

# Toward Long-Term Consistency in Ocean Color Measurements

*Bryan Franz*

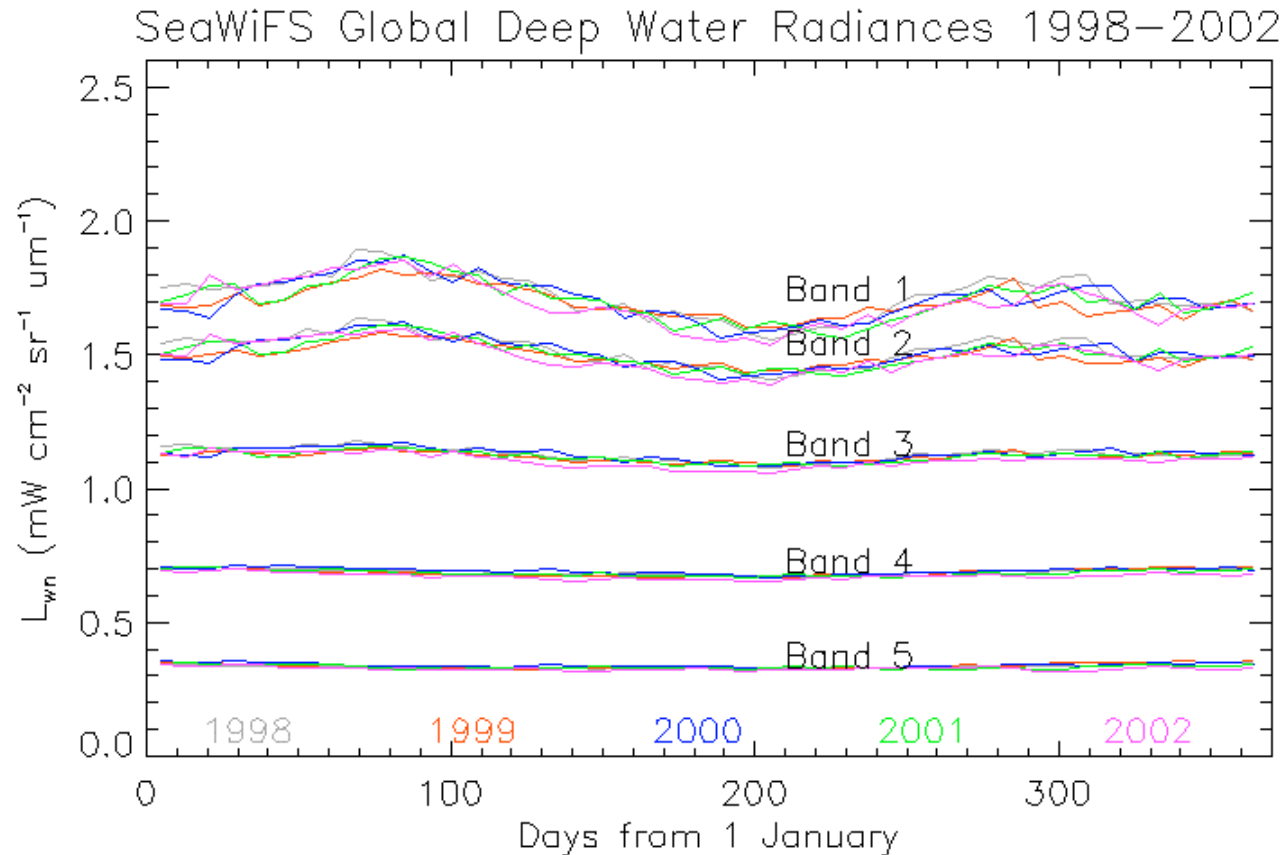
**Ocean Discipline Processing Group**

*the project formerly known as  
SeaWiFS/SIMBIOS/SeaDAS/SeaBASS*

17 February 2004

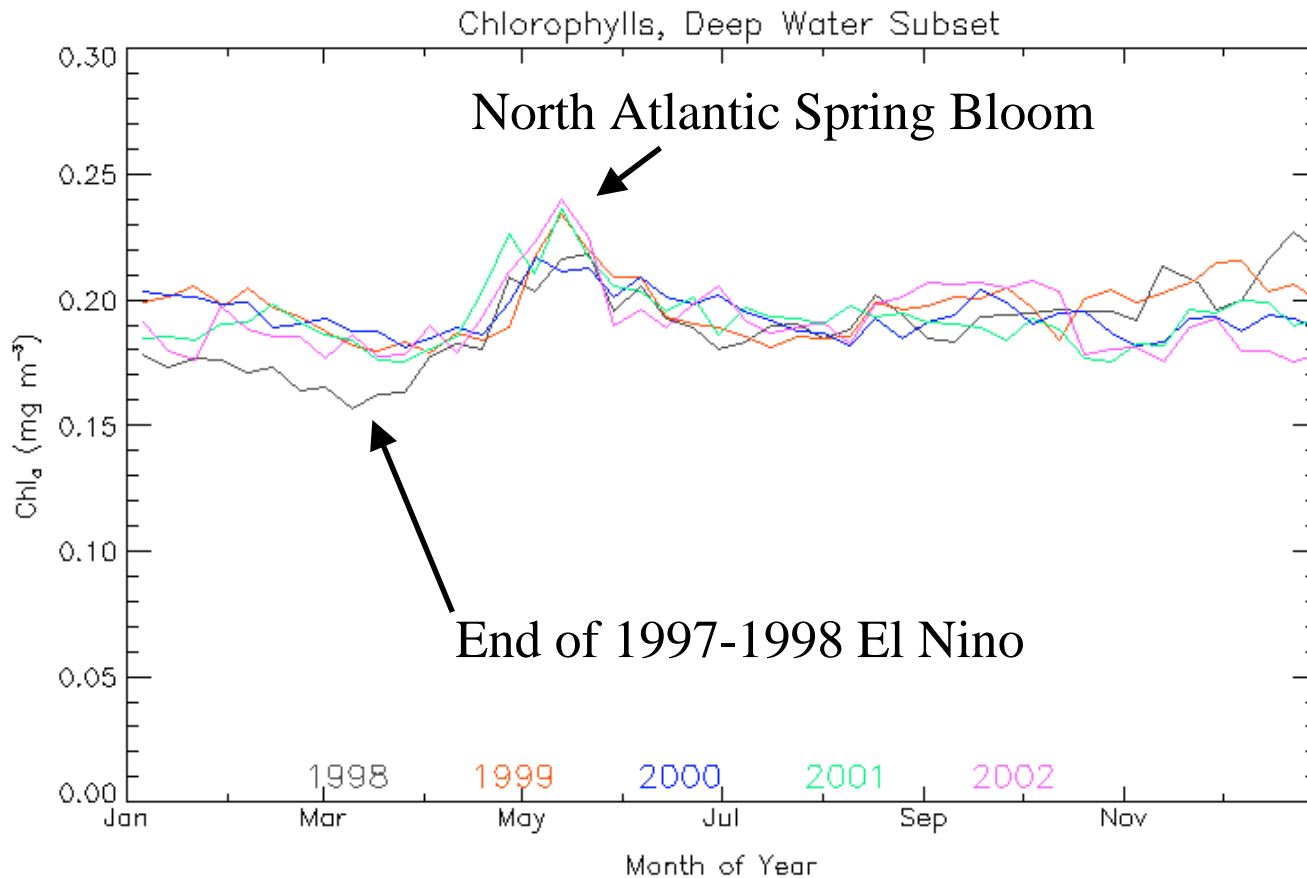
# SeaWiFS Annual Repeatability in nLw

## Deep-Water Subset, 8-Day Bins



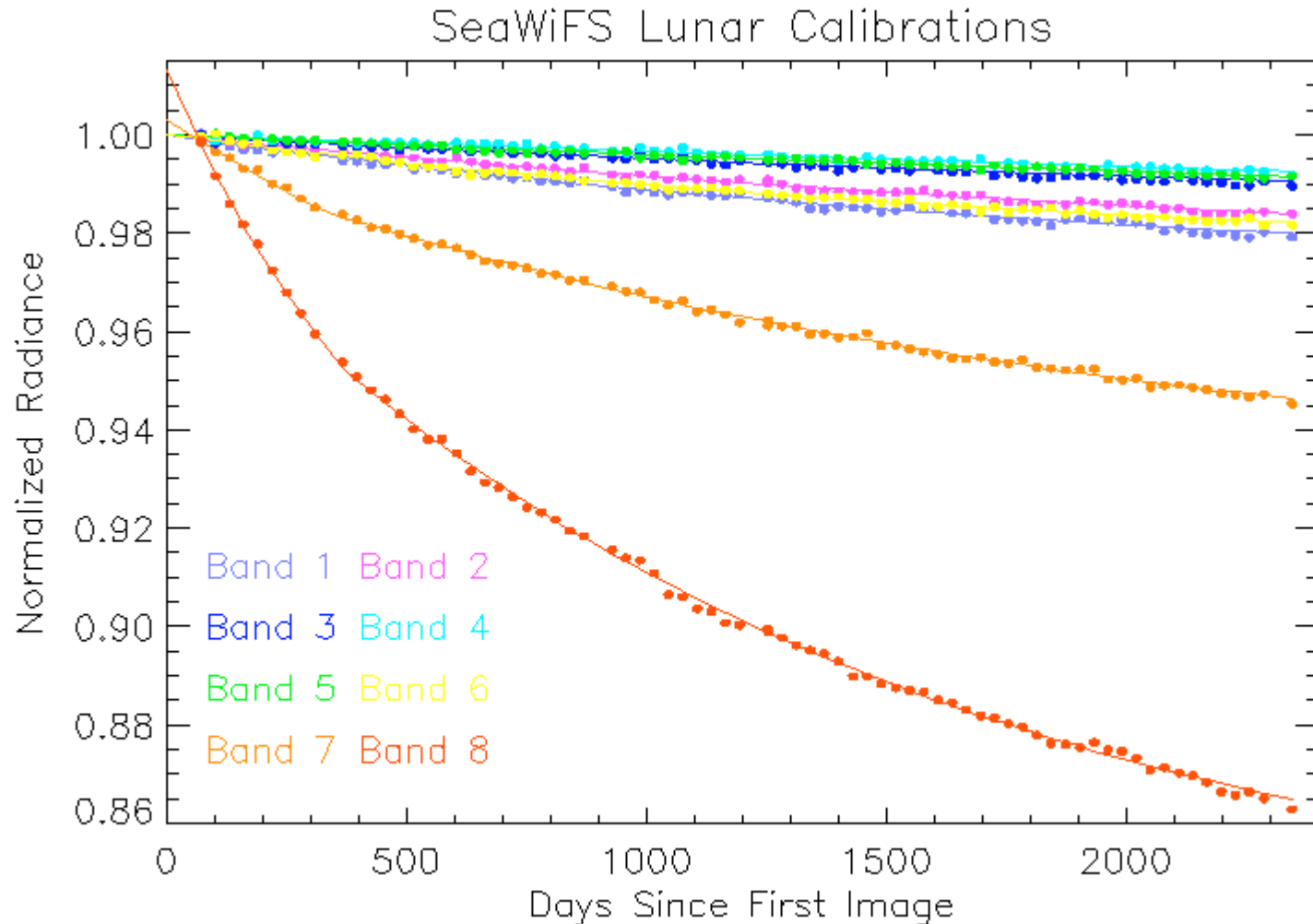
Long-term temporal stability is a fundamental requirement for climate data records.

# Annual Cycles in SeaWiFS Chlorophyll Deep-Water Subset, 8-Day Bins



Demonstrated sensor stability, and ultimately **mission to mission consistency**, allows for geophysical interpretation of long-term changes.

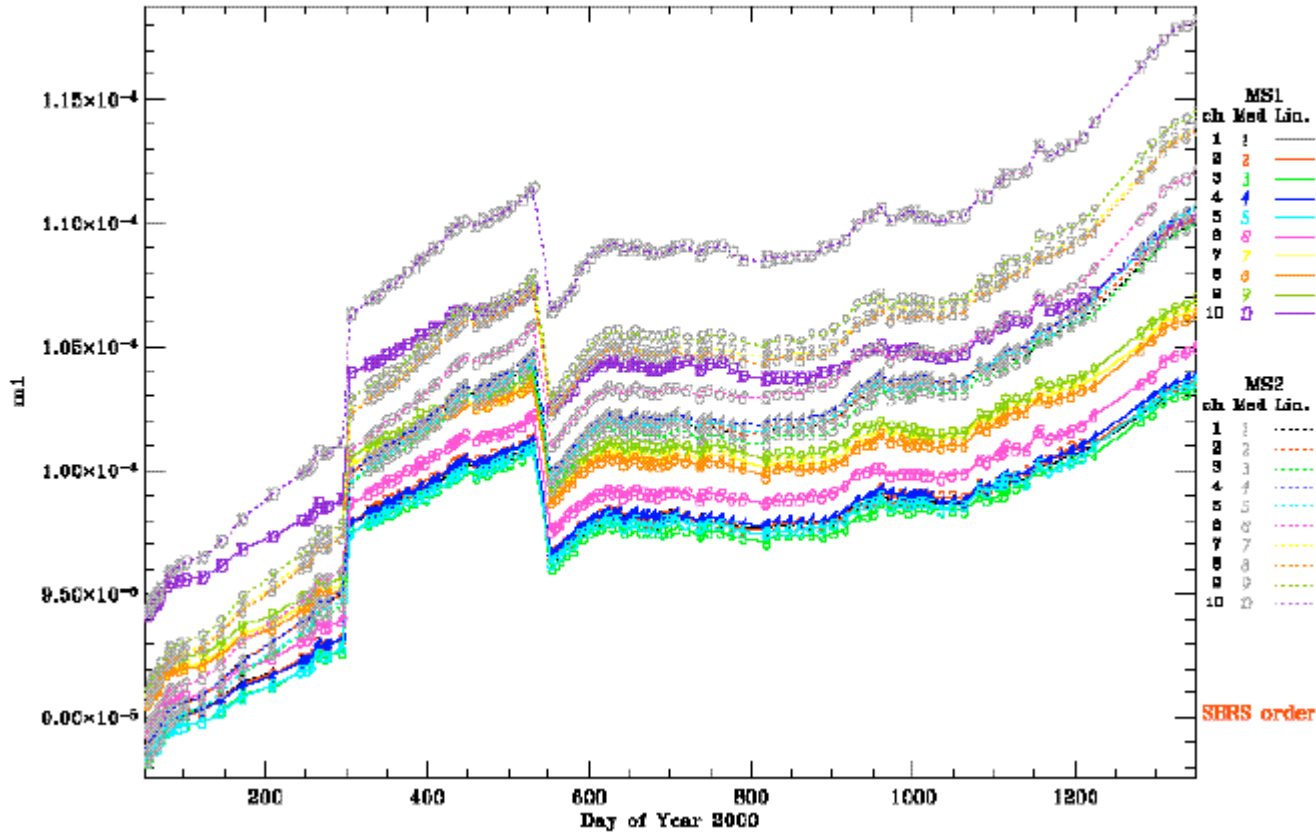
# SeaWiFS Lunar Calibration Time-Series



Changes in SeaWiFS response over time are tracked and corrected exclusively through monthly observations of the moon. Degradation is well behaved and predictable. **No need for routine updates.**

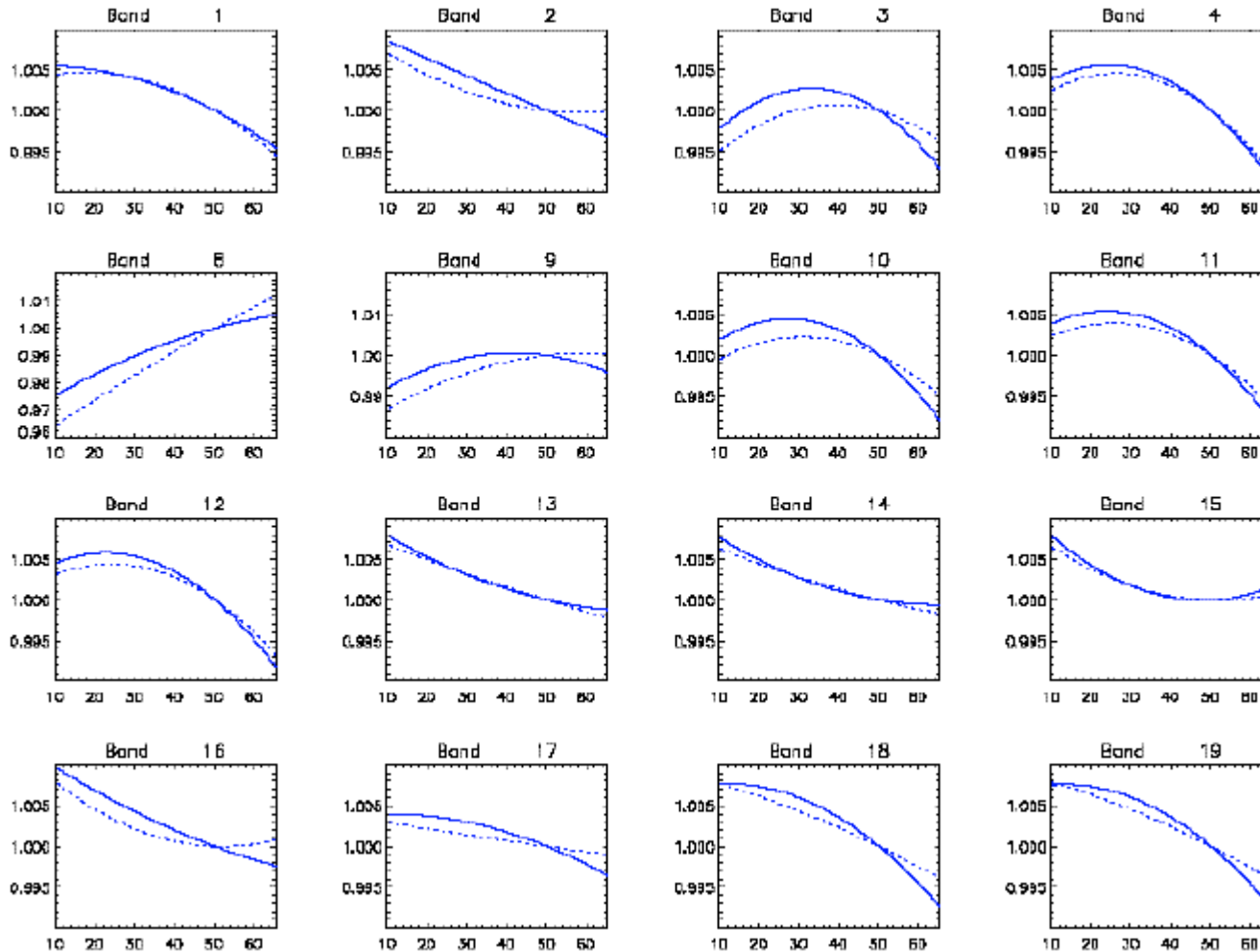
# MODIS/Terra Solar Diffuser Trends

412 nm, 2 Mirror Sides, 10 Detectors



MODIS/Terra temporal calibration has not been predictable, thus requiring routine calibration updates to maintain long-term stability.  
**Degradation of mirror** + state changes + SD measurement error.

# MODIS Response vs Scan Angle



MODIS response varies significantly across the scan (different mirror AOI). Mirror is degrading => RVS is changing => **polarization sensitivity is changing**. Effects vary by detector and mirror-side.

# Sensor-to-Sensor Comparative Analysis

SeaWiFS Band	MODIS Band	SeaWiFS $\lambda$ (nm)	MODIS $\lambda$ (nm)
1	8	412	412
2	9	443	443
3	10	490	488
4	11	510	531
5	12	555	551
6	13L	670	667
7	15	765	748
8	16	865	869

## Water-Leaving Radiance Products

- 8-Day mean Level-3 products binned at 9 km resolution
- common bins selected between sensors (**equal area bins**)
- means computed and trended with time

## Deep Water Subset

- all bins deeper than 1000 meters

# MODIS/Terra Collection 4.1

comparison with

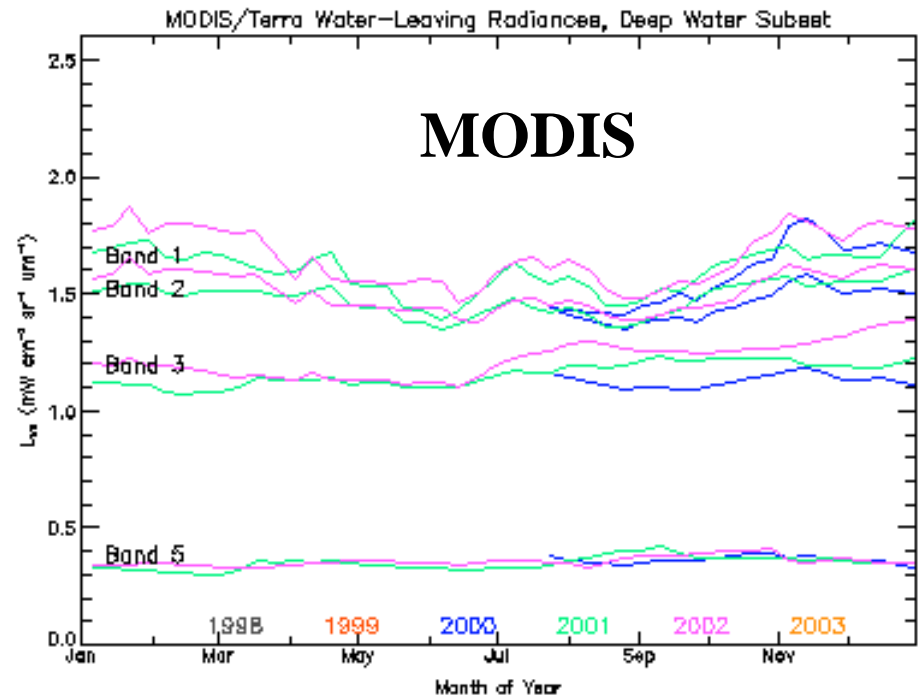
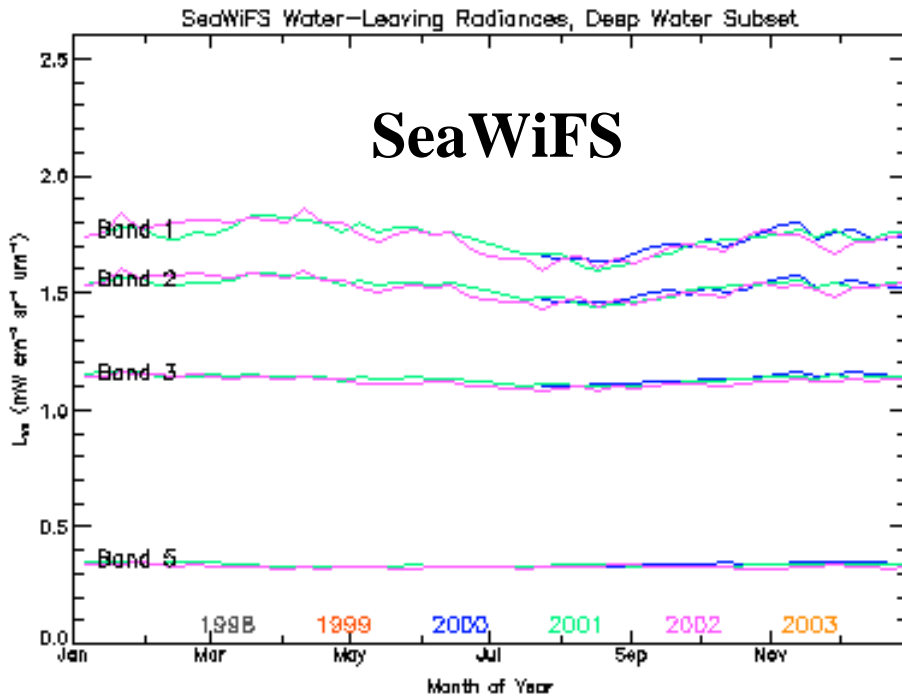
# SeaWiFS 4th Reprocessing



# MODIS and SeaWiFS Annual Repeatability

## MODIS/Terra Collection 4.1 vs SeaWiFS 4th Reprocessing

### Deep-Water Subset, 8-Day Means

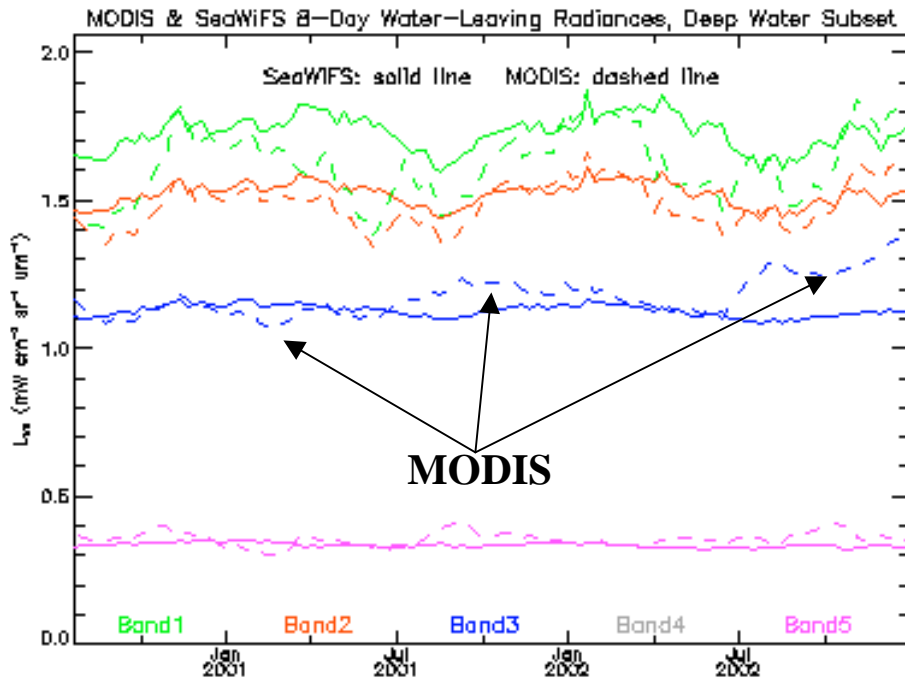


The annual repeatability of MODIS/Terra Collection 4.1 is not at the level observed with SeaWiFS. **Variability may not be geophysical.**

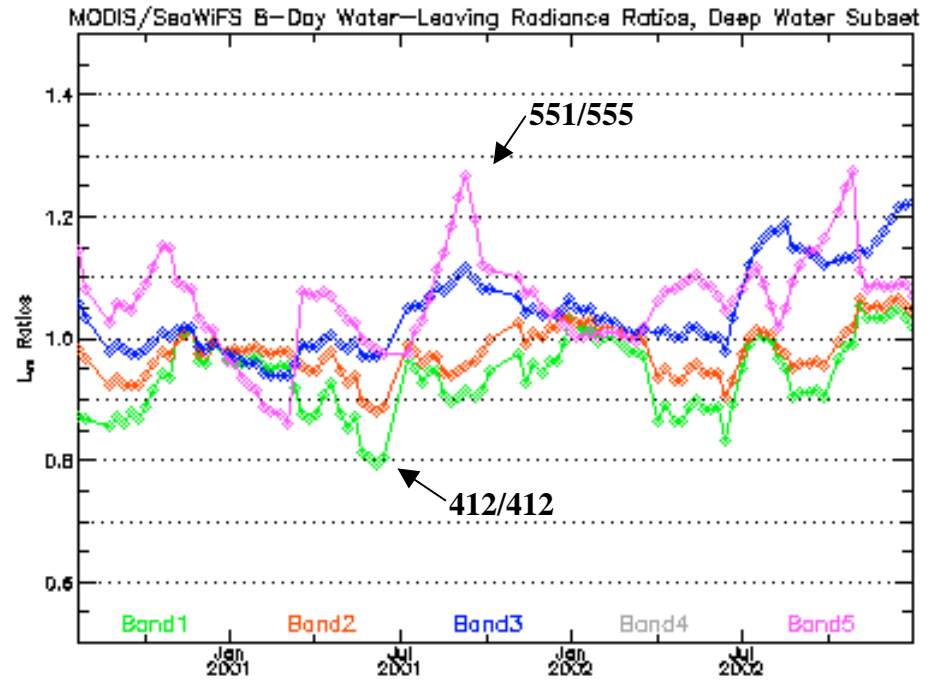
# MODIS and SeaWiFS nLw Trends

MODIS/Terra **Collection 4.1** vs SeaWiFS 4th Reprocessing  
Deep-Water Subset, 8-Day Means

## SeaWiFS & MODIS



## MODIS/SeaWiFS

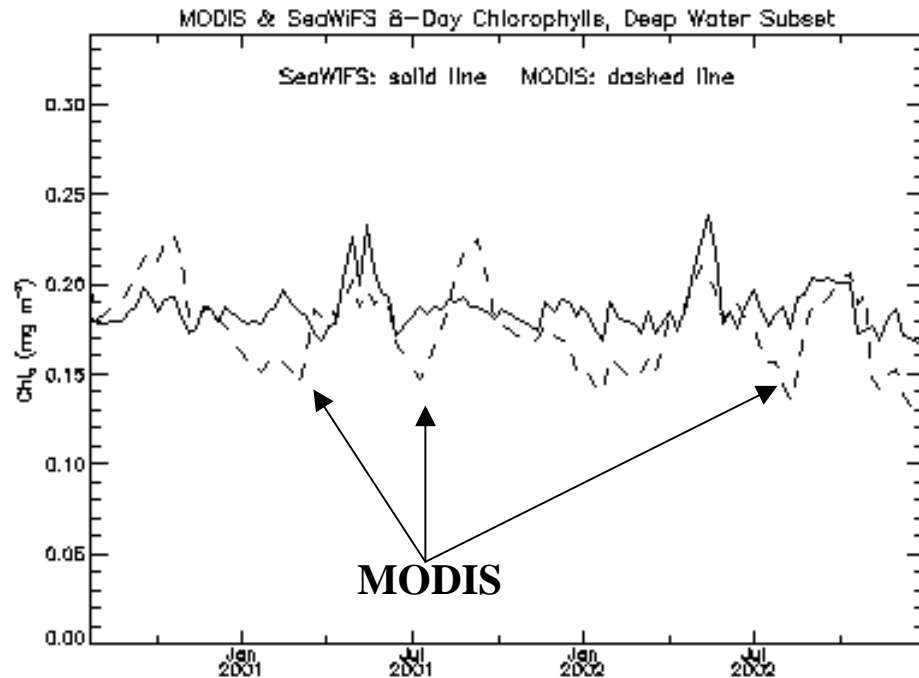


SeaWiFS radiances are relatively stable with time, while MODIS/Terra Collection 4.1 shows long-term increases at 488 and 551-nm and large deviations from SeaWiFS over shorter time-scales.

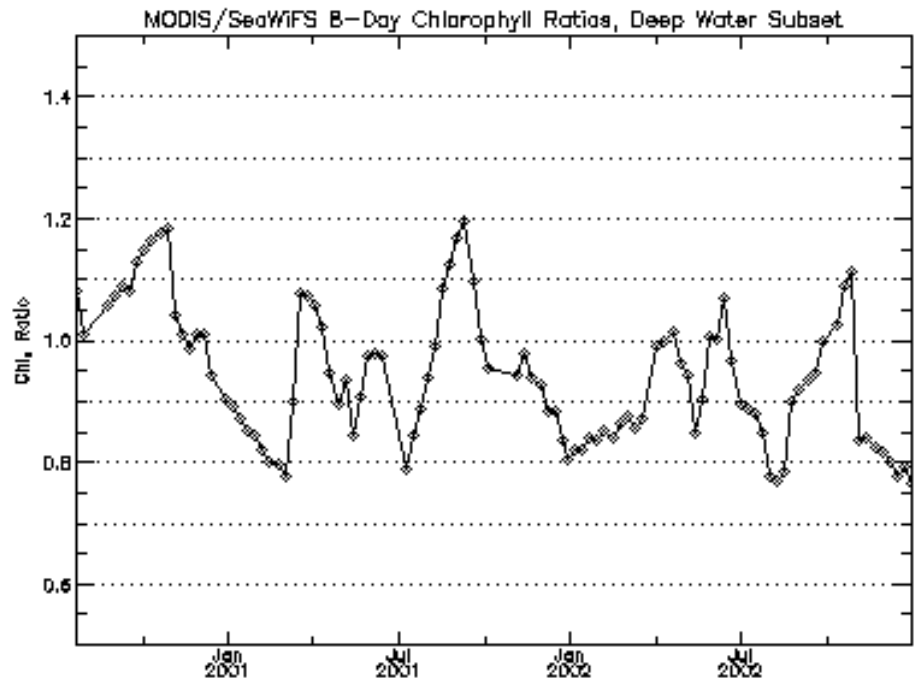
# MODIS and SeaWiFS Chlorophyll Trends

MODIS/Terra **Collection 4.1** vs SeaWiFS 4th Reprocessing  
Deep-Water Subset, 8-Day Means

## SeaWiFS & MODIS



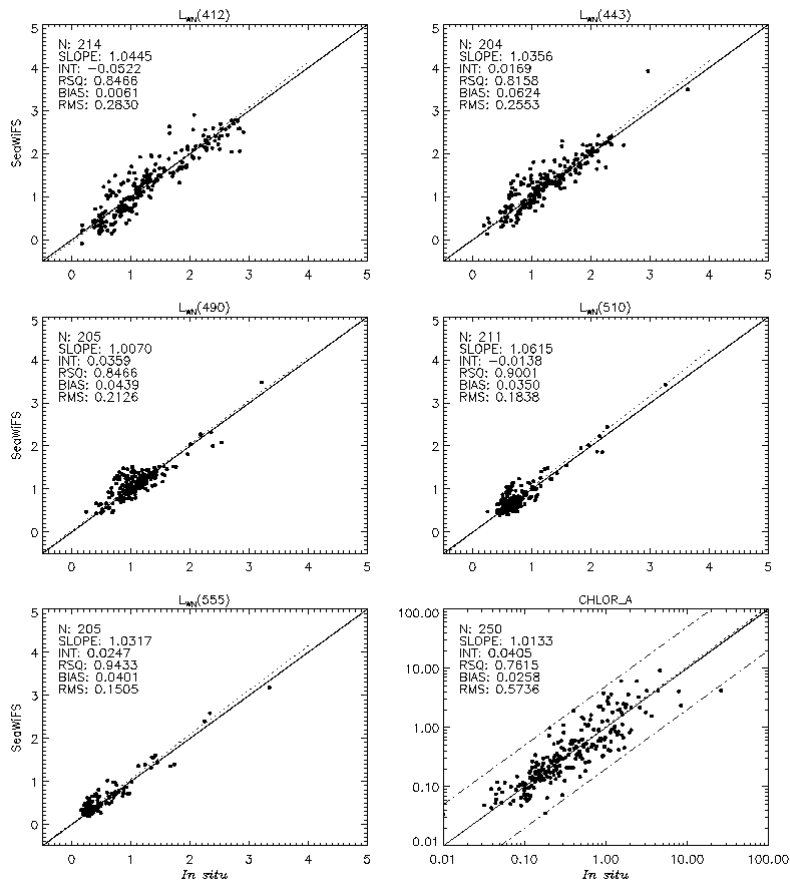
## MODIS/SeaWiFS



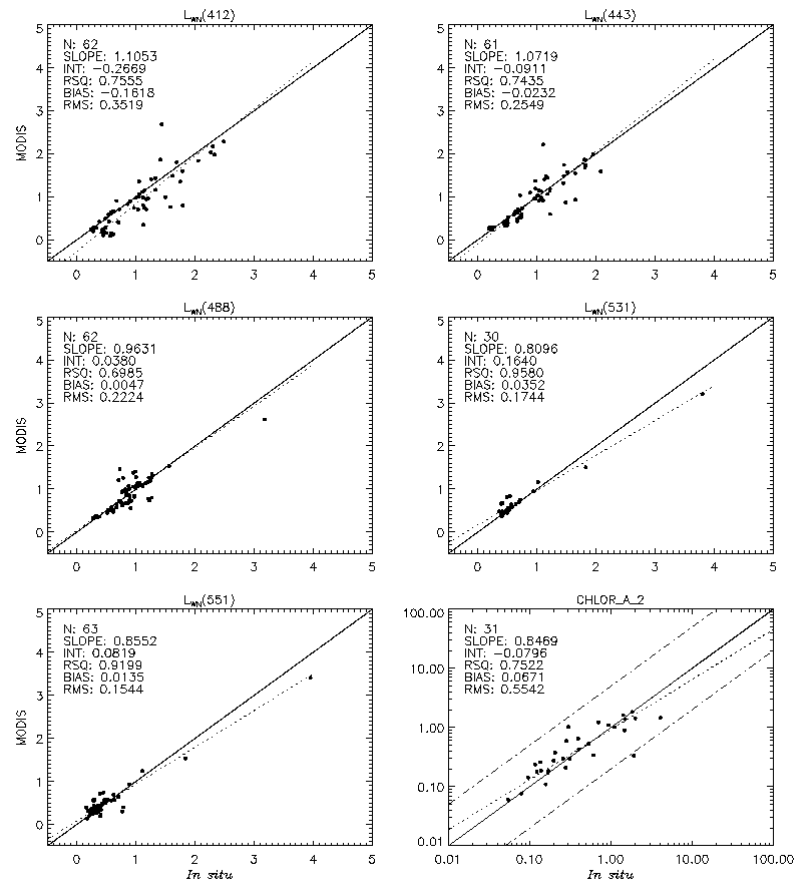
Variability in MODIS/Terra radiances translates to +/- 20% differences in global-averaged deep-water chlorophyll retrievals between sensors. Note that the **agreement is good when averaged over years.**

# Water-Leaving Radiance and Chlorophyll Comparison with *In Situ*

## SeaWiFS 4th Reprocessing

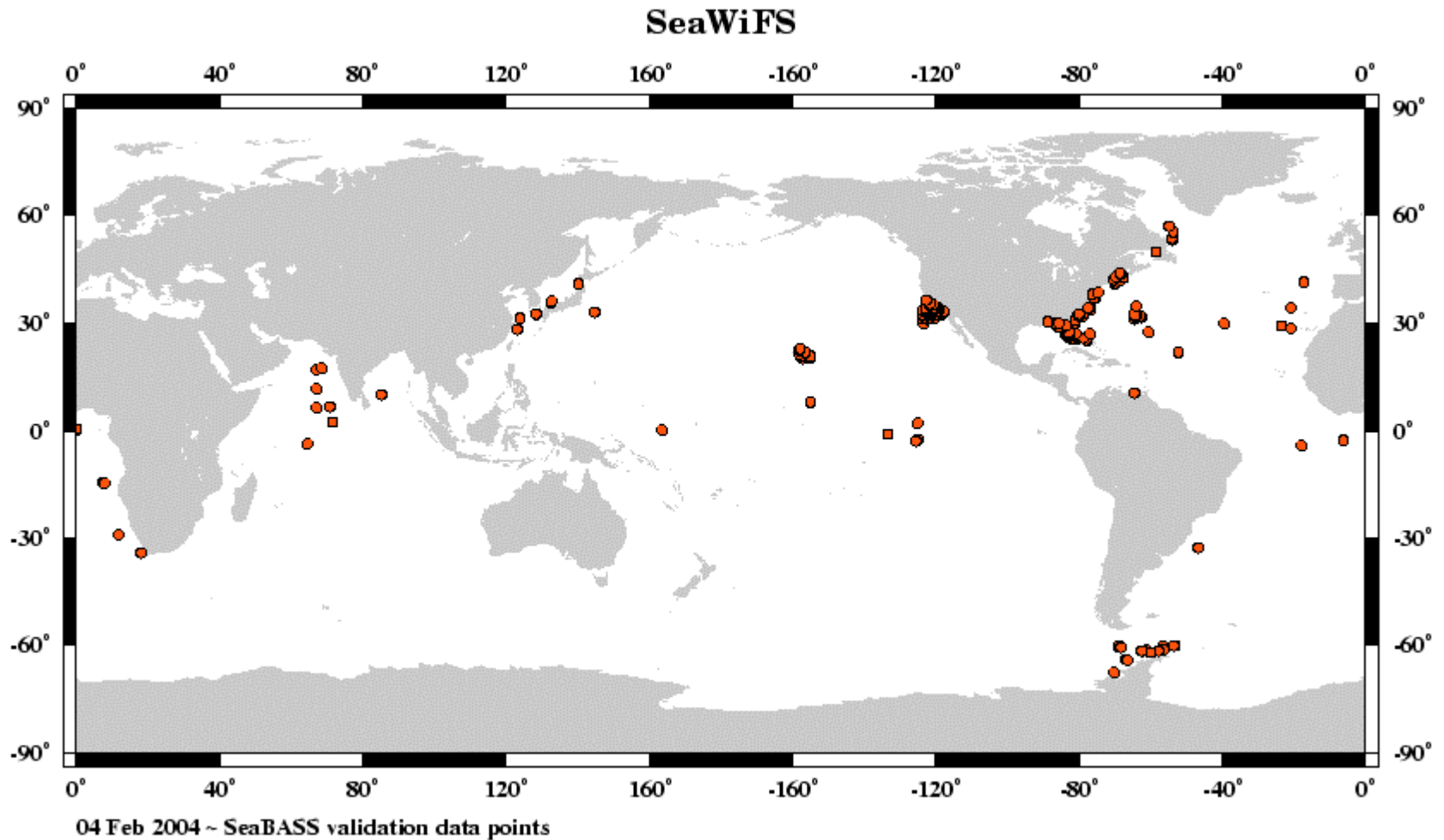


## MODIS/Terra Collection 4.1



Both sensors show a similar level of agreement with *in situ* data.

# Geographic Distribution of SeaBASS *In Situ* Match-ups Over SeaWiFS Mission Lifetime

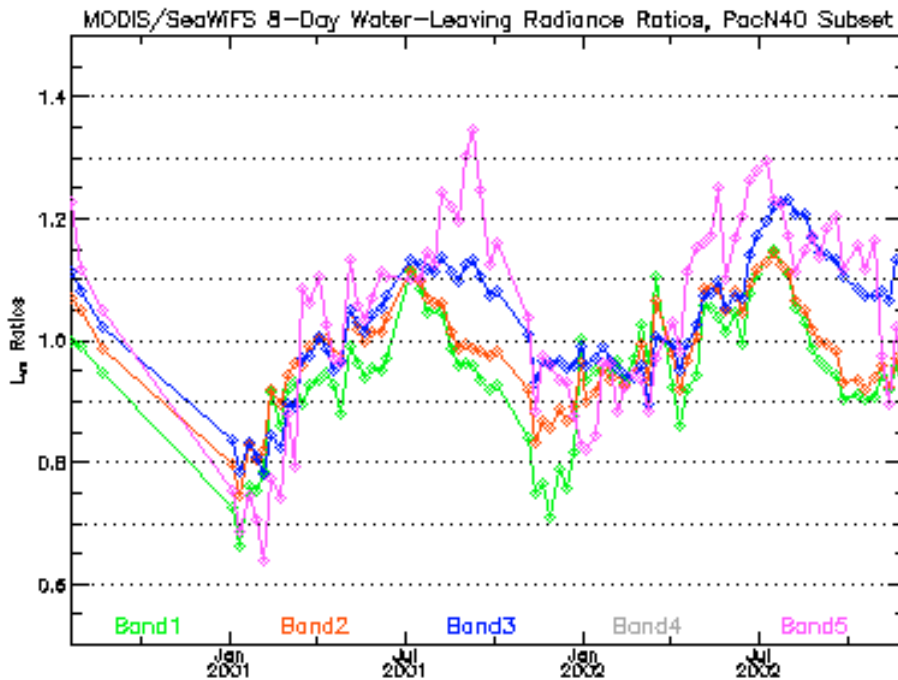


However, match-up distribution is heavily biased to mid-latitude NH,

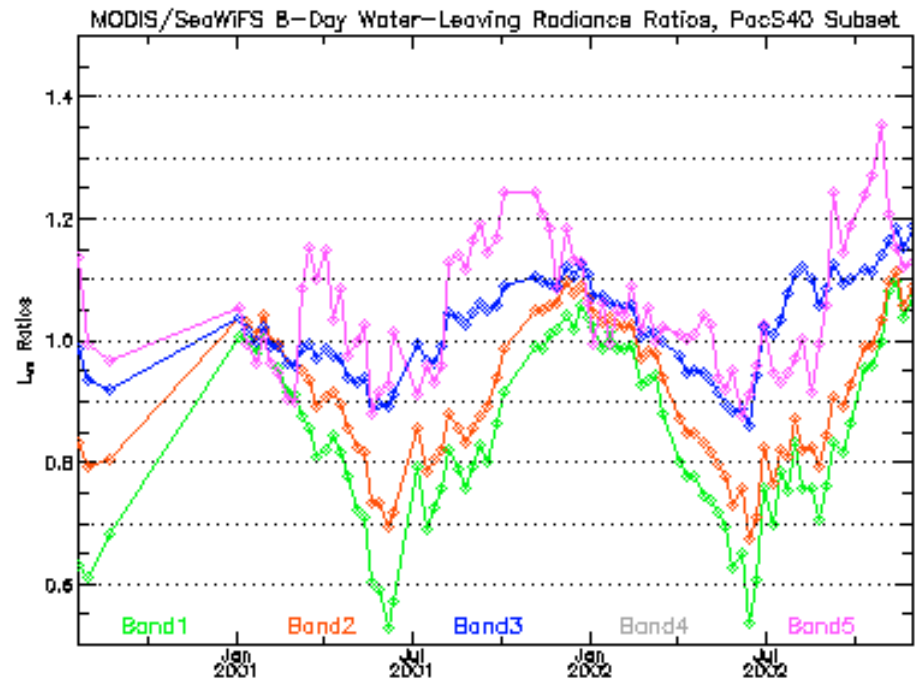
# MODIS/SeaWiFS nLw Ratios

MODIS/Terra **Collection 4.1** vs SeaWiFS 4th Reprocessing  
Zonal Pacific Subsets (**150-170W**), 8-Day Means

## 30N to 40N Latitude



## 30S to 40S Latitude



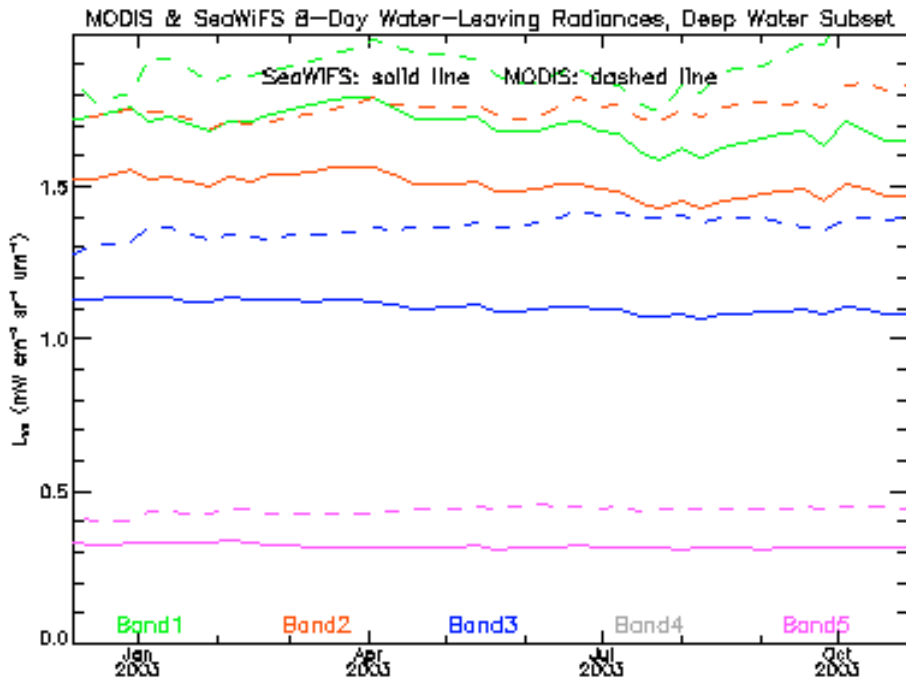
and differences between the two sensors vary geographically with a strong seasonality that increases with latitude (solar zenith angle). This may be uncorrected polarization, BRDF, other .....

What about Aqua?

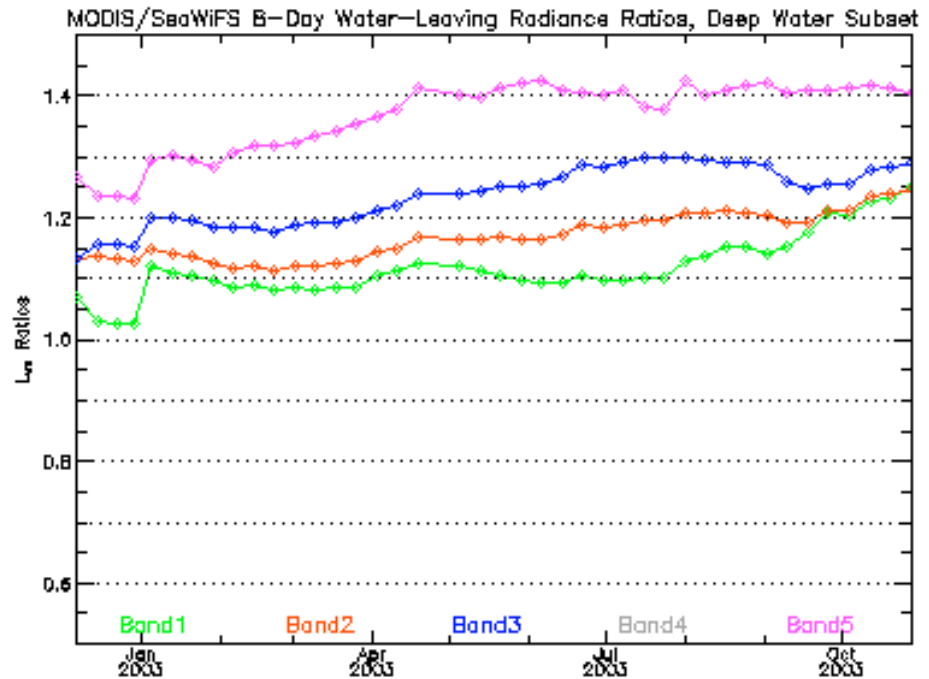
# MODIS and SeaWiFS nLw Trends

MODIS/Aqua Collection 3.0 vs SeaWiFS 4th Reprocessing  
Deep-Water Subset, 8-Day Means

## MODIS & SeaWiFS



## MODIS / SeaWiFS



MODIS radiances are 10-40% higher than SeaWiFS, and increasing with time in all bands. **Few resources have been focused on characterization of MODIS/Aqua, due to difficulties with Terra.**



MODIS/Aqua Reprocessing

within the

Ocean Discipline Processing System  
(ODPS)

# Differences from MODAPS Processing

## File Formats and Standard Product Suite

- SeaWiFS-like file formats for Level-2 and higher.

- SeaWiFS-like product suite + 11um SST.

nLw_412	normalize water-leaving radiance at 412 nm
nLw_443	normalize water-leaving radiance at 443 nm
nLw_488	normalize water-leaving radiance at 488 nm
nLw_531	normalize water-leaving radiance at 531 nm
nLw_551	normalize water-leaving radiance at 551 nm
nLw_667	normalize water-leaving radiance at 667 nm
chlor_a	OC3M chlorophyll (MODAPS chlor_a_2)
sst	11um sea surface temperature
eps_78	750/869 SS aerosol reflectance ratio
angstrom_531	Angstrom exponent 531/869
tau_869	aerosol optical thickness at 869

- Reduced Level-2 file size of 80MB (**5-30MB** compressed).

# Differences from MODAPS Processing Calibration

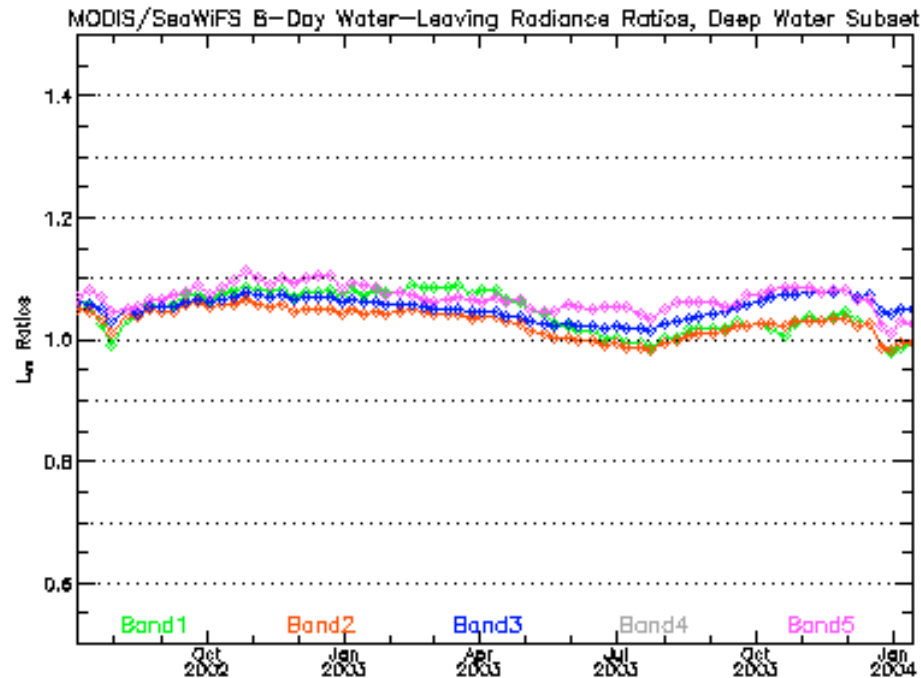
- Instrument Calibration (MCST)
  - Revised temporal calibration based on smoothed solar diffuser measurements and OBC-determined RVS corrections.
- Vicarious Calibration (ODPS)
  - No time dependence.
  - NIR ratio fixed at Tahiti (well characterized AERONET site, chosen for consistency of aerosol type over time).
  - Visible calibration determined at MOBY (6-point average).

412	443	488	531	551	667	749	869
0.9801	0.9846	0.9875	1.0003	0.9984	0.9913	0.9915	1.0000

# MODIS/SeaWiFS nLw Ratio Trends

## Deep-Water Subset, 8-Day Means

### ODPS 1st Reprocessing

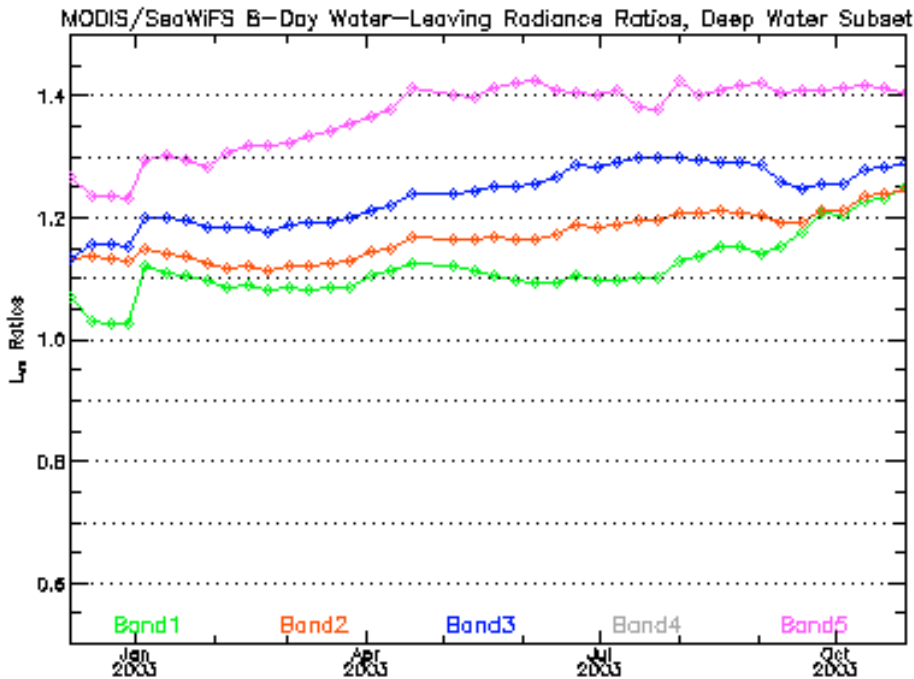


After ODPS reprocessing, MODIS/Aqua radiances are at most 5-10% higher than SeaWiFS, but with seasonal variability in differences.

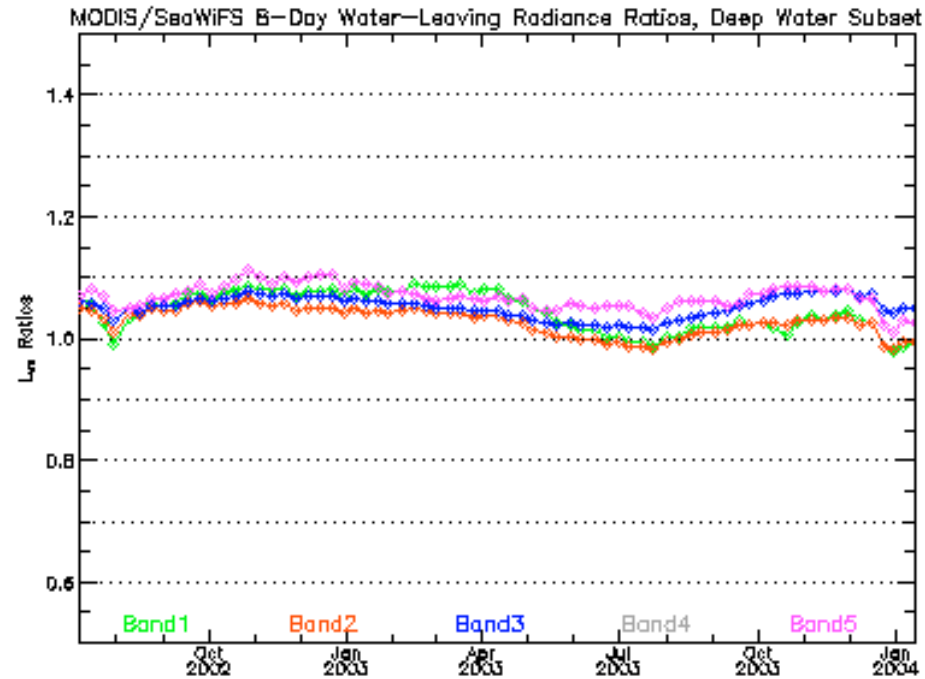
# MODIS/SeaWiFS nLw Ratio Trends

## Deep-Water Subset, 8-Day Means

### MODAPS Collection 3



### ODPS 1st Reprocessing

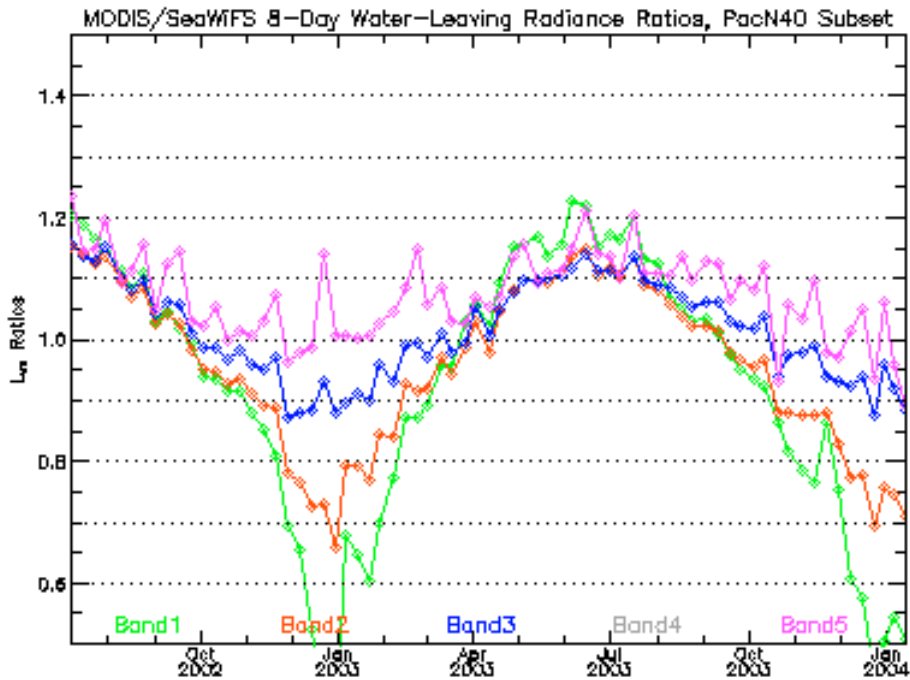


After ODPS reprocessing, MODIS/Aqua radiances are at most 5-10% higher than SeaWiFS, but with seasonal variability in differences.

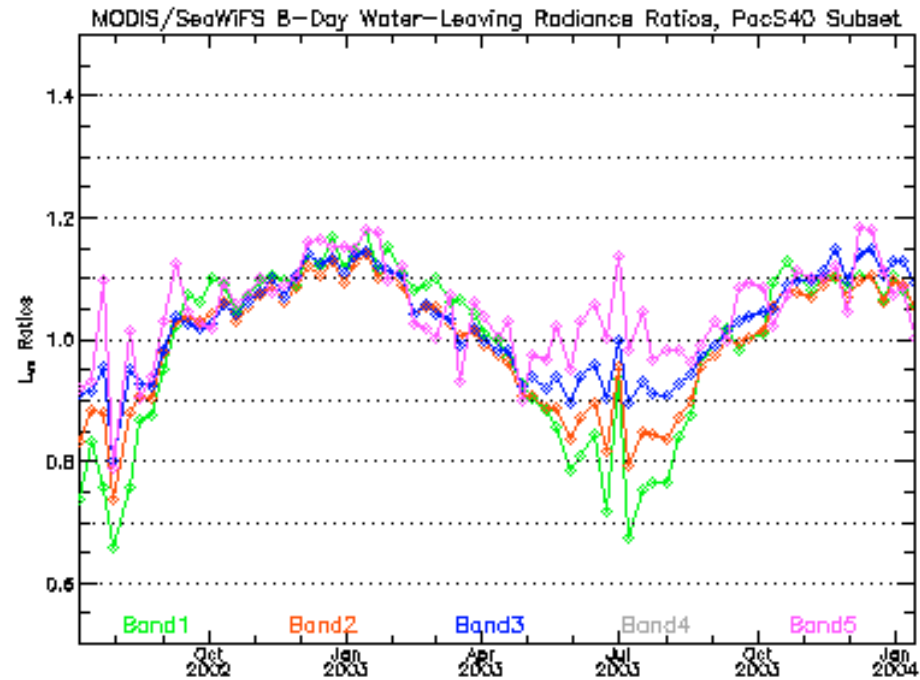
# MODIS/SeaWiFS nLw Ratios

MODIS/Aqua ODPS Reprocessing vs SeaWiFS 4th Reprocessing  
Zonal Pacific Subsets (150-170W), 8-Day Means

## 30N to 40N Latitude



## 30S to 40S Latitude

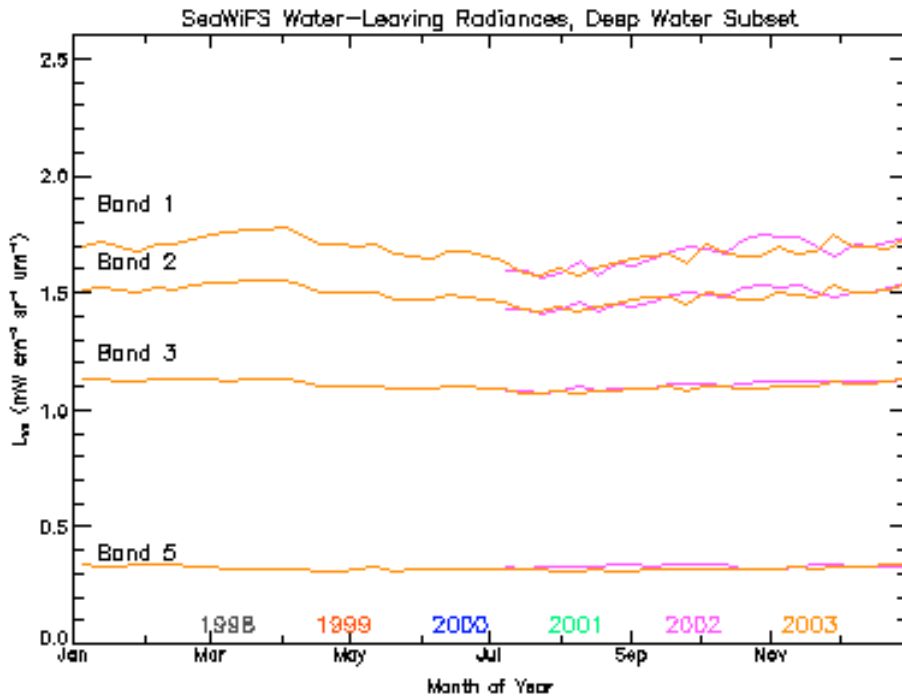


Seasonality in high-latitudinal differences is clear. Magnitude and phase are very similar to comparisons with MODIS/Terra 4.1. This results in high-lat chlorophylls which are 30-50% higher than SeaWiFS in winter.

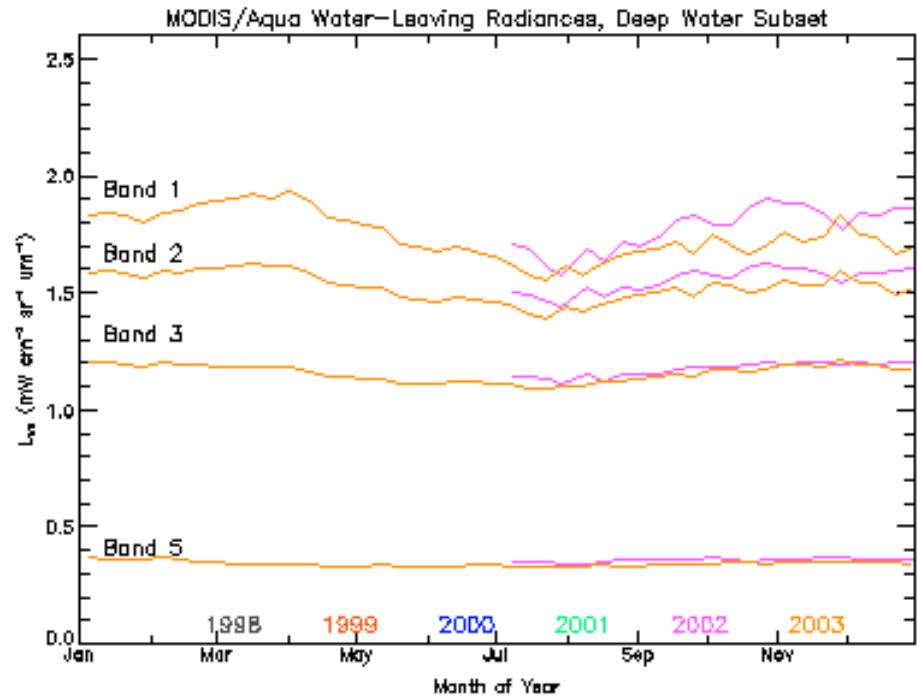
# MODIS and SeaWiFS Annual Repeatability

MODIS/Aqua **ODPS** Reprocessing vs SeaWiFS 4th Reprocessing  
Deep Water Subset, 8-Day Means

## SeaWiFS



## MODIS/Aqua

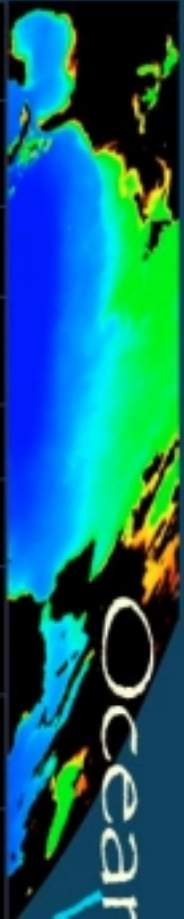


Additional algorithm development and/or characterization work is needed to achieve the level of stability observed with SeaWiFS.

# ODPS Data Distribution

- Currently MODIS/Aqua only
- Aqua data available within 2-4 hrs of observation
- Level-1A + ancillary files for processing in **SeaDAS**
- Level-2 standard product suite
- Level-3 mapped (chlorophyll, K490, tau\_869, nLw\_551)
- Web-based browse, search and order + point and click direct access.
- Direct ftp access to most recent L1A, L1B, Geolocation, L2, and entire mission archive of L3 maps at 4 and 9-km.





## Data Access

### Level 1 and 2 Browser

Visually search the ocean color data archive and directly download and/or order data from single files to the entire mission. Extensive online [HELP](#) and tutorials available.

### Level 3 Browser

Browse the entire Level 3 global ocean color data set for many parameters and time periods and download either JPEG images or digital data in HDF format.

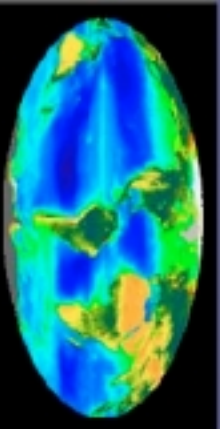
### Oceans FTP Site

The Oceans FTP site contains the most recent 10 days worth of all MODIS/Aqua data and products, as well as the complete Level 3 mapped data archive.

### GES DAAC

The GES DAAC hosts the recently reprocessed MODIS/Terra ocean color data, the SeaWiFS, OCTS, and CZCS data sets and Terra and Aqua SST data (in conventional MODIS format).

## Latest News



Welcome to the new OceanColor Web.

This site is intended to serve as the entry point into all of NASA's ocean color-related activities as part of the [evolution of the Individual ocean mission-based activities](#) into an integrated ocean measurement-based program.

We have just begun the process of integrating the various mission-specific services, information, and documentation that have been developed over a number of years, so we expect that this website will be evolving quite rapidly. We encourage everyone to use the online forum, which is linked through the [Questions](#) button above, to provide feedback, ask questions and offer suggestions.

[Subscribe: Ocean Mailing List](#)

## Support Services

### SeaDAS

SeaDAS is a comprehensive image analysis package for the processing, display, analysis, and quality control of ocean color data

### SeaBASS

SeaBASS is an archive of in situ oceanographic and atmospheric data used for algorithm development and satellite validation.

### Cruise Support Services

Overflight predictions;  
Near real-time imagery and data for cruise support.

### MOABI

MODIS (Ocean) Quality Assurance Browse Imagery Tool that allows access to MODIS Sea Surface Temperature products and statistics

online repository for anonymous ftp downloads containing:

- 1- the most recent 10 days of ALL MODIS/AQUA products
- 2- the complete Level-3 mission archive at multiple time/space resolutions
- 3- the complete ancillary met/ozone data and attitude and ephemeris

## **MODIS/Aqua data available within hours of observation**

**oceans.gsfc.nasa.gov**

---

Anonymous access granted, restrictions apply.

---

**Path:** [oceans.gsfc.nasa.gov]

<b>Name</b>	<b>Size</b>	<b>Kind</b>	<b>Last Modified</b>
<a href="#">Aqua SMI</a>	-	Folder	Wed, Jan 28, 2004, 3:29 AM
<a href="#">METOZ</a>	-	Folder	Tue, Feb 3, 2004, 7:56 PM
<a href="#">MODISA</a>	-	Folder	Wed, Feb 4, 2004, 6:51 PM
<a href="#">README</a>	2K	Text Readme	Wed, Feb 4, 2004, 8:09 PM
<a href="#">Recent Aqua</a>	-	Folder	Tue, Feb 10, 2004, 5:30 AM
<a href="#">Recent Aqua Night</a>	-	Folder	Tue, Feb 10, 2004, 5:31 AM

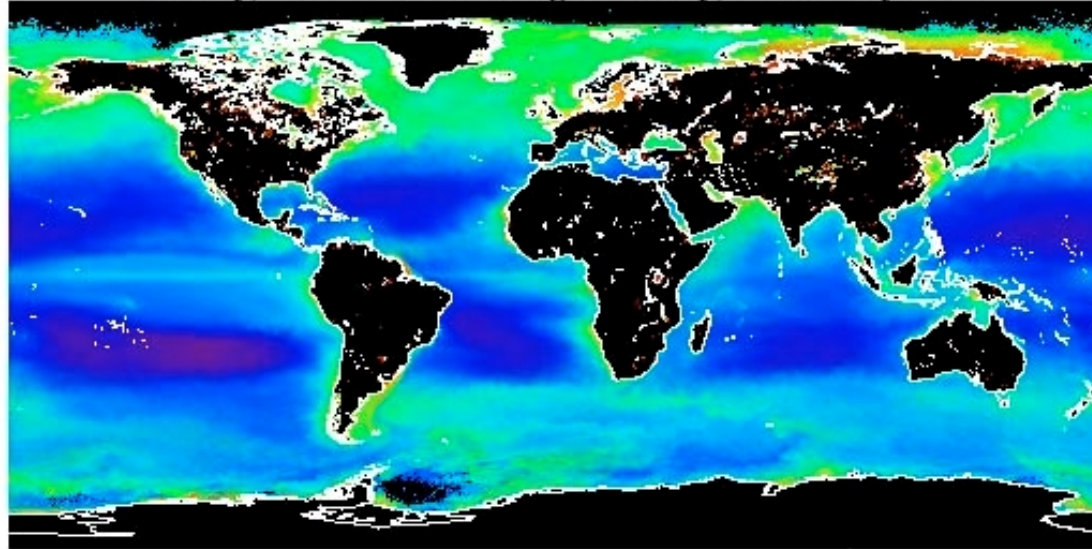
# Multi-Mission Browse and Order Page - Showing navigation tools

## Selection = Full MODIS/Aqua Mission - Chlorophyll

Navigation: [^](#) [<](#) [>](#) [TO CHL](#) [SST](#)

- GAC
- LAC
- HRPT
- MLAC
- MODIS (Aqua)

Sunday, 23 June 2002 through Monday, 9 February 2004



Chlorophyll

[Comment](#)

[Help](#)

Select one or more regions:

- AdriaticSea
- AegeanSea
- Antarctica
- ArabianSea
- AralSea
- Australia
- Azores

or specify boundary coordinates or a single location:

N:

W:  :E

S:

or check this box  to select all of this time period's scenes.

[Find swaths](#)

[Reconfigure page](#)

Radius (km) about map click or typed-in location:

36  400  800  1200  1500

Select swaths containing (at least):

any part  25 %  50 %  75 %  all of the area of interest.

Display results  at a time.

Mission	2002	J	F	M	A	M	J	J	A	S	O	N	D
	2003	J	F	M	A	M	J	J	A	S	O	N	D
	2004	J	F	M	A	M	J	J	A	S	O	N	D

December 2003						
S	M	T	W	T	F	S
	<a href="#">1</a>	<a href="#">2</a>	<a href="#">3</a>	<a href="#">4</a>	<a href="#">5</a>	<a href="#">6</a>
	***	***	xxx	xxx	xxx	xxx
<a href="#">7</a>	<a href="#">8</a>	<a href="#">9</a>	<a href="#">10</a>	<a href="#">11</a>	<a href="#">12</a>	<a href="#">13</a>
xxx	xxx	xxx	xxx	^^^	^^^	^^^
<a href="#">14</a>	<a href="#">15</a>	<a href="#">16</a>	<a href="#">17</a>	<a href="#">18</a>	<a href="#">19</a>	<a href="#">20</a>
^^^	^^^	^^^	^^^	^^^	000	000
<a href="#">21</a>	<a href="#">22</a>	<a href="#">23</a>	<a href="#">24</a>	<a href="#">25</a>	<a href="#">26</a>	<a href="#">27</a>
000	000	000	000	000	000	***
<a href="#">28</a>	<a href="#">29</a>	<a href="#">30</a>	<a href="#">31</a>			
***	***	***	***			

January 2004						
S	M	T	W	T	F	S
				<a href="#">1</a>	<a href="#">2</a>	<a href="#">3</a>
				000	000	000
<a href="#">4</a>	<a href="#">5</a>	<a href="#">6</a>	<a href="#">7</a>	<a href="#">8</a>	<a href="#">9</a>	<a href="#">10</a>
000	000	000	000	000	***	***
<a href="#">11</a>	<a href="#">12</a>	<a href="#">13</a>	<a href="#">14</a>	<a href="#">15</a>	<a href="#">16</a>	<a href="#">17</a>
***	***	***	***	***	***	xxx
<a href="#">18</a>	<a href="#">19</a>	<a href="#">20</a>	<a href="#">21</a>	<a href="#">22</a>	<a href="#">23</a>	<a href="#">24</a>
xxx	xxx	xxx	xxx	xxx	xxx	xxx
<a href="#">25</a>	<a href="#">26</a>	<a href="#">27</a>	<a href="#">28</a>	<a href="#">29</a>	<a href="#">30</a>	<a href="#">31</a>
^^^	^^^	^^^	^^^	^^^	^^^	^^^

February 2004						
S	M	T	W	T	F	S
<a href="#">1</a>	<a href="#">2</a>	<a href="#">3</a>	<a href="#">4</a>	<a href="#">5</a>	<a href="#">6</a>	<a href="#">7</a>
^^^	000	000	000	000	000	000
<a href="#">8</a>	<a href="#">9</a>	<a href="#">10</a>	<a href="#">11</a>	<a href="#">12</a>	<a href="#">13</a>	<a href="#">14</a>
000	000	***	***	***	***	***
<a href="#">15</a>	<a href="#">16</a>	<a href="#">17</a>	<a href="#">18</a>	<a href="#">19</a>	<a href="#">20</a>	<a href="#">21</a>
***	***	***	xxx	xxx	xxx	xxx
<a href="#">22</a>	<a href="#">23</a>	<a href="#">24</a>	<a href="#">25</a>	<a href="#">26</a>	<a href="#">27</a>	<a href="#">28</a>
xxx	xxx	xxx	xxx	^^^	^^^	^^^
<a href="#">29</a>						
^^^						

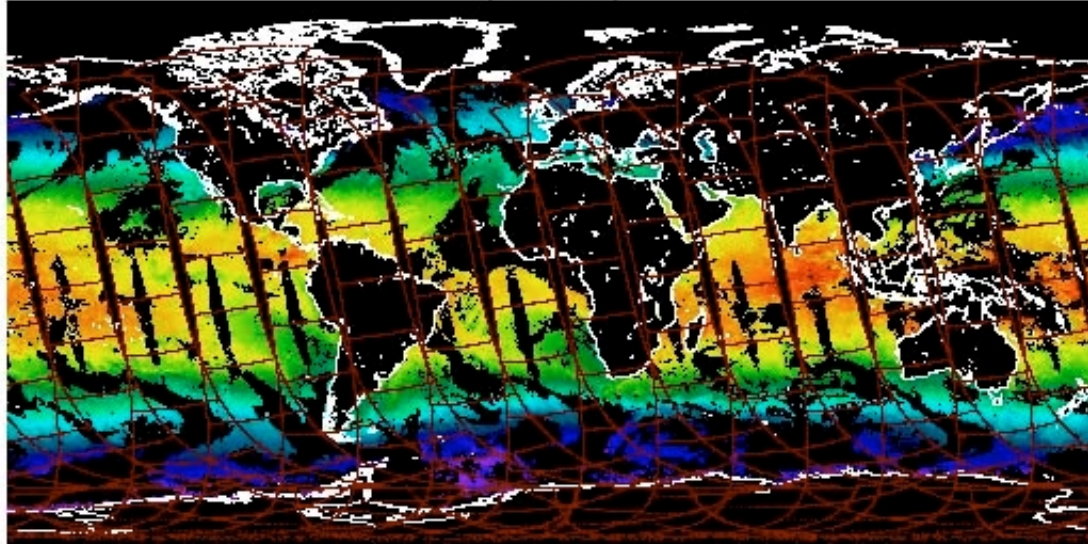


# Selection = Single Day MODIS/Aqua Mission - Sea Surface Temperature

For next screen, click on map near Central America



Saturday, 7 February 2004  
(2004038)



Sea Surface Temperature

Radius (km) about map click or typed-in location:



Select swaths containing (at least):



any part 25 % 50 % 75 % all of the area of interest.

Display results  at a time.

Comment

Select one or more regions:

- AdriaticSea
- AegeanSea
- Antarctica
- ArabianSea
- AralSea
- Australia
- Azores

or specify boundary coordinates or single location:

N:   
W:  :E  
S:

or check this box  to select all this time period's scenes.

M i s s i o n	<a href="#">2002</a>	J	F	M	A	M	J	J	A	S	O	N	D
	<a href="#">2003</a>	J	F	M	A	M	J	J	A	S	O	N	D
	<a href="#">2004</a>	J	F	M	A	M	J	J	A	S	O	N	D

December 2003						
S	M	T	W	T	F	S
	<a href="#">1</a>	<a href="#">2</a>	<a href="#">3</a>	<a href="#">4</a>	<a href="#">5</a>	<a href="#">6</a>
	***	***	xxx	xxx	xxx	xxx
<a href="#">7</a>	<a href="#">8</a>	<a href="#">9</a>	<a href="#">10</a>	<a href="#">11</a>	<a href="#">12</a>	<a href="#">13</a>
xxx	xxx	xxx	xxx	^^^	^^^	^^^
<a href="#">14</a>	<a href="#">15</a>	<a href="#">16</a>	<a href="#">17</a>	<a href="#">18</a>	<a href="#">19</a>	<a href="#">20</a>
^^^	^^^	^^^	^^^	^^^	000	000
<a href="#">21</a>	<a href="#">22</a>	<a href="#">23</a>	<a href="#">24</a>	<a href="#">25</a>	<a href="#">26</a>	<a href="#">27</a>
000	000	000	000	000	000	***
<a href="#">28</a>	<a href="#">29</a>	<a href="#">30</a>	<a href="#">31</a>			
***	***	***	***			

January 2004						
S	M	T	W	T	F	S
				<a href="#">1</a>	<a href="#">2</a>	<a href="#">3</a>
				000	000	000
<a href="#">4</a>	<a href="#">5</a>	<a href="#">6</a>	<a href="#">7</a>	<a href="#">8</a>	<a href="#">9</a>	<a href="#">10</a>
000	000	000	000	000	***	***
<a href="#">11</a>	<a href="#">12</a>	<a href="#">13</a>	<a href="#">14</a>	<a href="#">15</a>	<a href="#">16</a>	<a href="#">17</a>
***	***	***	***	***	***	xxx
<a href="#">18</a>	<a href="#">19</a>	<a href="#">20</a>	<a href="#">21</a>	<a href="#">22</a>	<a href="#">23</a>	<a href="#">24</a>
xxx	xxx	xxx	xxx	xxx	xxx	xxx
<a href="#">25</a>	<a href="#">26</a>	<a href="#">27</a>	<a href="#">28</a>	<a href="#">29</a>	<a href="#">30</a>	<a href="#">31</a>
^^^	^^^	^^^	^^^	^^^	^^^	^^^

February 2004						
S	M	T	W	T	F	S
<a href="#">1</a>	<a href="#">2</a>	<a href="#">3</a>	<a href="#">4</a>	<a href="#">5</a>	<a href="#">6</a>	<a href="#">7</a>
^^^	000	000	000	000	000	000
<a href="#">8</a>	<a href="#">9</a>	<a href="#">10</a>	<a href="#">11</a>	<a href="#">12</a>	<a href="#">13</a>	<a href="#">14</a>
000	000	***	***	***	***	***
<a href="#">15</a>	<a href="#">16</a>	<a href="#">17</a>	<a href="#">18</a>	<a href="#">19</a>	<a href="#">20</a>	<a href="#">21</a>
***	***	***	xxx	xxx	xxx	xxx
<a href="#">22</a>	<a href="#">23</a>	<a href="#">24</a>	<a href="#">25</a>	<a href="#">26</a>	<a href="#">27</a>	<a href="#">28</a>
xxx	xxx	xxx	xxx	^^^	^^^	^^^
<a href="#">29</a>						
^^^						

# Single file (level-1 or level-2) browse and download page

From this page one can directly download the compressed data Files in either level-1 or level-2 format as well as the supporting documentation.

The next example shows how to order all the files acquired over a week covering a given geographic region.



[A2004038191500.L1A\\_LAC](#)

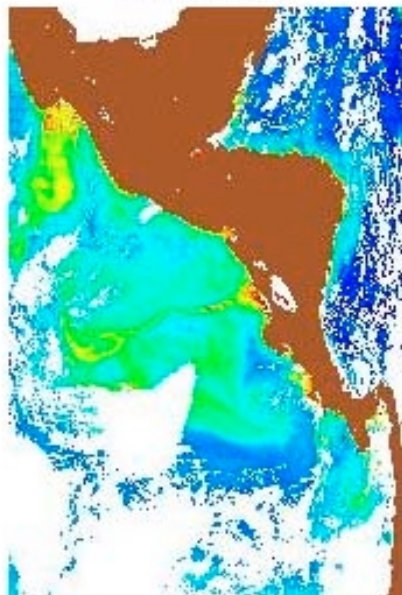
50,998,234 bytes

[A2004038191500.L2\\_LAC](#)

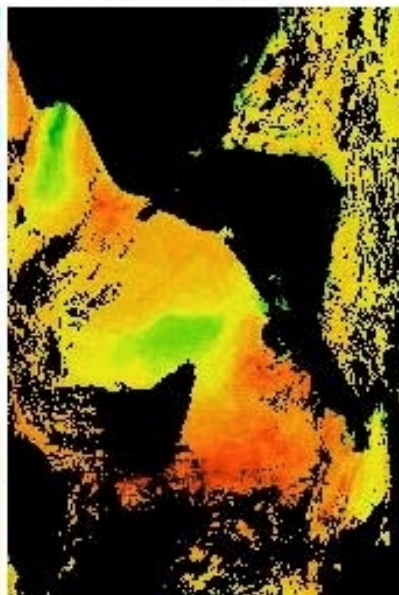
20,472,527 bytes

(The above hyperlinks point to [bzip2-compressed HDF files](#).  
Documentation on these **prototype** products can be found [HERE](#).)

**Chlorophyll**



**Sea Surface Temperature**

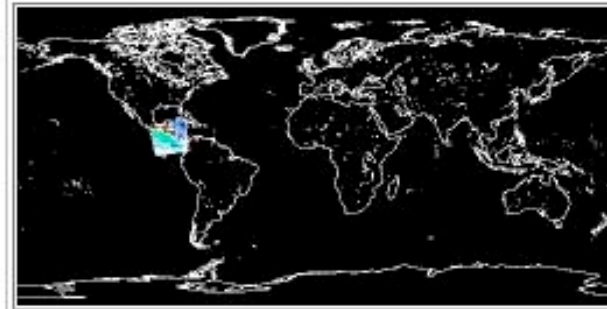


[Comment](#)

[Help](#)

Saturday, 7 February 2004

2004038



### Search Criteria

**Time Period:** Saturday, 7 February 2004

**Sensors:** MODIS(Aqua)

**Area of Interest:** Within 36 km of 16.5N,90.4W

**Percentage of AOI that swaths must include:** Any part

**Number of swaths:** 1 swath found



# Selection = Eight Day MODIS/Aqua Mission

Next Screen: select ALL the Aqua files that cover east coast of the United States during this period by clicking on the map

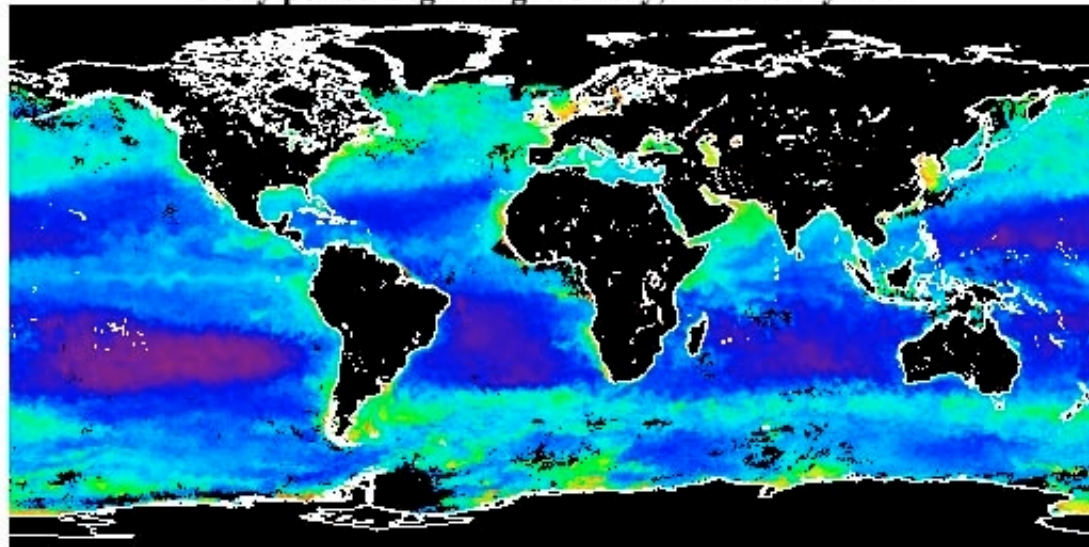


[Comment](#)

[Help](#)



8-day period beginning Monday, 2 February 2004



Select one or more regions:

- AdriaticSea
- AegeanSea
- Antarctica
- ArabianSea
- AralSea
- Australia
- Azores

or specify boundary coordinates or a single location:

N:   
 W:  :  E  
 S:

or check this box  to select all of this time period's scenes.

[Find swaths](#)

Radius (km) about map click or typed-in location:

36  400  800  1200  1500

Select swaths containing (at least):

any part  25 %  50 %  75 %  all of the area of interest.

Display results  at a time.

[Reconfigure page](#)

Chlorophyll


M i s s i o n	2002	J	F	M	A	M	J	J	A	S	O	N	D
	2003	J	F	M	A	M	J	J	A	S	O	N	D
	2004	J	F	M	A	M	J	J	A	S	O	N	D










December 2003						
S	M	T	W	T	F	S
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
	***	***	xxx	xxx	xxx	xxx
	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>
	xxx	xxx	xxx	xxx	^^^	^^^
	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>
	^^^	^^^	^^^	^^^	^^^	000
	<u>21</u>	<u>22</u>	<u>23</u>	<u>24</u>	<u>25</u>	<u>26</u>
	000	000	000	000	000	000
	<u>28</u>	<u>29</u>	<u>30</u>	<u>31</u>		
	***	***	***	***		

January 2004						
S	M	T	W	T	F	S
				<u>1</u>	<u>2</u>	<u>3</u>
				000	000	000
	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
	000	000	000	000	000	***
	<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>
	***	***	***	***	***	***
	<u>18</u>	<u>19</u>	<u>20</u>	<u>21</u>	<u>22</u>	<u>23</u>
	xxx	xxx	xxx	xxx	xxx	xxx
	<u>25</u>	<u>26</u>	<u>27</u>	<u>28</u>	<u>29</u>	<u>30</u>
	^^^	^^^	^^^	^^^	^^^	^^^

February 2004						
S	M	T	W	T	F	S
<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
^^^	000	000	000	000	000	000
<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>
000	000	***	***	***	***	***
<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>20</u>	<u>21</u>
***	***	***	xxx	xxx	xxx	xxx
<u>22</u>	<u>23</u>	<u>24</u>	<u>25</u>	<u>26</u>	<u>27</u>	<u>28</u>
xxx	xxx	xxx	xxx	^^^	^^^	^^^
<u>29</u>						
^^^						

These are all the Aqua files that covered the geographic region you Chose during the first 8 day period in February 2004. You can individually select which files you may want to order by clicking on the little box above the image (based on coverage, cloud cover,etc.) or just order them all.

^ < > TC CHL SST  Display  at a time.
 [ORDER DATA](#)
[Comment](#)
[Help](#)

<a href="#">↕A2004039182500.L2 LAC</a>		<a href="#">↕A2004036175500.L2 LAC</a>		<a href="#">↕A2004033172500.L2 LAC</a>				
<a href="#">↕A2004037184000.L2 LAC</a>				<a href="#">↕A2004035171500.L2 LAC</a>				
8Feb2004	7Feb2004	6Feb2004		5Feb2004	4Feb2004		3Feb2004	2Feb2004
****	****	****	****	****	****	****	****	****
								
<a href="#">↕A2004038174500.L2 LAC</a>				<a href="#">↕A2004035185000.L2 LAC</a>				
<a href="#">↕A2004037170000.L2 LAC</a>				<a href="#">↕A2004034181000.L2 LAC</a>				

### Search Criteria

**Time Period:** 8-day period beginning Monday, 2 February 2004

**Sensors:** MODIS(Aqua)

**Area of Interest:** Within 36 km of 39.7N,74.2W

**Percentage of AOI that swaths must include:** Any part

**Number of swaths:** 1st through 9th of 9 swaths

Choose which products you want and what level of interaction with the ordering system you prefer.



Comment

Help

Enter your email address.

gene.c.feldman@nasa.gov

Pick which data products you want for your selected scenes.

- Level 1
- Level 2
- Meteorology & Ozone
- Attitude & Ephemeris
  
- Remind me when my order is about to expire.
- Require my email confirmation for early file deletion.
- Notify me when my data have been deleted from the staging area.

Review order



Review your order and if correct, submit it. In a few minutes after you submit Your order, you will receive an automated confirmation message from the Ordering system that by replying to, will trigger your order to be filled. Currently, orders are staged within 3-5 minutes after confirmation.



[Comment](#)

[Help](#)

You are about to order the following 18 files from the SeaWiFS Data Processing System.

A2004039182500.L1A_LAC	A2004037184000.L1A_LAC	A2004036175500.L1A_LAC	A2004035171500.L1A_LAC	A2004034181000.L2_LAC
A2004039182500.L2_LAC	A2004037184000.L2_LAC	A2004036175500.L2_LAC	A2004035171500.L2_LAC	A2004033172500.L1A_LAC
A2004038174500.L1A_LAC	A2004037170000.L1A_LAC	A2004035185000.L1A_LAC	A2004034181000.L1A_LAC	A2004033172500.L2_LAC
A2004038174500.L2_LAC	A2004037170000.L2_LAC	A2004035185000.L2_LAC		

The total volume of the above files (*in the compressed form in which they are stored in our archive*) is **475,250,680** bytes.

You are also about to order the ancillary data (*Meteorology & Ozone and Attitude & Ephemeris*) that correspond to the scenes in your search results

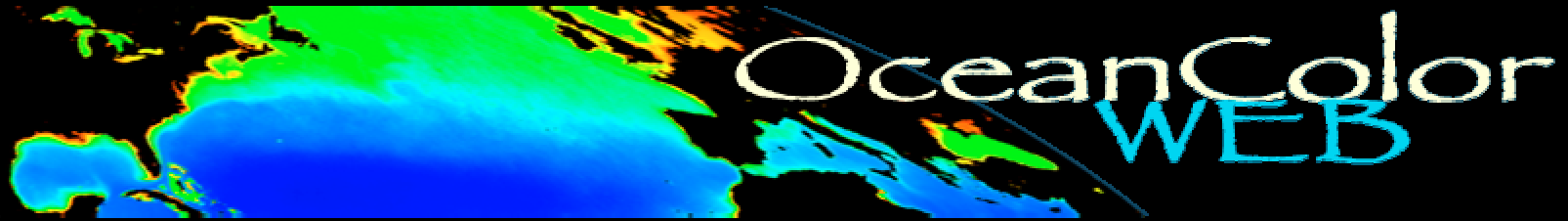
You **do** wish to be reminded by email when your order is about to expire, and you **do** require email confirmation when you use the Web to request early deletion of your staged order, and you **do** wish to be notified when your order has been deleted from our staging area.

The email address you have entered is **gene.c.feldman@nasa.gov**.

If all this information is correct and you wish to submit your order to be filled, then click the "Submit order" button below.

# Work in Progress

- Frequent reprocessing for evaluation (80-100x processing capacity)
- Running various sensitivity analyses over temporal subset of MODIS/Aqua mission.
  - Various polarization correction approaches
  - Various BRDF correction options
  - Various Level-1B LUT approaches (working closely with MCST personnel)
- Additional distribution options (parameter and geographic subsetting, subscriptions)



**<http://oceancolor.gsfc.nasa.gov/>**

Data Browse and Order

Data Products and Format Information

SeaDAS Display and Processing Software

Ocean Color Mailing List Subscription

User Forums for Q & A

Calibration & Validation Information

# Extra Slides

Some issues raised in recent calibration reviews reflect a difficulty in separating changes in instrument from changes in SD measurements.

## Challenging Issues and Concerns

- BRF error's impact on RSB calibration
- Instrument and focal plane temperature effects
- On-orbit RVS characterization limits
- Polarization (SBRs/MCST/Miami)
- SD screen vignetting effect – observations and simulation results (Xiong/Waluschka)
- Scattering (SBRs/Waluschka)
- Earth shine (Wolfe)
- Calibration (detector's response) stability

# MODIS Oceans Calibration

- **MCST pre-launch calibration**
  - DN to reflectance, temperature corrections, response versus scan angle (RVS)
- **MCST on-orbit calibration (solar, lunar, srca)**
  - time dependent gains
  - RVS adjustments
  - detector normalization (destriping)
- **RSMAS (Univ. of Miami) vicarious calibration**
  - time dependent gains, offsets to match water-leaving radiances from MOBY
  - time dependent RVS correction, detector normalization, mirror-side correction by flat-fielding near Hawaii.

# MODIS Calibration Issues

## **Class 1: Potential Level-1 calibration coefficient sources of error**

- Excess radiance on the MODIS solar diffuser (SD) due to Earthshine
- Excess radiance on the MODIS SD due to uncertainties in attenuation screen
- Uncertainty in the SD bi-directional reflectance (BRF) correction
- Uncertainties in the focal plane temperature corrections

## **Class 2: Maintaining calibration intra-orbit and inter-season**

- Stray light in the optical path from Earth view
- Detector-based temperature correction estimates
- **Changing polarization sensitivity**
- Uncertainties in the focal plane temperature correction

# Differences from MODAPS Processing

## Processing Algorithms

- SeaWiFS Level-2 and Level-3 processing software applied.
- Updated polarization sensitivity tables.
- Minimal BRDF correction (no f/Q).
- Alternate NIR water-leaving radiance correction (Arnone & Stumpf rather than Seigel).
- Additional correction of nLw for out-of-band response.
- Reduced aerosol model suite (12 models).
- Glint correction (SeaWiFS algorithm + polarization terms).
- Whitecap correction (SeaWiFS algorithm).
- Different solar irradiance model (Thuillier 2003).
- No NIR smoothing.



# Simplified RSMAS Calibration Model (RADCOR)

*only what is active for ocean color*

$$L'(b,d,p,t) = [L(b,d,p,t) - O_v(b,t)] G_v(b,t) G_d(b,d,t) G_r(b,m,p,t)$$

where:

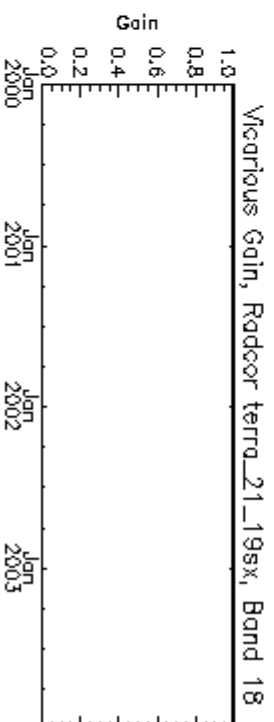
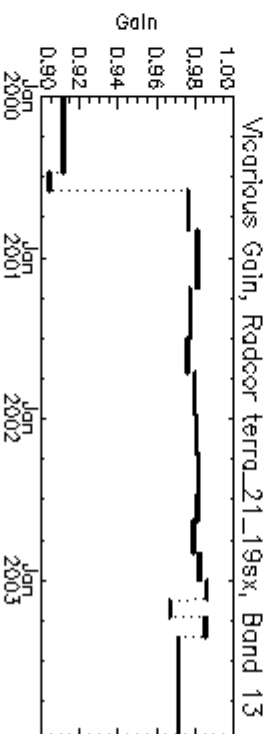
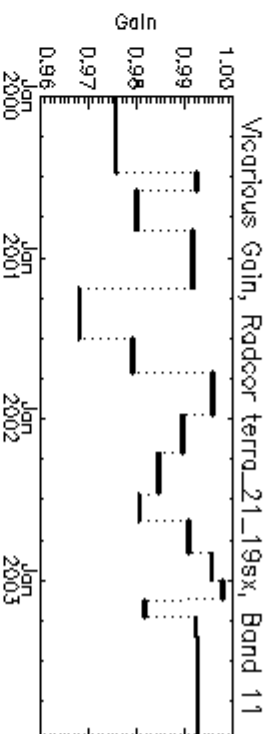
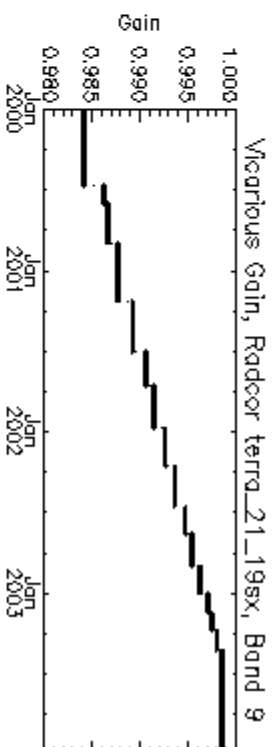
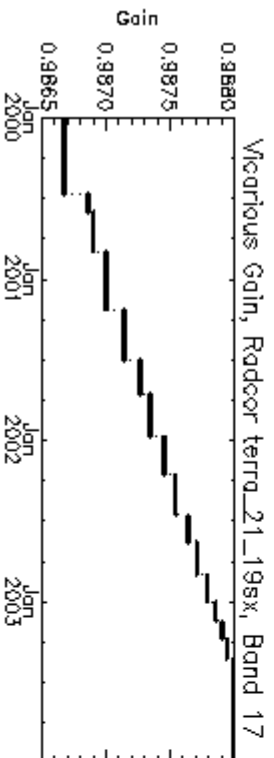
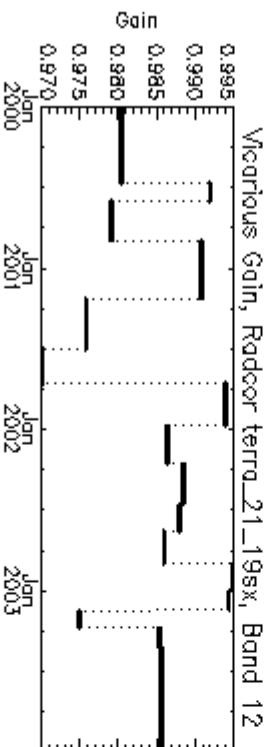
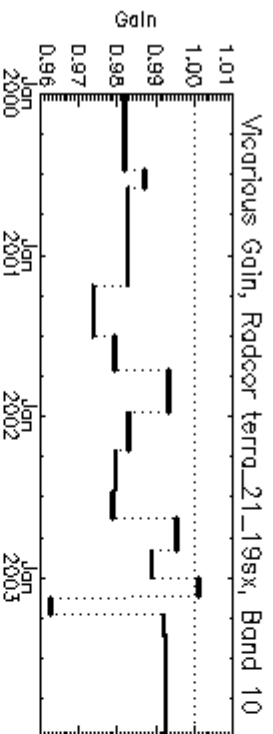
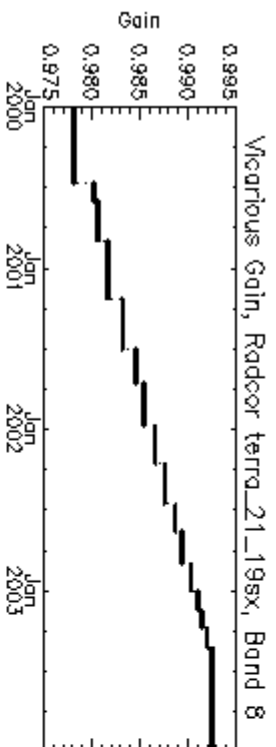
$O_v$  is the vicarious offset

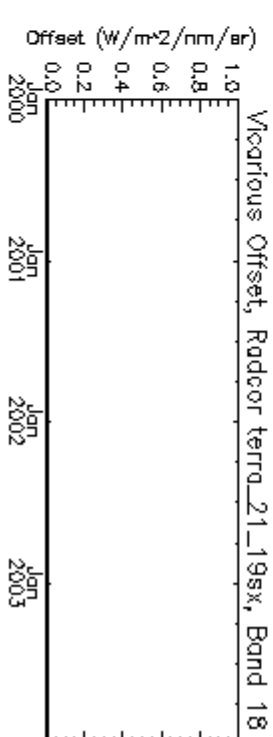
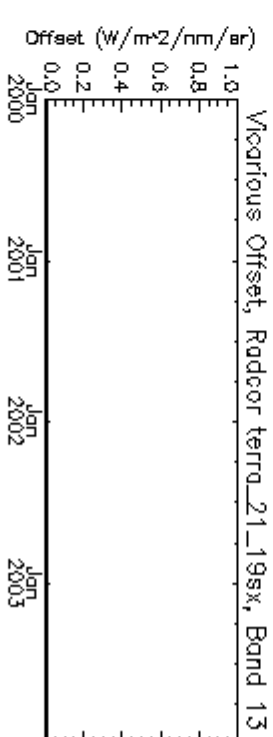
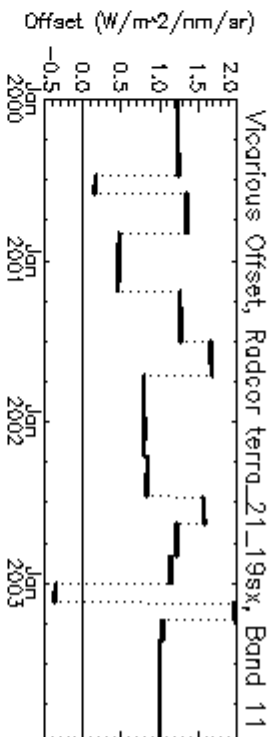
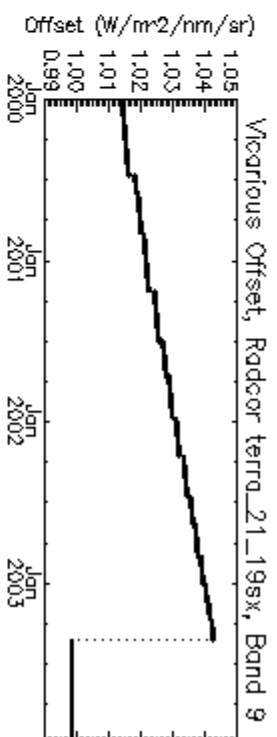
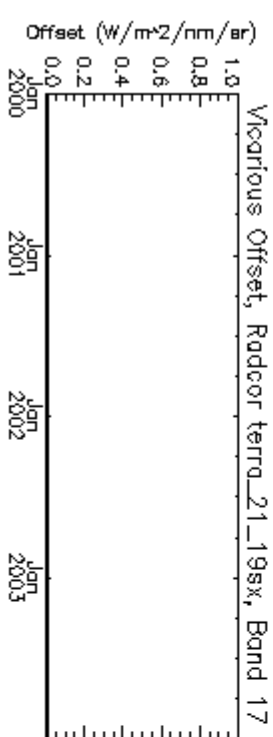
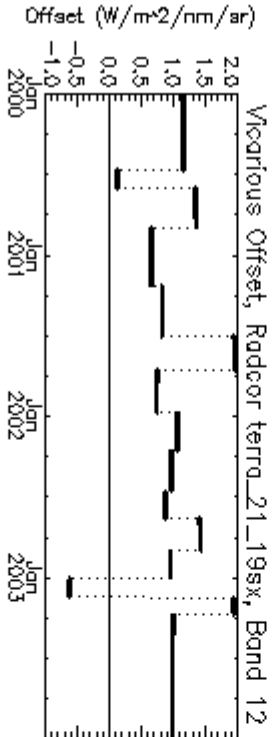
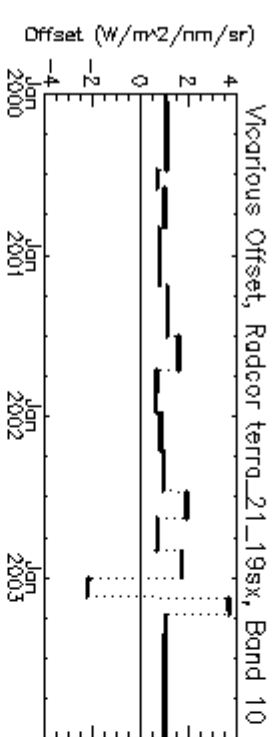
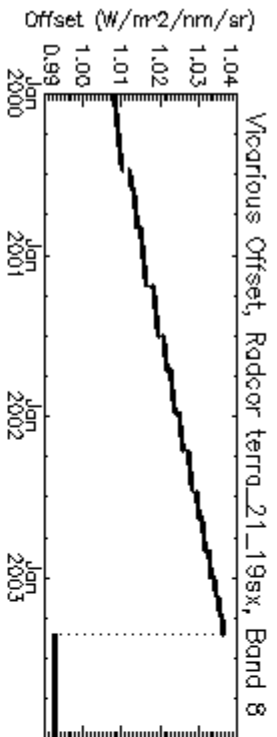
$G_v$  is the vicarious gain

$G_d$  is the detector relative gain (destriping)

$G_r$  is the RVS adjustment

b=band, d=detector, m=mirror-side, p=scan-pixel, t=time





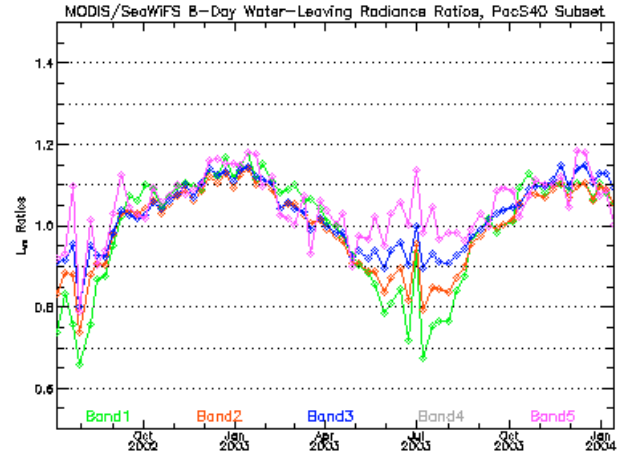
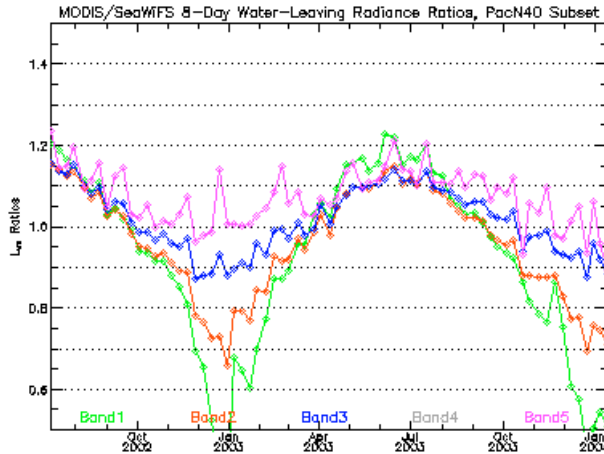
# MODIS/SeaWiFS nLw Ratios

Zonal Pacific Subsets (150-170W), 8-Day Means

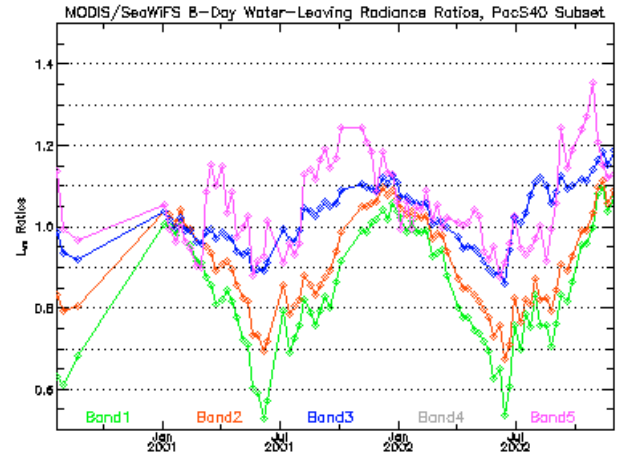
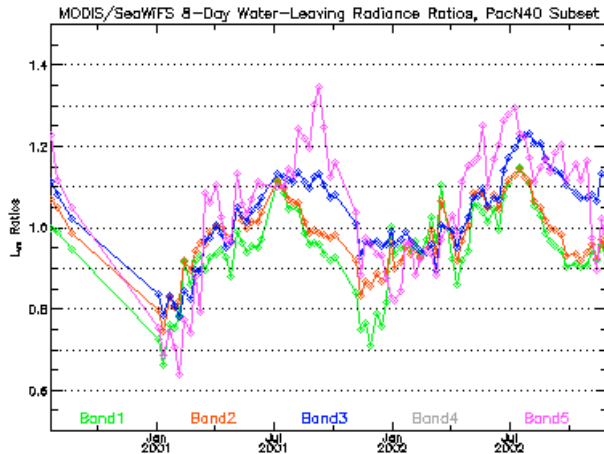
**30N to 40N Latitude**

**30S to 40S Latitude**

**Aqua  
ODPS  
Repro 1**



**Terra  
MODAPS  
Collection 4.1**



Magnitude and phase of high-latitude differences are very similar for MODIS/Terra (MODAPS) and MODIS/Aqua (ODPS).