) on which the Sea-
WiFS instrument was launched.
ORKA On-line Real-time Knowledge-based Analysis
OS Operating System
OSC Orbital Sciences Corporation
OSFI Optical Surface Floating Instrument
OSA Office of Space Science and Applications
OSU Oregon State University

P Production-Irradiance
PACE Plymouth Atmospheric Correction Experiment
(UK)
PAR Photosynthetically Available Radiation
PC (IBM) Personal Computer
PCASP Passive Cavity Aerosol Spectrometer Probe
(UK)
PDR Preliminary Design Review
PDT Pacific Daylight Time
PFF Programmable Frame Formatter
PGS Product Generation System
PI Principal Investigator
PIKE Phased Illuminated Knife Edge
PlyMBO Dy Plymouth Marine Bio-Optical Data Buoy (UK)
PM-1 Not an acronym, used to designate the after-
noon platform of EOS.
PMEL Pacific Marine Environmental Laboratory
PMI Programmable Multispectral Imager
PML Plymouth Marine Laboratory (UK)
POC Particulate Organic Carbon
POLDER Polarization Detecting Environmental Radiometer
(France) or Polarization and Directional-
ity of the Earth’s Reflectance (depending on
usage).
PON Particulate Organic Nitrogen
PPARR-1 First Primary Productivity Algorithm Round-
Robin (October 1995)
PPARR-2 Second Primary Productivity Algorithm
Round-Robin (August 1997)
PPARR-3 Third Primary Productivity Algorithm Round-
Robin
PPC Photoprotectant Carotenoids
ppm parts per million
PR Photo Research
PRIME Plankton Reactivity in the Marine Environ-
ment (UK)
PRR Profiling Reflectance Radiometer
PRT Platinum Resistance Thermometer
PSC Photosynthetic Carotenoids
PSII Photosystem II
PST Pacific Standard Time
PSU Practical Salinity Units
PTE Polytetrafluoroethylene
PUR Photosynthetically Usable Radiation
PZP Phytoplankton, Zooplankton, and Nutrients

QC Quality Control
QED Quantum Efficient Device
QUBIT Trade name of commercial data logging sys-
tem.

R&A Research and Applications
R&D Research and Development
R/V Research Vessel
RACER Research on Antarctic Coastal Ecosystem Rates
RACS(C) Rivers Basins-Atmosphere-Coast and Estuaries
Study (Coastal)
RAF Royal Air Force (UK)
RC Resistor-Capacitor (circuit)
RDBMS Relational Database Management System
RDF Radio Direction Finder
RDI RD Instruments
RF Radio Frequency
RFP Request for Proposals
RISC Reduced Instruction Set Computer
rms root mean squared
ROSIS Remote Sensing Imaging Spectrometer, also
known as the Reflective Optics System Imaging
Spectrometer (Germany)
ROV Remotely Operated Vehicle
ROW Reverse Osmosis Water
RR Round-Robin
RRS Royal Research Ship
RSADU Remote Sensing Applications Development
Unit
RSMAS Rosenstiel School for Marine and Atmospheric
Sciences (University of Miami)
RSS Remote Sensing Systems (Inc.)
RTM Reversing Thermometer
RTOP Research and Technology Operation Plan

S Spacecraft
S/N Serial Number
SAC Satellite Applications Centre
SARSAT Search and Rescue Satellite
SBE Sea-Bird Electronics
SBRC (Hughes) Santa Barbara Research Center
SBRS (Hughes) Santa Barbara Remote Sensing (new
name for SBRC)
SBUV Solar Backscatter Ultraviolet Radiometer
SBUV-2 Second Solar Backscatter Ultraviolet Radiome-
ter
SCADP SeaWiFS Calibration and Acceptance Data
Package
SCDR SeaWiFS Critical Design Review
SCF Science Computing Facility
SCOR Scientific Committee on Oceanographic Re-
search
SDPS SeaWiFS Data Processing System
SDS Scientific Data Set
SDSU San Diego State University
SDY Sequential Day of the Year
SeaBAM SeaWiFS Bio-Optical Algorithm Mini-workshop
SeaBASS SeaWiFS Bio-Optical Archive and Storage Sys-
tem
SeaDAS SeaWiFS Data Analysis System
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition/Description</th>
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<tbody>
<tr>
<td>SeaOPS</td>
<td>SeaWiFS Optical Profiling System</td>
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<tr>
<td>SEAPAK</td>
<td>Not an acronym, but an image display and analysis package developed at GSFC.</td>
</tr>
<tr>
<td>SeaSCOPE</td>
<td>SeaWiFS Study of Climate, Ocean Productivity, and Environmental Change</td>
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<td>SeaStar</td>
<td>Not an acronym, but the former name of the satellite on which SeaWiFS was launched; now known as OrbView-2.</td>
</tr>
<tr>
<td>SeaWiFS</td>
<td>Sea-viewing Wide Field-of-view Sensor</td>
</tr>
<tr>
<td>SEEP</td>
<td>Shelf Edge Exchange Program</td>
</tr>
<tr>
<td>SEI</td>
<td>SeaWiFS Exploitation Initiative (UK)</td>
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<tr>
<td>SEIBASS</td>
<td>SeaWiFS Exploitation Initiative Bio-Optical Archive and Storage System (UK)</td>
</tr>
<tr>
<td>SES</td>
<td>Shelf Edge Study</td>
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<tr>
<td>SFP</td>
<td>Size-Fractionated Pigments</td>
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<td>SGI</td>
<td>Silicon Graphics, Incorporated</td>
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<tr>
<td>SHP</td>
<td>Shaft Horsepower</td>
</tr>
<tr>
<td>SI</td>
<td>International System of Units or <em>Système International d’Unités</em></td>
</tr>
<tr>
<td>SIG</td>
<td>Special Interest Group</td>
</tr>
<tr>
<td>SIMBIOS</td>
<td>Sensor Intercomparison and Merger for Biological and Interdisciplinary Ocean Studies</td>
</tr>
<tr>
<td>SIO</td>
<td>Scripps Institution of Oceanography</td>
</tr>
<tr>
<td>SIO/MPL</td>
<td>Scripps Institution of Oceanography/Marine Physical Laboratory</td>
</tr>
<tr>
<td>SIRREX</td>
<td>SeaWiFS Intercalibration Round-Robin Experiment</td>
</tr>
<tr>
<td>SIRREX-1</td>
<td>The First SIRREX (July 1992)</td>
</tr>
<tr>
<td>SIRREX-2</td>
<td>The Second SIRREX (June 1993)</td>
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<tr>
<td>SIRREX-3</td>
<td>The Third SIRREX (September 1994)</td>
</tr>
<tr>
<td>SIRREX-4</td>
<td>The Fourth SIRREX (May 1995)</td>
</tr>
<tr>
<td>SIRREX-5</td>
<td>The Fifth SIRREX (July 1996)</td>
</tr>
<tr>
<td>SIS</td>
<td>Spherical Integrating Source or <em>Sensoren-Instrumente Systeme</em> (depending on usage.)</td>
</tr>
<tr>
<td>SISSR</td>
<td>Submerged <em>In Situ</em> Spectral Radiometer</td>
</tr>
<tr>
<td>SJU</td>
<td>San Jose State University</td>
</tr>
<tr>
<td>SMM</td>
<td>Solar Maximum Mission</td>
</tr>
<tr>
<td>SNR</td>
<td>Signal-to-Noise Ratio</td>
</tr>
<tr>
<td>SO</td>
<td>Southern Ocean (algorithm)</td>
</tr>
<tr>
<td>SOC</td>
<td>Southampton Oceanography Center (UK) or Simulation Operations Center (depending on usage)</td>
</tr>
<tr>
<td>SOGS</td>
<td>SeaStar Operations Ground Subsystem</td>
</tr>
<tr>
<td>SOH</td>
<td>State of Health</td>
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<tr>
<td>SOW</td>
<td>Statement of Work</td>
</tr>
<tr>
<td>SPIE</td>
<td>Society of Photo-Optical Instrumentation Engineers</td>
</tr>
<tr>
<td>SPM</td>
<td>Suspended Particulate Material or Special Particulate Material or Special Particulate Model (depending on usage).</td>
</tr>
<tr>
<td>SPMPR</td>
<td>SeaWiFS Post-Modification Preship Review</td>
</tr>
<tr>
<td>SPO</td>
<td>SeaWiFS Project Office</td>
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<tr>
<td>SPOT</td>
<td>Satellite <em>Pour l’Observation de la Terre</em> (France)</td>
</tr>
<tr>
<td>SPR</td>
<td>SeaWiFS Preship Review</td>
</tr>
<tr>
<td>SPSWG</td>
<td>SeaWiFS Prelaunch Science Working Group</td>
</tr>
<tr>
<td>SQL</td>
<td>Sequential Query Language</td>
</tr>
<tr>
<td>SRC</td>
<td>Satellite Receiving Station (NERC)</td>
</tr>
<tr>
<td>SRT</td>
<td>Sigma Research Technology, Incorporated</td>
</tr>
<tr>
<td>SSSLF</td>
<td>SeaWiFS Stray Light Signal Paths</td>
</tr>
<tr>
<td>SSMM</td>
<td>Special Sensor for Microwave/Imaging</td>
</tr>
<tr>
<td>SST</td>
<td>Sea Surface Temperature or SeaWiFS Science Team (depending on usage)</td>
</tr>
<tr>
<td>ST</td>
<td>Science Team</td>
</tr>
<tr>
<td>Sterna</td>
<td>Not an acronym, but a BOFS Antarctic research project.</td>
</tr>
<tr>
<td>STM</td>
<td>Science Team Member</td>
</tr>
<tr>
<td>SUDS</td>
<td>Submersible Upwelling and Downwelling Spectrometer</td>
</tr>
<tr>
<td>SUN</td>
<td>Sun Microsystems</td>
</tr>
<tr>
<td>SWAP</td>
<td><em>Synder Wattenmeier Austausch-Prozesse</em></td>
</tr>
<tr>
<td>SWG</td>
<td>Science Working Group</td>
</tr>
<tr>
<td>SWIR</td>
<td>Shortwave Infrared</td>
</tr>
<tr>
<td>SWL</td>
<td>Safe Working Load</td>
</tr>
<tr>
<td>SXR</td>
<td>SeaWiFS Transfer Radiometer</td>
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<tr>
<td>S--T--</td>
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<tr>
<td>T-S</td>
<td>Temperature-Salinity</td>
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<tr>
<td>TAE</td>
<td>Transportable Applications Executive</td>
</tr>
<tr>
<td>TAO</td>
<td>Thermal Array for the Ocean or more recently, Tropical Atmosphere-Ocean</td>
</tr>
<tr>
<td>TBD</td>
<td>To Be Determined</td>
</tr>
<tr>
<td>TBUS</td>
<td>Not an acronym, but a NOAA orbital element.</td>
</tr>
<tr>
<td>TDI</td>
<td>Time-Delay and Integration</td>
</tr>
<tr>
<td>TDRSS</td>
<td>Tracking and Data Relay Satellite System</td>
</tr>
<tr>
<td>TIM</td>
<td>Time Integrated Model</td>
</tr>
<tr>
<td>TIROS</td>
<td>Television Infrared Observation Satellite</td>
</tr>
<tr>
<td>TLCP</td>
<td>Team Leader Computing Facility</td>
</tr>
<tr>
<td>TLM</td>
<td>Telemetry</td>
</tr>
<tr>
<td>TM</td>
<td>Technical Memorandum</td>
</tr>
<tr>
<td>TOA</td>
<td>Top of the Atmosphere</td>
</tr>
<tr>
<td>TOGA</td>
<td>Tropical Ocean Global Atmosphere program</td>
</tr>
<tr>
<td>TOMS</td>
<td>Total Ozone Mapping Spectrometer</td>
</tr>
<tr>
<td>TOPEX</td>
<td>Topography Experiment</td>
</tr>
<tr>
<td>TOVS</td>
<td>TIROS Operational Vertical Sounder</td>
</tr>
<tr>
<td>TRMM</td>
<td>Tropical Rainfall Measuring Mission</td>
</tr>
<tr>
<td>TSM</td>
<td>Total Suspended Material</td>
</tr>
<tr>
<td>TV</td>
<td>Thermal Vacuum</td>
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<td>U--</td>
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<tr>
<td>UA</td>
<td>University of Arizona</td>
</tr>
<tr>
<td>UARS</td>
<td>Upper Atmosphere Research Satellite</td>
</tr>
<tr>
<td>UAXR</td>
<td>University of Arizona’s Transfer Radiometer</td>
</tr>
<tr>
<td>UCAR</td>
<td>University Consortium for Atmospheric Research</td>
</tr>
<tr>
<td>UCMBO</td>
<td>University of California Marine Bio-Optics</td>
</tr>
<tr>
<td>UCSB</td>
<td>University of California at Santa Barbara</td>
</tr>
<tr>
<td>UCSD</td>
<td>University of California at San Diego</td>
</tr>
<tr>
<td>UH</td>
<td>University of Hawaii</td>
</tr>
<tr>
<td>UIC</td>
<td>Underway Instrumentation and Control (room)</td>
</tr>
<tr>
<td>UICBM</td>
<td>University of Miami</td>
</tr>
<tr>
<td>UNESCO</td>
<td>United Nations Educational, Scientific, and Cultural Organization</td>
</tr>
<tr>
<td>UNIX</td>
<td>Not an acronym, but a computer operating system</td>
</tr>
<tr>
<td>UoP</td>
<td>University of Plymouth (UK)</td>
</tr>
<tr>
<td>UOR</td>
<td>Undulating Oceanographic Recorder</td>
</tr>
<tr>
<td>UPS</td>
<td>Uninterruptable Power System</td>
</tr>
<tr>
<td>URI</td>
<td>University of Rhode Island</td>
</tr>
<tr>
<td>URL</td>
<td>Universal Resource Locator</td>
</tr>
<tr>
<td>USC</td>
<td>University of Southern California</td>
</tr>
<tr>
<td>USDA</td>
<td>United States Department of Agriculture</td>
</tr>
<tr>
<td>USF</td>
<td>University of South Florida</td>
</tr>
<tr>
<td>UTC</td>
<td>Coordinated Universal Time (definition reflects actual usage instead of following the letters of the acronym)</td>
</tr>
</tbody>
</table>
E.R. Firestone and S.B. Hooker

UTM Universal Transverse Mercator (projection)
UV Ultraviolet
UVB Ultraviolet-B
UWG User Working Group

– V –
V0 Version 0
V1 Version 1
VAX Virtual Address Extension
VCS Version Control Software
VDC Volts Direct Current
VGPM Vertically Generalized Production Model
VHF Very High Frequency
VHRR Very High Resolution Radiometer
VI Virtual Instrument
VISLAB Visibility Laboratory (Scripps Institution of Oceanography)
VISNIR Visible and Near Infrared
VMS Virtual Memory System
VSF Volume Scattering Function

– W –
WFF Wallops Flight Facility
WHOI Woods Hole Oceanographic Institute
WIM Wavelength Integrated Model
WMO World Meteorological Organization
WOCE World Ocean Circulation Experiment
WORM Write-Once Read-Many (times)
WP2 Not an acronym, but a standard net mesh size (200 μm).
WRM Wavelength Resolved Model
WVS World Vector Shoreline

– X –
XBT Expendable Bathythermograph
XDR External Data Representation

– Y, Z –
YBOM Yamato Bank Optical Mooring
SYMBOLS

A

- A -

\( a \) The semi-major axis of the Earth’s orbit; a formulation constant; a constant equal to 0.983; a constant equal to \(-20/\tanh(2)\); an exponential value in the expression relating the radius of scattered light to wavelength; or a regression coefficient (depending on usage).

\( \bar{a} \) The measured value of \( a \).

\( a’ \) The absorption at the Raman excitation wavelength.

\( a_\text{abs} \) The specific absorption of chlorophylls \( a, b \), and \( c \).

\( a_b \) The specific absorption of chlorophyll \( b \).

\( a_c \) The specific absorption of chlorophyll \( c \).

\( a_w(\lambda) \) Absorption coefficient due to substances other than water.

\( a_f(z, \lambda) = a_p(\lambda) - a(z, \lambda) \).

\( a_g \) The DOM/detritus specific absorbance.

\( a_g(\lambda) \) Gelbstoff spectral absorption coefficient.

\( a_i \) Cubic polynomial coefficients.

\( a_l(\lambda, T) \) Initial estimate of the apparent absorption coefficient; used for determining the apparent absorption coefficient for substances other than water.

\( a_N \) Normalized absorption coefficient.

\( a_o \) Oxygen absorption coefficient.

\( a_{oa} \) Coefficient for oxygen absorption.

\( a_{oa} \) Coefficient for ozone absorption.

\( a_{ps}(\lambda) \) Particulate spectral absorption coefficient.

\( a_{pp} \) The specific absorption of PPC.

\( a_{ps}(\lambda) \) Photosynthetically active pigment spectral absorption coefficient.

\( a_{ps} \) The specific absorption of PSC.

\( a_{sp} \) The sediment specific absorption coefficient.

\( a_{sp}(\lambda) \) Tripton spectral absorption coefficient.

\( a_{sp}(\lambda) \) The absorption coefficient for pure water.

\( a_{sw} \) Coefficient for water vapor absorption.

\( a_{sw} \) The DOM/chlorophyll combined absorbance.

\( a_{ps}(\lambda) \) Phytoplankton pigment spectral absorption coefficient.

\( a_{ps}(\lambda) \) Phytoplankton pigment spectral absorption coefficient determined in methanol extract.

\( A(k) \) Absorptivity.

\( A(k) \) Coefficient for calculating \( b_s(\lambda) \).

\( A(\lambda) \) AC-9 instrument calibration factor for absorption.

\( A(\lambda) \) AC-9 instrument calibration factor for beam attenuation.

\( A_0 \) Coefficient for the linear term in the scan modulation correction equation.

\( A_d \) The detector aperture.

\( A_d(z, \lambda) \) Linear regression intercepts at the center of a fitted depth interval for \( \ln \) of \( A_d(z, \lambda) \) (defined in Vol. 26).

\( A_f \) The foam reflectance.

\( A_i \) The intersection area, or an arbitrary constant (depending on usage).

\( A_i’ \) An arbitrary constant.

\( A_j \) An arbitrary constant.

\( A_j’ \) An arbitrary constant.

\( A_k(\lambda) \) Linear regression intercepts at the center of a fitted depth interval for \( \ln \) of \( A_k(\lambda) \) (defined in Vol. 26).

\( b(z, \lambda) \) The total scattering coefficient.

\( b(\theta, z, \lambda) \) Volume scattering coefficient.

\( b_k \) Backscattering coefficient.

\( \tilde{b}_k(\lambda) \) The backscatter ratio \( (b_k/b) \).

\( b_0(z, \lambda) \) The spectral backscattering coefficient.

\( b_0(\lambda) \) The spectral backscattering coefficient for phytoplankton.

\( b_\text{bb}(\lambda) \) The particle specific backscatter coefficient (usually normalized to chlorophyll \( a \) concentration).

\( b_\text{bb}(\lambda) \) The backscatter coefficient of water.

\( b_\text{bb}(\lambda) \) The total scattering coefficient for pure seawater.

\( b_l(k) \) Input data for polarization calculations for SeaWiFS band 1.

\( b_l(k) \) Input data for polarization calculations for SeaWiFS band 7.

\( B(\lambda) \) Coefficient for calculating \( b_s(\lambda) \).

\( B_0 \) Coefficient for the power term in the scan modulation correction equation.

\( B_1 \) BBOP casts 1 m from the ship’s stern.

\( B_6 \) BBOP casts 6 m from the ship’s stern.

\( B_6 \) An empirical constant dependent on the backscatter ratio.

\( B_{\text{bb}}(\lambda) \) Greybody radiance model.

- B -

\( b \) A formulation coefficient, a constant equal to 1/3, or a regression coefficient (depending on usage).

\( b(\theta, z, \lambda) \) Volume scattering coefficient.

\( b_0(\lambda) \) Backscattering coefficient.

\( \tilde{b}_k(\lambda) \) The backscatter ratio \( (b_k/b) \).

\( b_0(\lambda) \) Spectral backscattering coefficient.

\( b_0(\lambda) \) Spectral backscattering coefficient for phytoplankton.

\( b_{\text{bb}}(\lambda) \) Particle specific backscatter coefficient (usually normalized to chlorophyll \( a \) concentration).

\( b_{\text{bb}}(\lambda) \) Backscatter coefficient of water.

\( b(\lambda) \) Initial estimate of the particle scattering coefficient; used for determining the apparent particle scattering coefficient for substances other than water.

\( b_{\text{min}} \) Scattering associated with phytoplankton (Prieur and Sathyendranath 1981).

\( b_{\text{bb}}(\lambda) \) Total particle scattering.

\( b_l(\lambda) \) Total Raman scattering coefficient.

\( b_l(\lambda) \) Total Raman scattering coefficient.

\( b_l(\lambda) \) The Raman scattering coefficient.

\( b_s(\lambda) \) The sediment specific scattering coefficient.

\( b_s(\lambda) \) The total scattering coefficient for pure seawater.

\( b_l(k) \) Input data for polarization calculations for SeaWiFS band 1.

\( b_l(k) \) Input data for polarization calculations for SeaWiFS band 7.

\( B(\lambda) \) Excess target radiance; the fitting coefficient for \( e^{B/\beta_0} \); the width of band 7; a variable in the expression for limiting reflectance \( (R_{\text{lim}}) \), defined as \( 0.33b/K_\alpha \); or an empirical constant (depending on usage).

\( B(\lambda) \) Coefficient for calculating \( b_s(\lambda) \).

\( B_0 \) Coefficient for the power term in the scan modulation correction equation.

\( B_1 \) BBOP casts 1 m from the ship’s stern.

\( B_6 \) BBOP casts 6 m from the ship’s stern.

\( B_6 \) An empirical constant dependent on the backscatter ratio.

\( B_{\text{bb}}(\lambda) \) Greybody radiance model.

- C -

\( c(\lambda) \) Spectral beam attenuation coefficient.

\( c(z, 660) \) Red beam attenuation (at 660 nm).

\( c_{\text{bb}}(\lambda) \) Corrected non-water beam attenuation coefficient.

\( c_{\text{bb}}(\lambda) \) Initial estimate of the beam attenuation coefficient (used for determining the apparent beam attenuation coefficient for substances other than water).

\( c_{\text{bb}}(\lambda) \) Beam attenuation coefficient due to particles.

\( c_{\text{bb}}(\lambda) \) Beam attenuation coefficient for pure water equal to \( a_w(\lambda) + b_0(\lambda) \).

\( c_{\text{bb}}(\lambda) / K \) Concentration of chlorophyll \( a \) over \( K \), the diffuse attenuation coefficient.

\( C(\lambda) \) Chlorophyll \( a \) pigment, or just pigment concentration.

\( C(\lambda) \) Chlorophyll \( a \) pigment, or just pigment concentration.

\( C(\lambda) \) AC-9 factory calibration coefficient.

\( C_0(\lambda) \) AC-9 factory calibration coefficient.

\( C_0(\lambda) \) Additional AC-9 factory calibration coefficient.

\( C_0(\lambda) \) Measured value for the flight diffuser on a given scan line in counts, or a polynomial regression factor (depending on usage).

\( C_0(\lambda) \) Measured value for the flight diffuser on a given scan line in counts, or a polynomial regression factor (depending on usage).

\( C_0(\lambda) \) Measured value for the flight diffuser on a given scan line immediately sequential to the first scan line used to measure the flight diffuser (i.e., \( S_2 \) in counts).
$C_{13}$ Pigment concentration derived using CZCS bands 1 and 3.

$C_{23}$ Pigment concentration derived using CZCS bands 2 and 3.

$C_a$ The concentration of chlorophyll $a$.

$C_{abc}$ The concentration of chlorophylls $a$, $b$, and $c$.

$C_b$ The concentration of chlorophyll $b$.

$C_c$ The concentration of chlorophyll $c$.

$C_{dark}$ Instrument dark restore value, in counts.

$C_{est}$ Estimated chlorophyll concentration.

$C_{ext}$ Average total extinction cross-section of a particle.

$C_P$ The calibration factor.

$C_K$ Average chlorophyll $a$ concentration within the first optical depth ($\text{mg} \cdot \text{Chl} \cdot \text{m}^{-3}$).

$C_{out}$ Instrument output, in counts.

$C_P$ Phaeopigment concentration.

$C_{PP}$ PPC concentration.

$C_{PS}$ PSC concentration.

$C_r(A)$ Digital response of reference detector.

$C_{ref}$ Reference chlorophyll value (0.5).

$C_{sat}$ Satellite-based surface chlorophyll concentration ($\text{mg} \cdot \text{Chl} \cdot \text{m}^{-3}$).

$C_S$ Simulated $C$.

$C_{sed}$ Sediment concentration (SPM).

$C_{temp}$ Temperature sensor output, in counts, represented by an 8-bit digital word in the SeaStar telemetry.

$C_{TP}$ Total pigment concentration.

$[C + P]$ Pigment concentration defined as milligrams of chlorophyll $a$ plus phaeopigments per cubic meter.

$(\text{CO}_2)_{GLOB}$ Global CO$_2$ concentration in parts per million.

$E(\lambda, 50)$ Spectral irradiance measured at 50 cm from a source.

$E_0$ Incident downwelling irradiance.

$E_0(\lambda)$ Irradiance in air.

$E_{beg}$ Beginning irradiance value.

$E_{cal}$ Calibration source irradiance.

$E_d(\lambda)$ Incident downwelling irradiance.

$E_d(0^\circ, \lambda)$ Incident spectral irradiance.

$E_d(z, \lambda)$ Downwelling spectral irradiance profile.

$E_d(0^\circ, \lambda)$ Normalized downwelled spectral irradiance.

$E_{end}$ Ending irradiance value.

$E_{mean}(\lambda)$ Measured radiance.

$E_{s}(z, \lambda)$ Vertical profile of surface irradiance.

$E_{s}(z_m, \lambda)$ Defined as $E_{s}(\lambda)$.

$E_s(\lambda)$ Surface irradiance.

$E_{skyl}(\lambda)$ Spectral sky irradiance distribution.

$E_{sw}(z, \lambda)$ Spectral sun irradiance distribution.

$E_u(0^\circ, \lambda)$ Upwelling spectral irradiance profile.

$E_u(0^\circ, \lambda)$ Upwelling spectral irradiance just beneath the sea surface.

$E_{uv}(z, \lambda)$ Irradiance in water.

$E_{WN}(\lambda)$ Normalized water-leaving irradiance.

$E_f$ The fraction of the surface covered by foam, the ratio of sensor-to-instrument diameters, a factor relating IOPs to irradiance reflectance, or the ratio of new primary production to total primary production (depending on usage).

$f_i$ Filter number, $i=0-11$.

$f_r(T)$ Offset voltage correction from the linear function characterizing temperature response.

$F$ Instrument spectral response function.

$f$-ratio $f$ The ratio of new to total production.

$F$ Fluorescence.

$F_0$ Arithmetic average.

$F(r)(\lambda)$ A mean conversion factor.

$F(A)$ A calibration factor.

$F(A)$ A conversion factor to convert PR714 readings to the GSFC sphere radiance scale.

$F(A)$ Average of calibration factors.

$F_0(\lambda)$ Extraterrestrial irradiance corrected for Earth-sun distance, or initial fluorescence (depending on usage).

$F_0$ The scalar value of the solar spectral irradiance at the top of the atmosphere, multiplied by a columnar matrix of the four Stokes parameters ($1/2, 1/2, 0, 0$).

$F_0$ Mean solar irradiance.

$F_0$ Extraterrestrial irradiance corrected for the atmosphere.

$F_0(\lambda)$ Mean extraterrestrial spectral irradiance.

$F_{sp}(\lambda)$ Mean extraterrestrial irradiance.

$F_1$ Pigment biomass loading factor.

$F_2$ Detritus concentration loading factor.
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\(F_3\) Carotenoid concentration (or relative pigment abundance) loading factor.

\(F_a\) Forward scattering probability of the aerosol.

\(F_d\) The total flux incident on the surface if it did not reflect light.

\(F_d'\) The total flux incident on the surface, corrected for surface reflection.

\(G(z, \lambda)\) The scalar value of the total flux incident on the surface, corrected for surface reflection, multiplied by a column matrix of the four Stokes parameters.

\(F_{GAC}\) A GAC correction factor.

\(i\) A correction factor, or an immersion coefficient (depending on usage).

\(F_{m}\) Total sample maximal fluorescence (directly comparable to values measured by standard active fluorometers).

\(F_{SL}\) A correction factor for stray light.

\(F_n(\lambda)\) Field-of-view coefficient or variable fluorescence, \(F_m - F_0\).

\(G\) A constant that consists of the ratios of the air–sea interface effects, the effects of the light field, and the relative spectral variation of \(Q\).

\(g(T)\) Coefficient of a linear function characterizing temperature response.

\(g_1\) A constant equal to 0.82.

\(g_2\) A constant equal to \(-0.55\). 

\(g_{ij}\) Integrals of \(\gamma_{ij}\) (defined in Vol. 26).

\(g_s\) Gain selection datum.

\(G\) Gain factor, or the concentration of DOM and DOM-like absorbers (depending on usage).

\(G(z, \lambda)\) Solid angle dependence with water depth.

\(G(\lambda)\) The effect of the downwelling light field.

\(G_{(i_0, \lambda)}\) The effect of the downwelling light field.

\(G_1\) Gain setting 1.

\(G_2\) Gain setting 2.

\(G_3\) Gain setting 3.

\(G_4\) Gain setting 4.

\(G_e\) Gravitational constant of the Earth (398,600.5 km\(^3\) \(\text{rad}^{-2}\)).

\(G_n\) Gain factor at gain setting \(n\).

\(h(k)\) Residual values without the calculated sinusoidal response.

\(h(\lambda)\) Normalized response function.

\(h_{ij}\) Analytic integral coefficients over the Hermitian polynomials \(\gamma_{ij}\).

\(h_{m,j}\) Matrix elements (defined in Vol. 26).

\(H(\lambda; \lambda')\) Pigment calculated from the hyperbolic transform of \(L_{i;i,j}\).

\(H_{GMT}\) GMT in hours.

\(H_{M}\) The measured moon irradiance.

\(H_s\) Altitude of the spacecraft (for SeaStar 705 km).

\(i\) Inclination angle, interval index, or variable infrared bands (depending on usage).

\(i'\) Inclination angle minus 90°.

\(I\) Rayleigh intensity.

\(I(\lambda)\) Detector current.

\(I_0\) Surface downwelling irradiance.

\(I_1\) Radiant intensity after traversing through an absorbing medium.

\(I_2\) Reflected radiant energy received by the satellite sensor.

\(I_{max}\) Recorded maximum instrument output in response to linearly polarized light.

\(I_{min}\) Recorded minimum instrument output in response to linearly polarized light.

\(ICS\) Current from the current source diode.

\(j\) Interval index, or variable infrared bands (depending on usage).

\(J_2\) The \(J_2\) gravity field term (0.0010863).

\(J_3\) The \(J_3\) gravity field term (\(-0.0000254\)).

\(J_4\) The \(J_4\) gravity field term (-0.0000161).

\(J_5\) The \(J_5\) gravity field term.

\(k\) Wavenumber of light (1/\(\lambda\)), the fractional factor of total particle scattering, the molecular absorption cross-section area, or an index to two vectors of band ratios \(k_1\) and \(k_2\) (depending on usage).

\(k'\) \(g/\tan \theta_{m}\).

\(k_1\) Beginning wavenumber, or a band ratio vector (depending on usage).

\(k_2\) Ending wavenumber, or a band ratio vector (depending on usage).

\(k_i\) Wavelength independent fraction.

\(k_i(\lambda)\) Spectral fit coefficient weighted over the SeaWiFS bands, \(k_i(\lambda)\) also used.

\(k_s\) A constant related to \(a_s\) and \(b_s\).

\(K\) Vector of \(K_n\).

\(K(\lambda)\) Generic irradiance attenuation coefficient.

\(K(z, \lambda)\) Diffuse attenuation coefficient.

\(K(440)\) Diffuse attenuation coefficient of seawater measured at 440 nm.

\(K(490)\) Diffuse attenuation coefficient of seawater measured at 490 nm.

\(K_{0}(\lambda)\) Diffuse attenuation coefficient at \(z = 0\).

\(K_1\) Primary instrument sensitivity factor.

\(K_2\) Gain factor.

\(K_3\) Temperature dependence of detector output.

\(K_4\) Scan modulation correction factor.

\(K_5\) Spacecraft analog-to-digital conversion factor.

\(K_6\) Analog-to-digital offset in spacecraft conversion.

\(K_7\) Current from the diode at 20°C.

\(K_c(\lambda)\) Attenuation coefficient for phytodetector.

\(K_d(\lambda)\) Diffuse attenuation coefficient for downwelling irradiance.

\(K_{d}(z, \lambda)\) Vertical profile of the diffuse attenuation coefficient for the downwelling irradiance spectrum.

\(K_{d}(z, \lambda)\) Determined by least squares regression over a depth interval.

\(K_3(\lambda)\) Attenuation coefficient downwelled irradiance.

\(K_4(\lambda)\) Attenuation coefficient for Gelbstoff.

\(K_i\) A correction constant at the \(i\)th pixel.

\(K_{L}(z, \lambda)\) Vertical profile of the diffuse attenuation coefficient for the upwelling radiance spectrum.
\( K_L(z,\lambda) \) \( K_L(z,\lambda) \) determined by least squares regression over a depth interval.

\( K_n \) \( K_n \) at node depth \( z_n \) determined, with its vertical derivative by least-squares fit to radiometric profiles.

\( K_a(z,\lambda) \) Apparent attenuation coefficient measured in a homogeneous water column.

\( K_a'(z,\lambda) \) Vertical attenuation coefficient for upwelled irradiance.

\( K_a''(z,\lambda) \) \( K_a''(z,\lambda) \) determined by least squares regression over a depth interval.

\( K_s(\lambda) \) Attenuation coefficient for pure seawater.

\( K_{PUR} \) A temperature-dependent variable in the productivity model of Morel (1991) that defines the shape of the photosynthesis-irradiance relationship.

\( L(\lambda) \) Spectral radiance measured at the point closest to the center of a sphere.

\( L(0,0) \) Measured radiance at nadir.

\( L(411.5) \) Spectral radiance at 411.5 nm.

\( L(532) \) Spectral radiance at 532 nm.

\( L(z,\theta,\phi) \) Submerged upwelled radiance.

\( L(\lambda) \) Spectral radiance.

\( L(\lambda_m) \) The radiance of a calibration sphere at the nominal peak wavelength of a filter.

\( L^i,\lambda,\theta,\phi \) Atmospheric path radiance at flight altitude.

\( L_0 \) The radiance of the atmosphere.

\( L_1(\lambda) \) Apparent radiance response to a linearly polarized source.

\( L_2(\lambda) \) Orthogonal apparent radiance response to a linearly polarized source.

\( L_{\text{atm}} \) Atmospheric path radiance due to aerosols.

\( L_{\text{cloud}} \) Radiance of light transmitted through absorbing oxygen.

\( L_{\text{cloud}} \) Radiance of light transmitted through absorbing oxygen.

\( L_{\text{atm}} \) Calibrated source radiance.

\( L_{\text{cloud}} \) The maximum radiance from reflected light off of clouds.

\( L_d \) A matrix of the four Stokes parameters for radiance incident on the surface.

\( L_{\text{sun}} \) Sun glint radiance.

\( L_i \) Incident light, or the length of the ith element (depending on usage).

\( L_i(\lambda) \) Spectral radiance for run number \( i \), or radiance, where \( i \) may represent any of the following: \( m \) for measured; \( LU \) for look-up table; \( 0 \) for light scattered by the atmosphere; \( sfc \) for reflection from the sea surface; and \( w \) for water-leaving radiance.

\( L_{ij} \) The ratio of normalized water-leaving radiance at wavelengths \( i \) (\( \lambda_i \)) to \( j \) (\( \lambda_j \)): \( L_{WN}(\lambda_i)/L_{WN}(\lambda_j) \).

\( L_{LU} \) The radiance calculated for the look-up tables.

\( L_{\text{atm}} \) The radiance of the ocean–atmosphere system measured at a satellite.

\( L_M \) The radiance of the moon.

\( L_{\text{max}} \) Maximum saturation radiance.

\( L_{\text{nadir}} \) Measured radiance at nadir.

\( L_{\text{N2N}}(\lambda) \) Noise equivalent radiance.

\( L_\text{et}(\lambda) \) Atmospheric path radiance due to Rayleigh scattering.

\( L_{\text{et}}(\lambda) \) Rayleigh radiance at standard atmospheric pressure, \( P_0 \).

\( L_s(\lambda) \) Subsurface water radiance.

\( L_{\text{sat}} \) Saturation radiance for the sensor.

\( L_{\text{scat}} \) Measured radiance at any pixel in a scan.

\( L_{\text{fsc}} \) The radiance of the light reflected from the sea surface.

\( L_{\text{fsc}} \) The columnar matrix of the four Stokes parameters \( L_{\text{fsc}} = (L_{\text{fsc},1}, L_{\text{fsc},2}, L_{\text{fsc},3}, L_{\text{fsc},4}) \).

\( L_{\text{sky}}(\lambda) \) Spectral sky radiance distribution.

\( L_t(\lambda) \) Total radiance at the top of the atmosphere (where a satellite sensor is located).

\( L_{\text{atm}} \) Radiance emerging at the top of the atmosphere.

\( L_{\text{typical}} \) Expected radiance from the ocean measured on orbit.

\( L_u(\lambda) \) Upwelling spectral radiance profile.

\( L_u(0^-,\lambda) \) Upwelling spectral radiance just beneath the sea surface.

\( L_u(\lambda) \) True upwelled spectral radiance.

\( L_{\text{cloud}} \) Measured upwelled spectral radiance.

\( L_{\text{scat}} \) The columnar matrix of light leaving the surface containing the values \( L_{\text{scat},1}, L_{\text{scat},2}, L_{\text{scat},3}, \) and \( L_{\text{scat},4} \).

\( L_{\text{scat},i} \) The RADTRAN radiance parameters (for \( i = 1, 4 \)).

\( L_{\text{scat}} \) The scalar value of the water-leaving radiance multiplied by a columnar matrix of the four Stokes parameters.

\( L_{\text{atm}} \) The water-leaving radiance of light scattered from beneath the surface and penetrating it.

\( L_{\text{atm}} \) Water-leaving radiance at 443 nm.

\( L_{\text{atm}} \) Water-leaving radiance at 520 nm.

\( L_{\text{atm}} \) Water-leaving radiance at 550 nm.

\( L_{\text{atm}} \) Water-leaving radiance at 670 nm.

\( L_{\text{atm}} \) Normalized water-leaving radiance at the Raman excitation wavelength.

\( L_{\text{atm}} \) Normalized water-leaving radiance.

\( L_{\text{atm}} \) Measured radiance for mirror side 1.

\( L_{\text{atm}} \) Measured radiance for mirror side 2.

\( M \) Path length through the atmosphere, or the total number of discrete data points in a vertical radiometric profile (depending on usage).

\( M_{\text{atm}} \) The corrected mean orbit anomaly of the Earth, which is a function of date, and refers to an imaginary moon in a circular orbit.

\( M_{\text{atm}} \) Path length for ozone transmittance.

\( n \) The index of refraction, the mean orbital motion in revolutions per day, the gain setting, or the starting index in a measurement for angular measurements, or node index for the integral \( K \) analysis (depending on usage).

\( n(\lambda) \) An exponent conceptually similar to the Ångström exponent.

\( n(\lambda) \) The index of refraction of PlexiglasTM.

\( n(\lambda) \) The index of refraction of water.

\( v \) The total number of something, or the ending index in a measurement sequence for angular measurements, or total number density (depending on usage).

\( N \) The compensation factor for a 4 log neutral density filter.

\( N \) Total number density of either the first or second aerosol model when \( i = 1 \) or 2, respectively.
O

\( \dot{O} \) \( \times \dot{V} \).

(O2/N2)ref The referenced amount of O2/N2.

(O2/N2)samp The sampled amount of O2/N2.

O2O OFFI casts 20 m from the ship’s stern.

OD(\( A \)) Baseline optical density spectrum.

OD(\( A \)) Optical density of soluble material (Gelbstoff).

OD(\( A \)) Optical density spectra of filtered particles.

OD(\( A \)) Optical density reference for filtered or distilled water.

OD(\( A \)) Optical density of non-pigmented particulates (tripton).

P Surface pressure.

pa A factor to account for the probability of scattering to the spacecraft for three different paths from the sun.

pCO2 The partial pressure of CO2.

Pdev Pressure deviation between the minimum and maximum surface pressures compared to 1,013 mb.

Pfd Reference pressure.

pThe probability of seeing sun glitter in the direction \( \theta, \phi \) given the sun in position \( \theta_0, \phi_0 \) as a function of wind speed (W).

P Nodal period, phaeopigment concentration, local surface pressure, or the particulate concentration including detrital material (depending on usage).

\( \dot{P} \) Orbit position vector.

P(\( \theta^+ \)) Phase function for forward scattering.

P(\( \theta^- \)) Phase function for backward scattering.

P(\( A \)) Polarization sensitivity.

P0 Standard atmospheric pressure (1,013.25 mb).

Pa Probability of scattering to the spacecraft.

Pdgel A pixel located on the exact edge of a bright source in a GAC scene.

P12 Gross photosynthesis is defined as the number of electrons photochemically produced from the splitting of water.

P17 R714 raw radiance, the fitting coefficient for \( i = 1 - 5 \), or the ith pixel under correction (depending on usage).

Pr Net photosynthesis is defined as \( P_1 - R_1 \).

\( P_{r12} \) Annual average phytoplankton particulate organic carbon production (g C \( \cdot m^{-2} \cdot yr^{-1} \)).

S Simulated \( C_a + C_r \) (q.v.).

Pn Designates the number of pixels after the slit for the instrument to return to the residual counts allowed in the specification.

P16 Depth-integrated primary production.

Pr17 Probability of seeing sun glitter in the spacecraft direction.

Pixl Pixel number, i.e., the numerical designation of a pixel in a scan line.

Pzero Designates the number of pixels required for the instrument to settle to a level of zero residual counts.

\( P^e(z) \) Chlorophyll-specific photosynthetic rate at depth \( z \).

\( P_{opt}^e \) Maximum chlorophyll-specific carbon fixation rate within a water column.

\( P^B \) Chlorophyll normalized photosynthesis.

\( P_{max}^B \) \( P_{max} \) normalized to chlorophyll concentration.

\( P_{max}^B \) Maximum biomass-specific photosynthetic rate.

PF Polarization factor.

PP Primary productivity.

Pa The location of the pixel to be corrected in GAC pixels relative to the (bright target) edge pixel.

Ps Phaeopigment concentration.

Q Water transmittance factor.

Q The ratio of upwelling irradiance to radiance, which varies with the angular distribution of the upwelling light field, and is \( \pi \) for an isotropic distribution.

\( Q(\lambda) \) \( L_n(0^-, \lambda) \) to \( E_n(0^-, \lambda) \) relation factor (equal to \( \pi \) for a Lambertian surface).

R Water-air reflectance for totally diffuse irradiance, the radius coordinate, the Earth-sun distance, or the lamp-to-plaque distance in centimeters (depending on usage).

rt The radius of circle one, or source aperture (depending on usage).

r2 The radius of circle two, or detector aperture (depending on usage).

r The geometric mean radii of either the first or second aerosol model when \( i = 1 \) or 2, respectively.

R Reflectance, the linear correlation coefficient, or phytoplankton respiration (depending on usage).

R The reflection matrix.

\( R \) Mean Earth–sun distance.

\( R^2 \) The square of the linear correlation coefficient.

\( R(0^-, \lambda) \) Irradiance reflectance just below the sea surface.

\( R(\lambda) \) The irradiance reflectance at a particular wavelength.

R0 A multiplier for mirror side 1.

R1 A multiplier for mirror side 2.

R2 Aerosol reflectance.

Ra Ra/(qT2v).

Rg Bidirectional reflectance distribution function.

R Dark respiration by the photosynthetic organism.

Re Mean Earth radius (6,378.137 km).

Re Effective resistance for the thermistor–resistor pair.

Ri Radiance of the ith pixel.

Rk All the losses of fixed carbon due to respiratory processes of the photosynthetic organism in the light.

Rk reflectance from an uncalibrated radiometer.

\( R_{x}(z, \lambda) \) Spectral reflectance.

\( R_{lim} \) Limiting reflectance for defining Case-1 water.

Rs Rayleigh reflectance.

Rr Remote sensing reflectance.

Rr(z, \lambda) Spectral remote sensing reflectance profile.

R Subsurface reflectance.

\( R(t) \) Total reflectance at the sensor.

\( R(t) \) \( R(t) - R_1 \) (qT2v).

R Resistance of the thermistor.

Rs Sunspot number.

S The solar constant, or the slope of a line (depending on usage).
S(\lambda) \text{ The solar spectral irradiance, or } L_a(\lambda)/L_a(670) \text{ (depending on usage).} \\
S(\lambda) \text{ A coefficient of water temperature variation in } a_w(\lambda, T). \\
S_{ci}(\lambda) \text{ Radiometer signal (uncalibrated) measured viewing a reflectance plaque.} \\
S_i \text{ Initial detector signal.} \\
S_n \text{ Detector signal with gain.} \\
S_{scw} \text{ Radiometer signal (uncalibrated) measured viewing the sky.} \\
S_W(\lambda) \text{ Radiometer signal (uncalibrated) measured viewing the water.} \\
\text{– } T \text{ –} \\
t \text{ Time variable, or the transmission of } L_{opc} \text{ through the atmosphere (depending on usage).} \\
t' \text{ The transmission of } L_W \text{ through the atmosphere.} \\
t(k) \text{ Spectral transmission as a function of wavenumber.} \\
t(\lambda) \text{ Diffuse transmittance of the atmosphere.} \\
t(750, 0) \text{ Diffuse transmittance between the ocean surface and the sensor at 750 nm.} \\
t_0 \text{ Initial time, or the sum of the direct and diffuse transmittance of sunlight through the atmosphere (depending on usage).} \\
t_1 \text{ First observation time.} \\
t_2 \text{ Second observation time.} \\
t_a \text{ Aerosol transmittance after absorption.} \\
t_{as} \text{ Aerosol transmittance after scattering.} \\
t_d \text{ Direct component of transmittance after absorption by the gaseous components of the atmosphere, scattering and absorption by aerosols, and scattering by Rayleigh.} \\
t_d(z, \lambda) \text{ Downward spectral irradiance transmittance from flight altitude } z \text{ to the surface.} \\
t_e \text{ Time difference in hours between present position and most recent equator crossing.} \\
t_{EFC} \text{ Equator crossing time.} \\
t_{oa} \text{ Transmittance after absorption by ozone.} \\
t_r \text{ Transmittance after Rayleigh scattering.} \\
t_s \text{ Diffuse component of transmittance after absorption by the gaseous components of the atmosphere, scattering and absorption by aerosols, and scattering by Rayleigh.} \\
t_{sw} \text{ Transmittance after absorption by water vapor.} \\
T' \text{ Tilt position.} \\
T^* \text{ Instrument temperature during calibration.} \\
T^o \text{ Levitus climatological median upper ocean temperature (18.1°C) as computed by Antoine et al. (1996).} \\
T(\lambda) \text{ The transmittance along the slant path to the sun.} \\
T(\lambda, \theta) \text{ Total transmittance (direct plus diffuse) from the ocean through the atmosphere to the spacecraft along the path determined by the spacecraft zenith angle } \theta. \\
T(\lambda, \theta, \theta_0) \text{ Two-way transmission through oxygen in the model layer in terms of zenith angle } (\theta), \text{ and solar angle } (\theta_0). \\
T_0(\lambda, \theta_0) \text{ Total downward transmittance of irradiance.} \\
T_{2r} \text{ Two-way diffuse transmittance for Rayleigh attenuation.} \\
T_e \text{ Equation of time.} \\
T_g(\lambda) \text{ Transmittance through a glass window.} \\
T_{oa} \text{ Transmittance of ozone } (O_3). \\
T_{ow} \text{ Transmittance of water vapor.} \\
T_s(\lambda) \text{ Transmittance through the surface.} \\
T_w(\lambda) \text{ Transmittance through a water path.} \\
T_{sw} \text{ Transmittance of water vapor } (H_2O). \\
\text{– } U, V \text{ –} \\
U \text{ Volume of water filtered.} \\
V \text{ Orbit velocity vector.} \\
U \text{ True voltage.} \\
\Psi \text{ Measured voltage.} \\
V(z) \text{ Transmissometer voltage.} \\
\Psi(\theta) \text{ Normalized measured value for a cosine collector.} \\
\Psi(\theta) \text{ Mean normalized measured value of instrument response.} \\
V_{air} \text{ Factory transmissometer air calibration voltage.} \\
V_{airc} \text{ Current transmissometer air calibration voltage.} \\
V_{dark} \text{ Transmissometer dark response.} \\
V_i(t_j) \text{ The } i \text{th spatial location at observation time } t_j. \\
V_d \text{ The radiance detector voltage while viewing the moon.} \\
V_s \text{ The radiance detector voltage while viewing the sun.} \\
V_{fp} \text{ Focal plane temperature sensor voltage output.} \\
\text{– } W \text{ –} \\
w_m \text{ The weighting coefficient at each depth } z_m. \\
W \text{ Wind speed, or equivalent bandwidth (depending on usage).} \\
W_d \text{ Direct irradiance divided by the total irradiance at the surface.} \\
W_s \text{ Diffuse irradiance divided by the total irradiance.} \\
W_9 \text{ Weighting function.} \\
\text{– } X \text{ –} \\
x \text{ The abscissa or longitudinal coordinate, or the pixel number within a scan line (depending on usage).} \\
X \text{ ECEF } x \text{ component of orbit position, or depth in meters (depending on usage).} \\
\dot{X} \text{ ECEF } X \text{ component of orbit velocity.} \\
\text{– } Y \text{ –} \\
y \text{ The ordinate, meridional coordinate, or an empirical factor (depending on usage).} \\
Y \text{ ECEF } y \text{ component of orbit position; or the base 10 logarithm of the radiometric measurement } E_d, E_a, \text{ or } L_u \text{ (depending on usage).} \\
\dot{Y} \text{ ECEF } Y \text{ component of orbit velocity.} \\
\text{– } Z \text{ –} \\
\dot{z} \text{ The vertical coordinate (frequently water depth).} \\
\dot{z}' \text{ Corrected depth for pressure transducer depth offset relative to a sensor.} \\
\dot{z}_{oa} \text{ Depth of the euphotic zone.} \\
\dot{z}_1 \text{ The depth of a particular node.} \\
\dot{z}_m \text{ Centered depth, or the depth of the } m \text{th data point in a vertical radiometric profile (depending on usage).} \\
\dot{z}_n \text{ The node depth number } (n = 0, \ldots, N - 1). \\
\dot{z}_s \text{ Shallow depth.} \\
\dot{z}_c \text{ Exclusion depth due to data contamination.} \\
\dot{Z} \text{ ECEF } z \text{ component of orbit position, or a substrate (depending on usage).} \\
\dot{Z} \text{ ECEF } Z \text{ component of orbit velocity.} \\
\text{– OTHER –} \\
* \text{ Normalization-to-chlorophyll concentration.
The changes in the global 02:N2.

\( \delta(02:N2)_{c1<0} \) The changes in the global 02:N2.

\( \Delta p \) The difference in atmospheric pressure.

\( \Delta pCO_2 \) The difference in the partial pressure of CO2 in the air and in the sea.

\( \Delta P \) The difference in successive pixels, or the pressure deviation from standard pressure, \( P_b \) (depending on usage).

\( \Delta t \) Time difference.

\( \Delta T \) Changes in temperature.

\( \Delta Y(\lambda) \) The error in transmittance.

\( \Delta z \) Half-interval depth increment.

\( \Delta\theta \) Angular increment.

\( \Delta\theta \) The error (in radians) in the knowledge of \( \theta_s \).

\( \Delta\lambda \) An interval in wavelength.

\( \Delta\rho_d(\lambda) \) The error in the water-leaving reflectance for the red channel.

\( \Delta\sigma(\lambda) \) The absolute error in spectral optical depth.

\( \Delta\Phi_{max} \) The error in the aerosol optical thickness.

\( \Delta\Phi_{max} \) The ratio \( F_e/F_m \) which corresponds to the (normalized) maximum number of reaction centers in the chlorophyll population which are capable of photosynthesis.

\( \Delta\omega \) The longitude difference from the subsatellite point to the pixel.

\( \Delta\omega \) Longitude difference.

\( \varepsilon \) Cosine collector response error or an atmospheric correction parameter (depending on usage).

\( \varepsilon(i,j) \) The ratio of \( L_o \) in two bands \( i \) and \( j \).

\( \varepsilon_{sky} \) Self-shading error for \( E_{sky} \).

\( \varepsilon_{sun} \) Self-shading error for \( E_{sun} \).

\( \varepsilon(\lambda) 1 - e^{-\kappa_d(\lambda)\tau} \) .

\( \eta \) The bearing from the sub-satellite point to the pixel along the direction of motion of the satellite.

\( \theta \) The spacecraft zenith angle, spacecraft pitch, the polar angle of the line-of-sight at a spacecraft, the centroid angle of the scattering measurement, or a generalized angle (depending on usage).

\( \theta \) Pitch rate.

\( \theta_d \) Polar angle of the direct sunlight, or solar zenith angle (depending on usage).

\( \theta_0 \) Refracted solar zenith angle.

\( \theta_i \) The intersection angle of circle one or the lower integration limit (depending on usage).

\( \theta_o \) The intersection angle of circle two or the upper integration limit (depending on usage).

\( \theta_p \) Tilt angle.

\( \theta_{zw} \) In-water measurement angle.

\( \kappa \) An integration constant: \( \kappa = A_0\pi r^2 \left( r_1^2 + r_2^2 + d^2 \right)^{-1} \) .

\( \kappa \) Self-shading coefficients.

\( \lambda \) Wavelength of light.

\( \lambda' \) A channel of nominal wavelength, or the Raman excitation wavelength (depending on usage).

\( \lambda_0 \) Center wavelength.

\( \lambda_1 \) Starting wavelength.

\( \lambda_2 \) Ending wavelength.

\( \lambda_i \) A wavelength of light at a particular band.

\( \lambda_j \) A wavelength of light at a particular band.

\( \lambda_m \) Nominal center wavelength.

\( \lambda_n \) Any nominal wavelength.

\( \lambda_{near-IR} \) Near-IR wavelength.

\( \mu \) Mean value, or cosine of the satellite zenith angle (depending on usage).

\( \mu_0 \) Cosine of the solar zenith angle.

\( \bar{\mu}_d(z, \lambda) \) Spectral mean cosine for downwelling radiance at depth \( z \).

\( \bar{\mu}_d(0^+, \lambda) \) Spectral mean cosine for downwelling radiance at the sea surface.

\( \mu_0 \) The reciprocal of the effective optical length to the top of the atmosphere, along the line of sight to the sun.
\( \nu_j \) The \( j \)th temporal weighting factor.

\( \xi \) A local depth coordinate ranging from \(-1\) at node \( z_{i-1} \) to \(+1\) at node \( z_i \), or actual deployment distance (depending on usage).

\( \xi_d \) The calculated deployment distance for downwelling irradiance measurements.

\( \xi_{EM} \) The distance between the Earth and the moon.

\( \xi_L \) The calculated deployment distance for upwelling radiance measurements.

\( \xi_n \) The calculated deployment distance for upwelling irradiance measurements.

II \ Depth-integrated primary production.

\( \rho \) The Fresnel reflectivity, the weighted direct plus diffuse reflectance, or the average reflectance of the sea (depending on usage).

\( \tilde{\rho} \) The Fresnel reflectance for sun and sky irradiance.

\( \rho(\theta) \) Fresnel reflectance for viewing geometry.

\( \rho(\theta_z) \) Fresnel reflectance for solar geometry.

\( \rho(\lambda) \) The bidirectional reflectance.

\( \rho_{c,i} \) Reflectance of clouds and ice.

\( \rho_C(\lambda) \) Gray card or plaque reflectance.

\( \rho_i \) The reflectance of the sea of either the first or second aerosol model when \( i = 1 \) or 2, respectively.

\( \rho_i(\lambda) \) The reflectance where \( i \) may represent any of the following: \( m \) for measured; \( LU \) for look-up table; \( o \) for light scattered by the atmosphere; \( sfc \) for reflection from the sea surface; or \( w \) for water-leaving radiance.

\( \rho_n \) Sea surface reflectance for direct irradiance at normal incidence for a flat sea.

\( \rho_N \) Reflectance for diffuse irradiance.

\( \sigma \) One standard deviation of a set of data values.

\( \sigma^2 \) The mean square surface slope distribution.

\( \sigma(\lambda) \) The spectral optical depth.

\( \sigma_i^2 = (\log r - \log r_0)^2 \).

\( \Sigma P P \) Classification system for primary productivity models based on implicit levels of integration.

\( \sigma_i \) The density of sea water determined from the in situ salinity and temperature, but at atmospheric pressure.

\( \sigma_i \) The density of sea water determined from the in situ salinity and the potential temperature (\( \theta \)), but at atmospheric pressure.

\( \overline{\sigma} \) Vector of measured optical depths.

\( r(z, \lambda) \) Vertical profile of the spectral optical depth.

\( \tilde{r}(z, \lambda) \) The estimated vertical profile of the spectral optical depth.

\( \tau_0 \) Aerosol optical thickness.

\( \tau_g(\lambda) \) Uniform mixed gas optical thickness.

\( \tau_o(\lambda) \) Ozone optical thickness.

\( \tau_{ox} \) Oxygen optical thickness at 750 nm.

\( \tau_{ox}(\lambda) \) Optical thickness due to oxygen absorption.

\( \tau_o \) The optical thickness of ozone.

\( \tau_R \) Rayleigh optical thickness due to scattering by the standard molecular atmosphere.

\( \tau_P \) Pressure corrected Rayleigh optical thickness.

\( \tau_{R0} \) Rayleigh optical thickness at standard atmospheric pressure, \( P_0 \).

\( \tau_{P0} \) Rayleigh optical thickness weighted by the SeaWiFS spectral response.

\( \tau_s(\lambda) \) Spectral solar atmospheric transmission.

\( \tau_{tw}(\lambda) \) The absorption optical thickness of water vapor.

\( \phi \) Azimuth angle of the line-of-sight at a spacecraft.

\( \phi_0 \) Azimuth angle of the direct sunlight.

\( \Phi \) Spacecraft azimuth angle or roll (depending on usage).

\( \Phi \) A photoadaptive variable which is a chlorophyll-specific quantum yield for absorbed PAR.

\( \Phi \) Roll rate.

\( \Phi_0 \) Solar azimuth angle.

\( \Phi_D \) The detector solid angle.

\( \Phi_M \) The solid angle subtended by the moon at the measuring instrument.

\( \varphi \) A photoadaptive variable which is a chlorophyll-specific quantum yield for available PAR.

\( \chi \) Proportionality constant.

\( \Psi \) The pixel latitude, yaw, or the ratio of depth-integrated primary production to the product of depth-integrated chlorophyll \( a \) and time-integrated radiant energy \( [\text{gC (gChl)}^{-1} \text{Ein}^{-1} \text{m}^{-2}] \) (depending on usage).

\( \Psi \) Yaw rate.

\( \Psi_d \) Solar declination latitude.

\( \Psi_s(t) \) Subsatellite latitude as a function of time.

\( \omega \) Longitude variable, the surface reflection angle, or the single scattering albedo (depending on usage).

\( \omega_0 \) Old longitude value.

\( \omega_s \) Single scattering albedo of the aerosol.

\( \omega_e \) Equator crossing longitude.

\( \omega_w \) Spatial weighting factor.

\( \omega_l \) Longitude variable.

\( \Omega \) Solar hour angle, or the amount of ozone in Dobson units (depending on usage).
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E.R. Firestone and S.B. Hooker


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E.R. Firestone and S.B. Hooker


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The Sea-viewing Wide Field-of-view Sensor (SeaWiFS) is the follow-on ocean color instrument to the Coastal Zone Color Scanner (CZCS), which ceased operations in 1986, after an eight-year mission. SeaWiFS was launched on 1 August 1997, on the SeaStar satellite, built by Orbital Sciences Corporation (OSC). The SeaWiFS Project at the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC), undertook the responsibility of documenting all aspects of this mission, which is critical to the ocean color and marine science communities. This documentation, entitled the *SeaWiFS Technical Report Series*, is in the form of NASA Technical Memorandum Number 104566 and 1998-104566. All reports published are volumes within the series. This particular volume, which is the last of the so-called *Prelaunch Series* serves as a reference, or guidebook, to the previous 42 volumes and consists of 6 sections including: an addenda, an errata, an index to key words and phrases, lists of acronyms and symbols used, and a list of all references cited. The editors have published a cumulative index of this type after every five volumes. Each index covers the reference topics published in all previous editions, that is, each new index includes all of the information contained in the preceding indexes with the exception of any addenda.