Reprocessing of the OCTS Global Dataset

a Collaborative Effort Between NASDA and the NASA SIMBIOS Project

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Background

- CZCS: Oct 1978 - June 1986

  First demonstration of ocean color from space

- OCTS: Nov 1996 - June 1997

  First operational ocean color monitoring mission

- SeaWiFS: Sep 1997 - Present

  Second operational ocean color monitoring mission

- NASDA initiates collaboration with NASA SIMBIOS Project to reprocess OCTS dataset using calibration and processing methodologies consistent with SeaWiFS.

Purpose of Work

Evaluate and Enhance Consistency of Global Ocean Color Archive from November 1996 to Present Day.

- Minimize processing and calibration differences between OCTS and SeaWiFS.
- Support future reprocessing of OCTS GAC (full mission reprocessing can be done in 1-2 weeks).
- Simplify user interface to both datasets through common formats, common data distribution systems, and standardized software tools.
- Increase confidence in studies of El Niño transition, Kelvin/Rossby wave propagation in 1996-1997 period.

OCTS and SeaWiFS
Sensor and Mission Characteristics

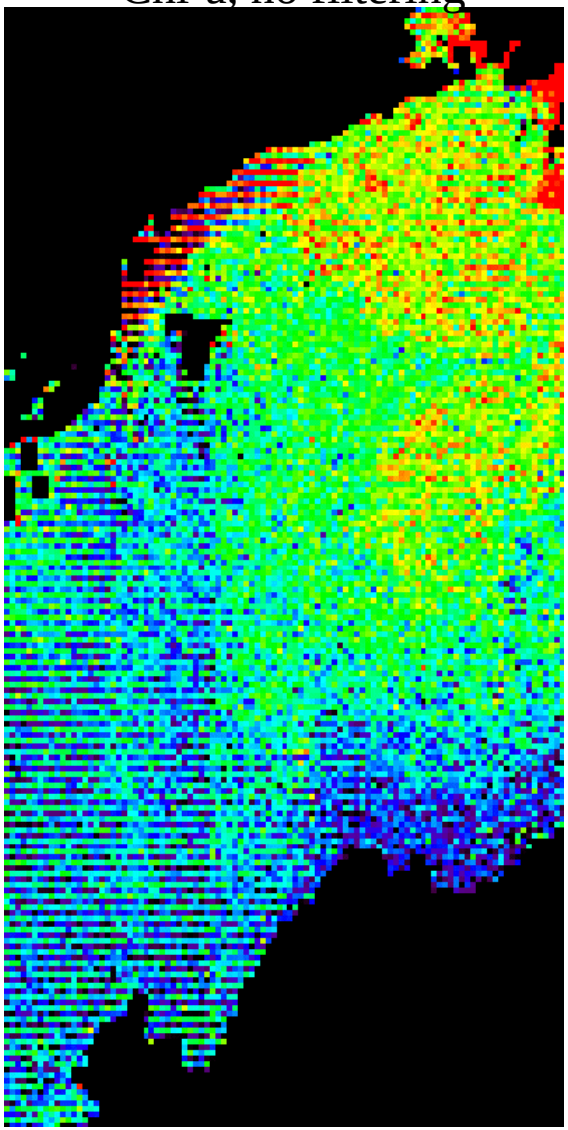
	OCTS	SeaWiFS
Start of Imaging Ops.	Oct. 31, 1996	Sep. 24, 1997
End of Imaging Ops.	Jun. 30, 1997	Operational
Equator Crossing	10:30 a.m. Descending	12:00 p.m. Descending
Nadir Resolution (km)	0.7 LAC 4.2 GAC	1.1 LAC 4.5 GAC
Swath Width (km)	1400	2800 LAC 1500 GAC
Tilt Capability (deg)	+/- 20	+/- 20
Spectral Range (nm)	412 - 12,700	412 - 865
Spectral Channels	8 VIS 4 NIR	8 VIS

Processing Differences: SIMBIOS vs NASDA V4

- Standard SeaWiFS processing system and software employed
- Level-2 and 3 data formats identical to SeaWiFS
- Vicarious Calibration to MOBY (Wang, et al.)
- Wind-dependence in Rayleigh calculations
- SeaWiFS aerosol model suite and aerosol model selection scheme (765/865 rather than 670/865)
- Iterative correction for NIR black-pixel assumption (Siegel et al.)
- Chlorophyll algorithm, modified OC4 vs OCTS-C (O'Reilly)
- Filtering of TOA radiance in all bands to reduce striping noise, cloud edge artifacts.

Effect of Radiance Filtering

Chl-a, no filtering



For each band:

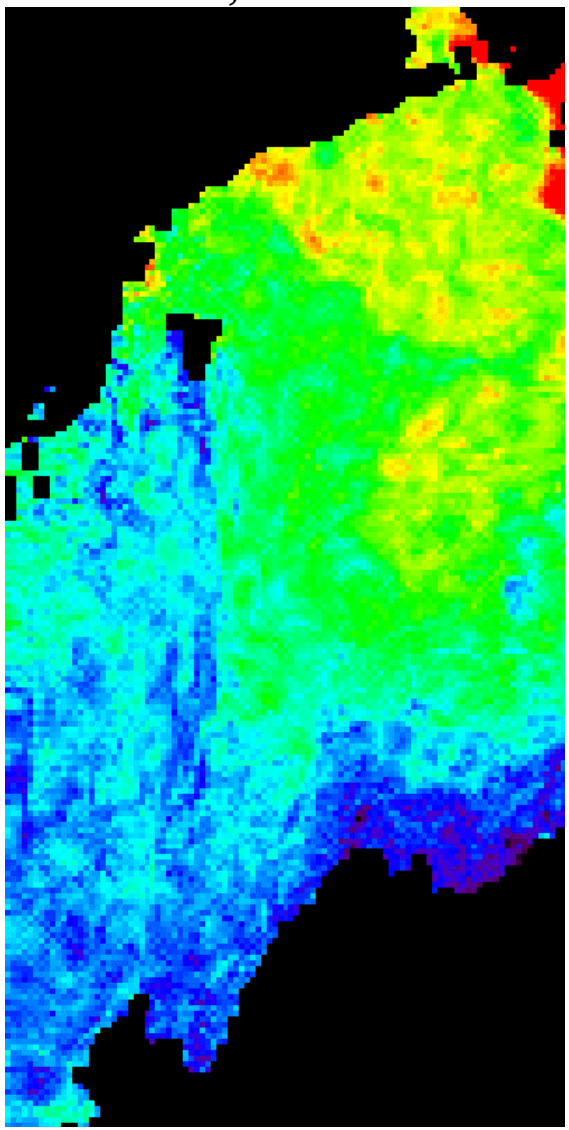
$$L_t' = L_r + f(L_t - L_r)$$

f is the mean of the interquartile range applied over a sliding 5x5 diamond-shaped sampling window

0 0 1 0 0
0 1 1 1 0
1 1 1 1 1
0 1 1 1 0
0 0 1 0 0

Diamond Filter Kernel

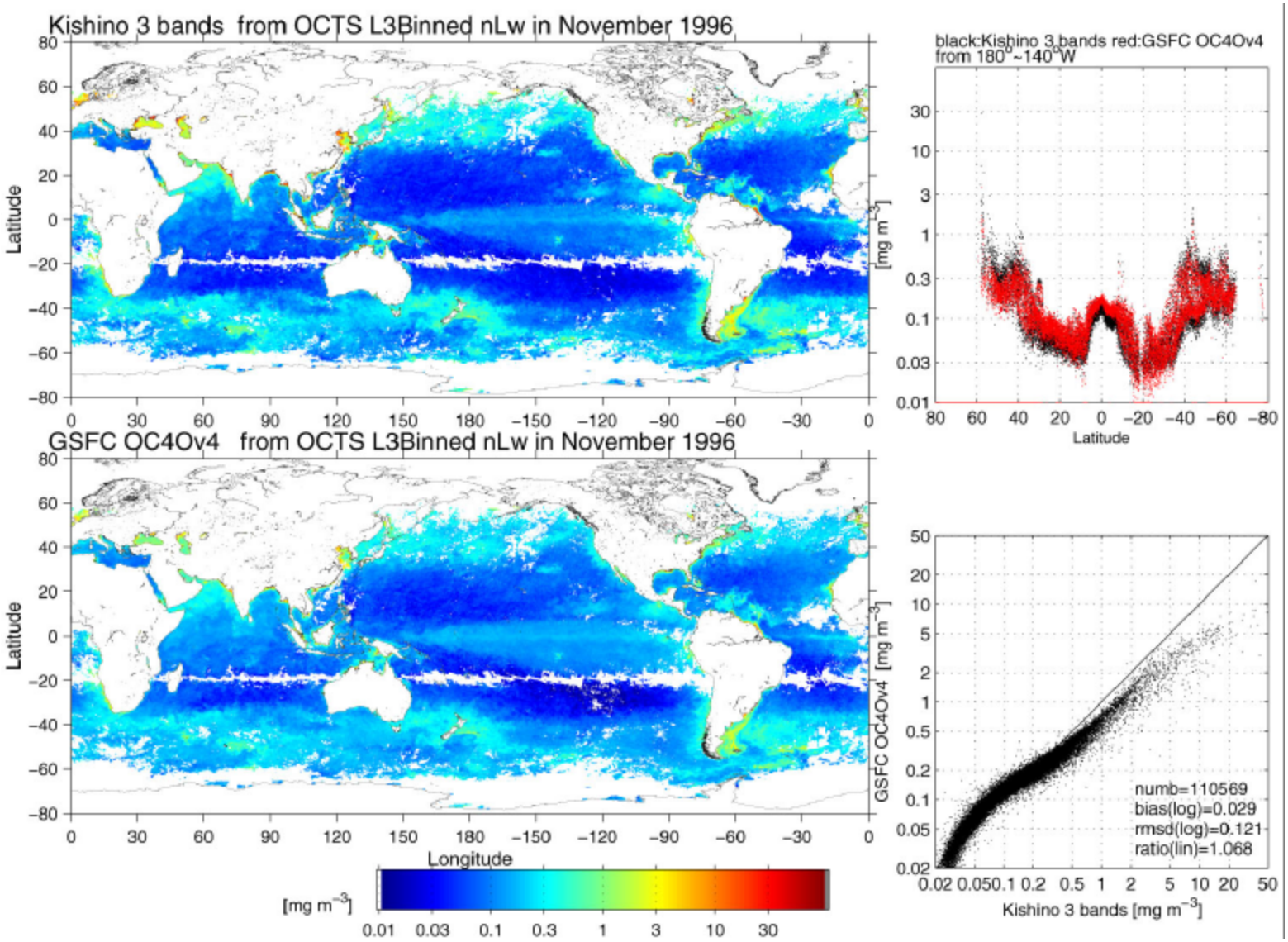
Chl-a, no filtered



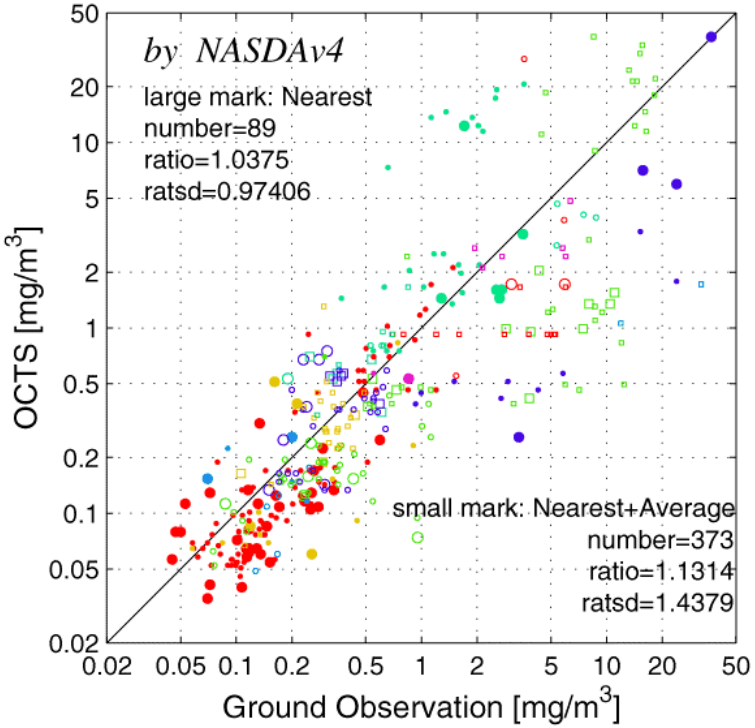
0 mg m^{-3} 0.2

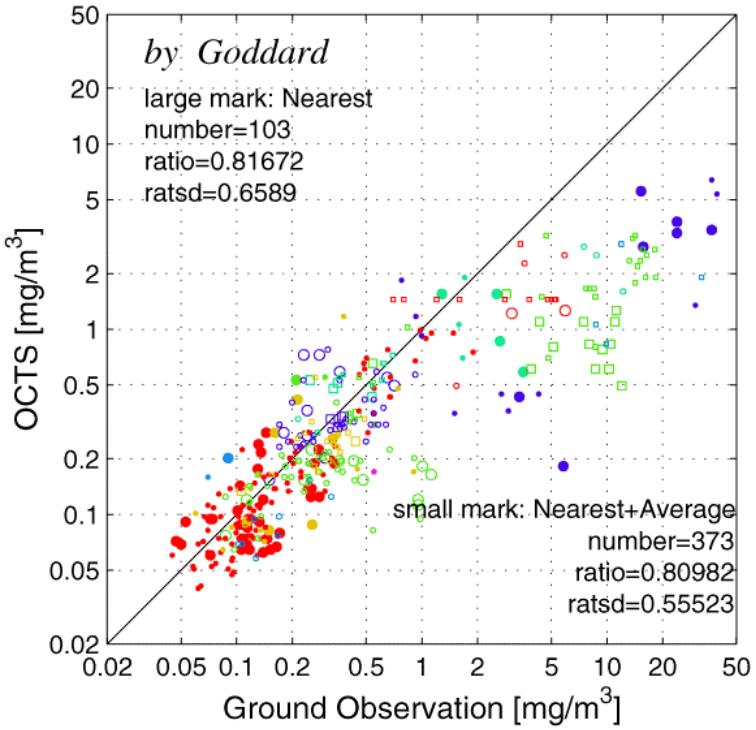
Effect of Change in Chlorophyll Algorithm

reduction in concentrations above 0.2 mg m^{-3}

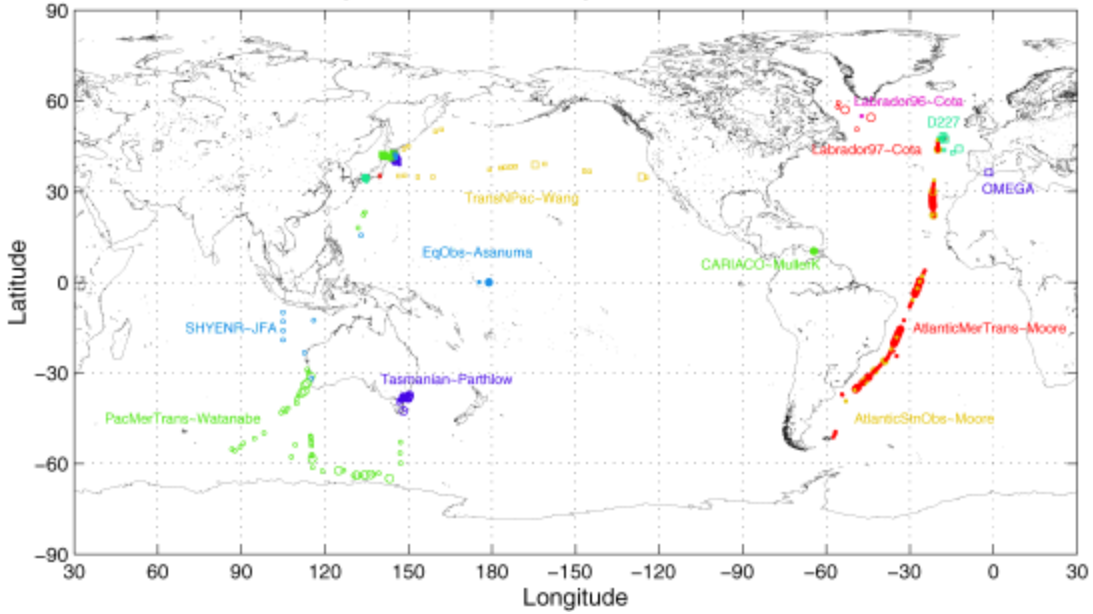


Comparison with NASDA Version 4 Standard Products



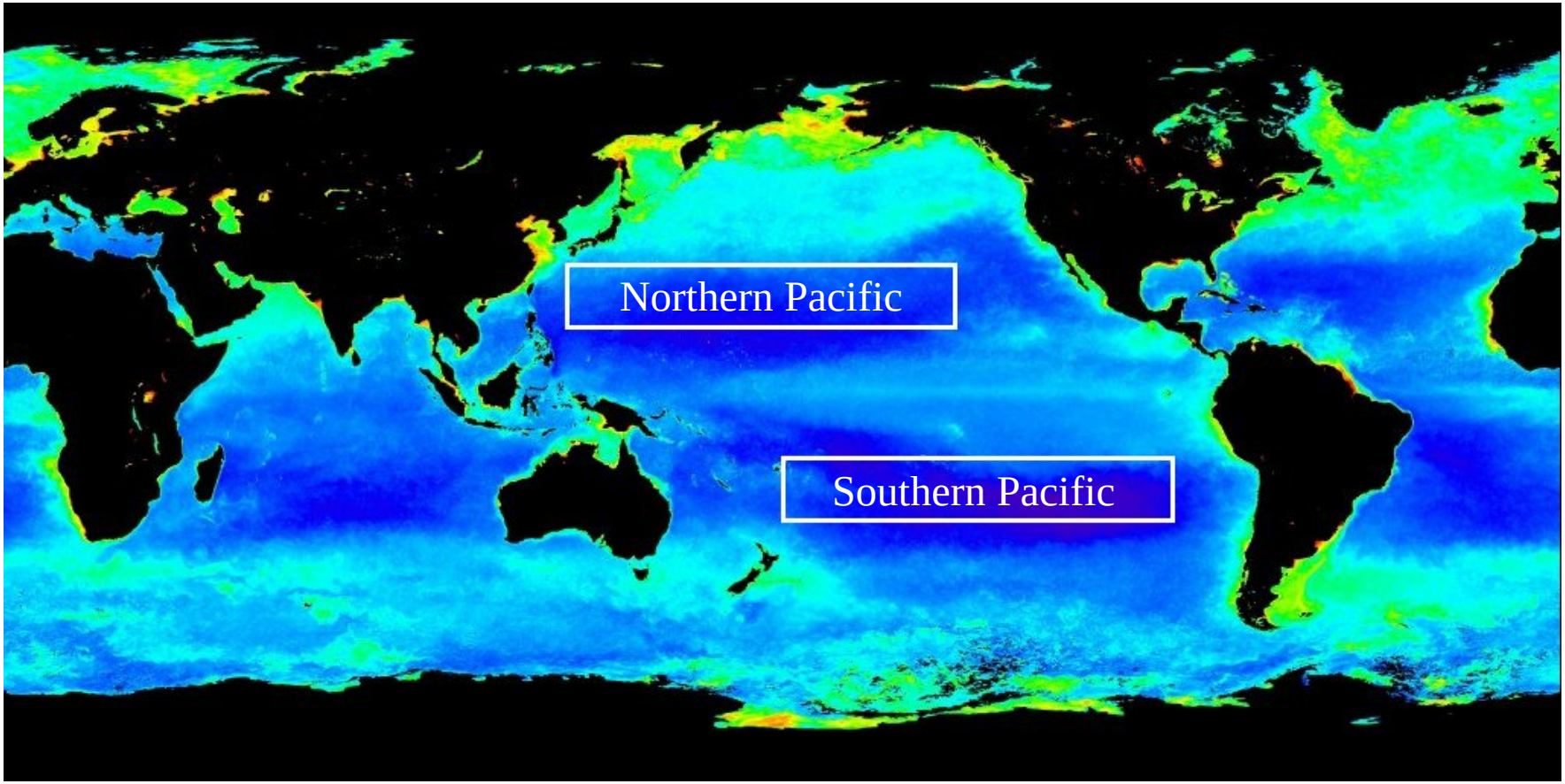


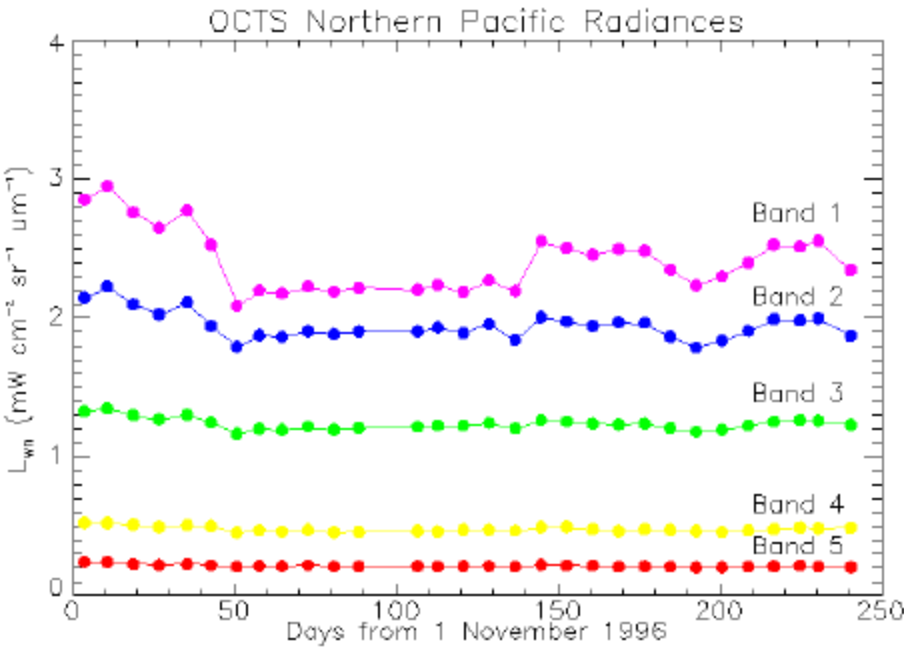
Location of Observation Data (from Nov. 1996 to Jun. 1997)

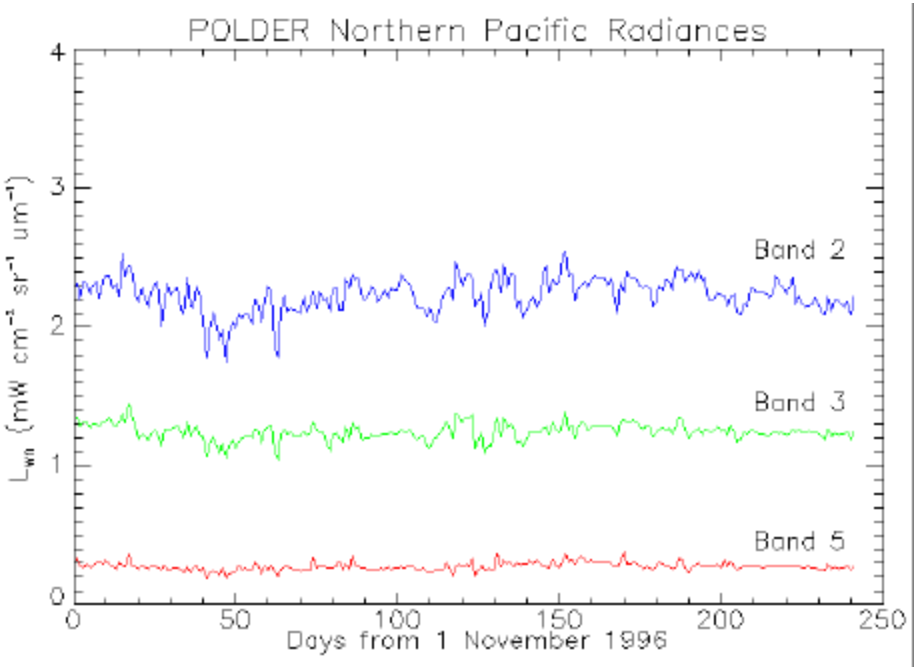


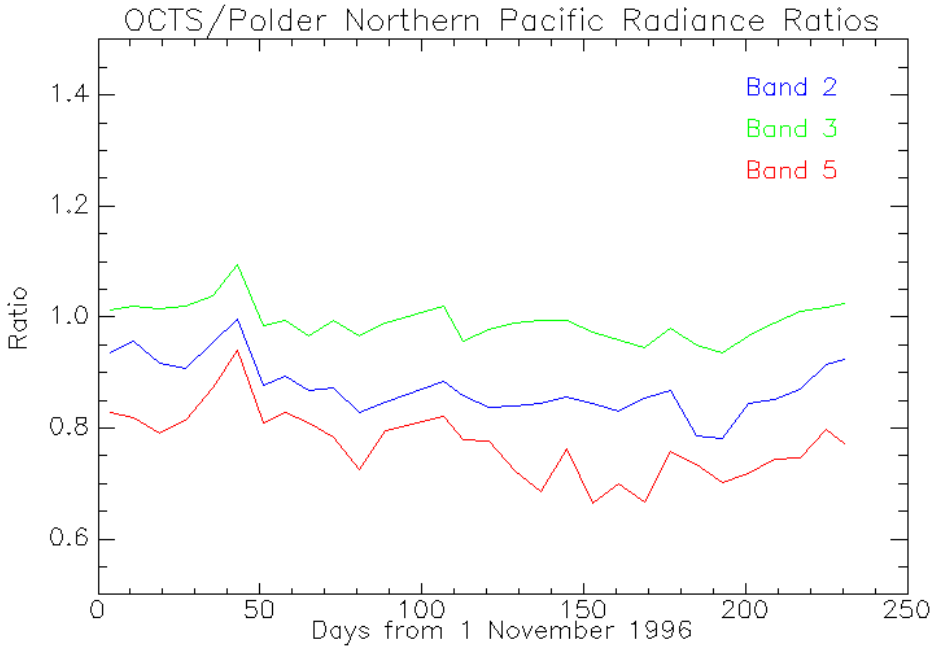
Temporal Variability: OCTS vs POLDER

concurrent measurements from two different sensors

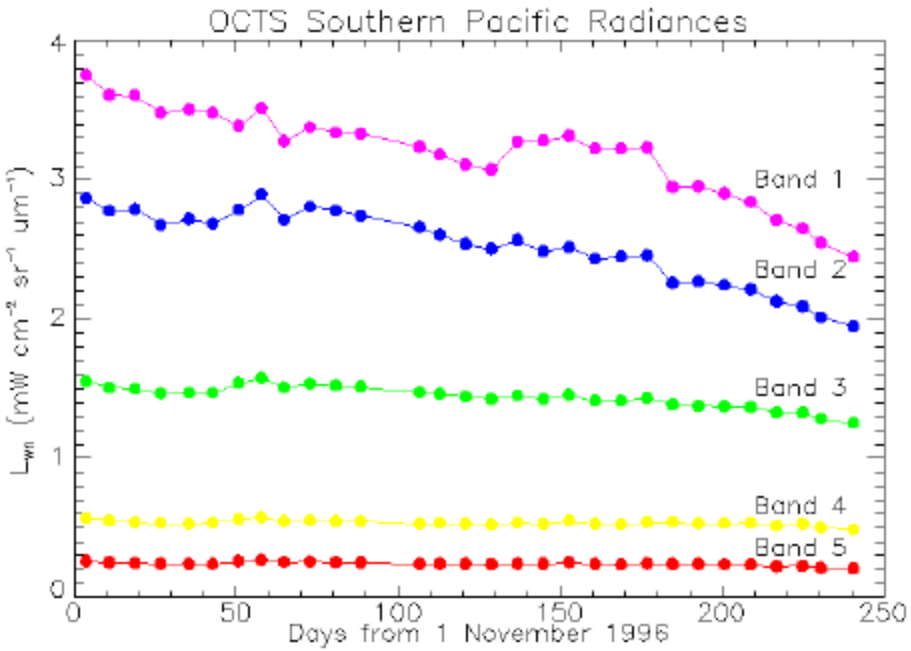


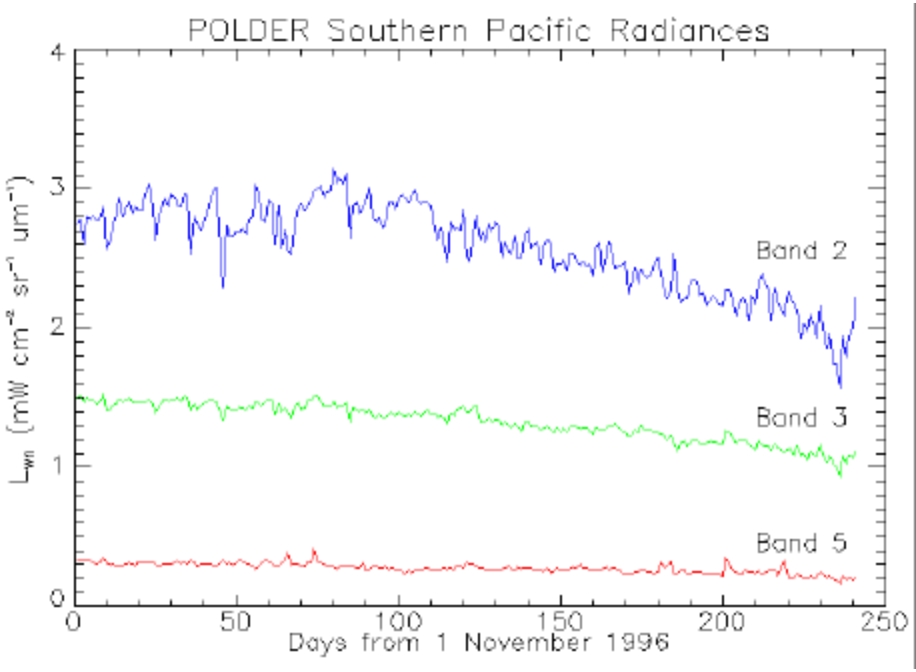


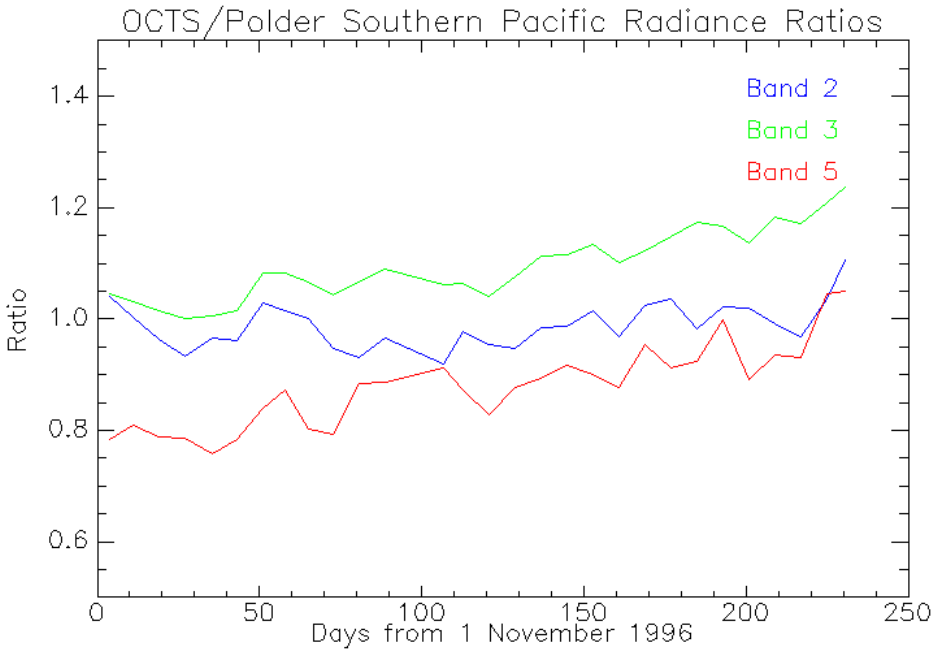




POLDER data courtesy of Jean-Marc Nicolas, Univ. des Sciences et Tech. de Lille, France



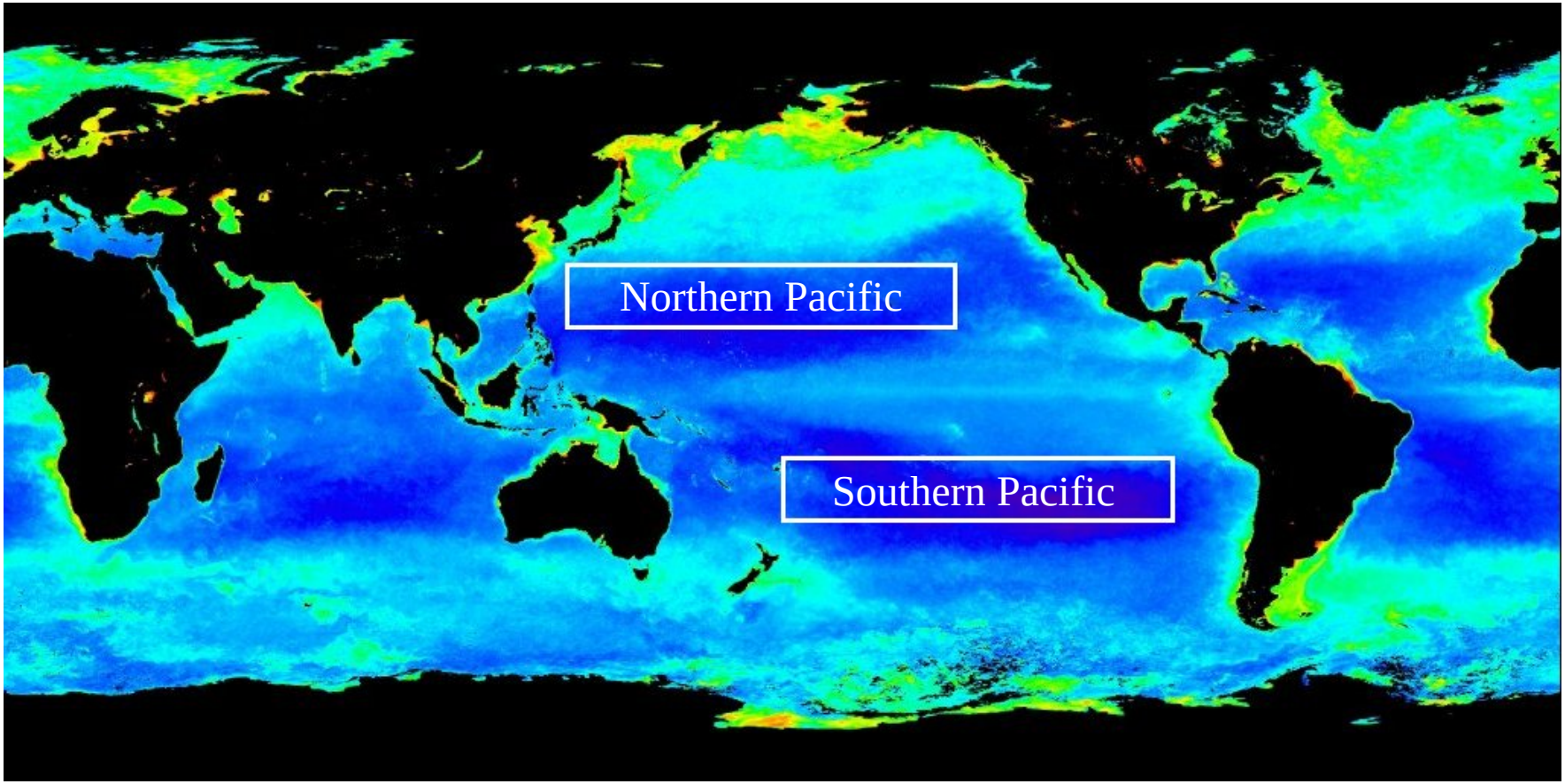


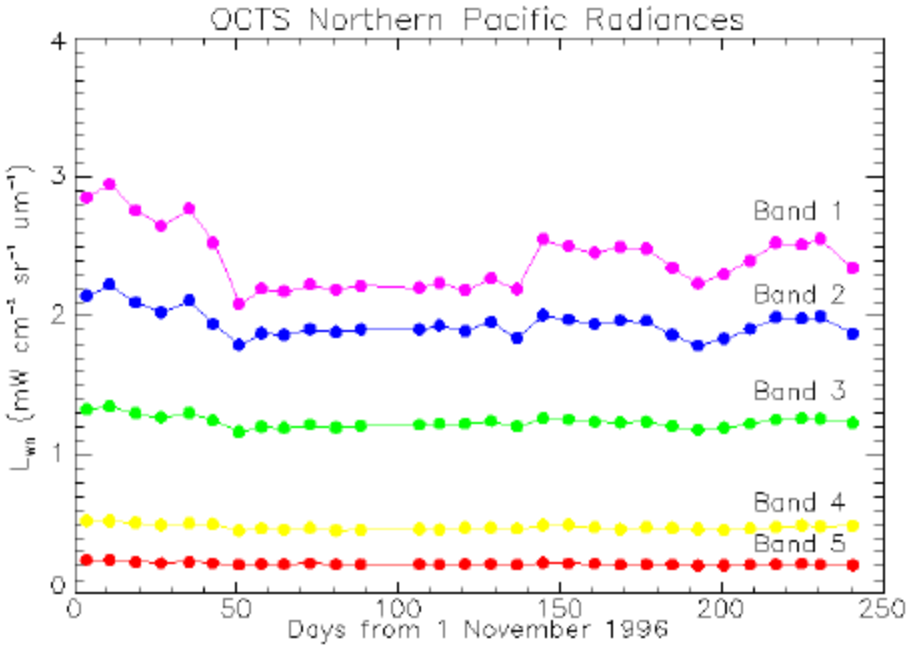


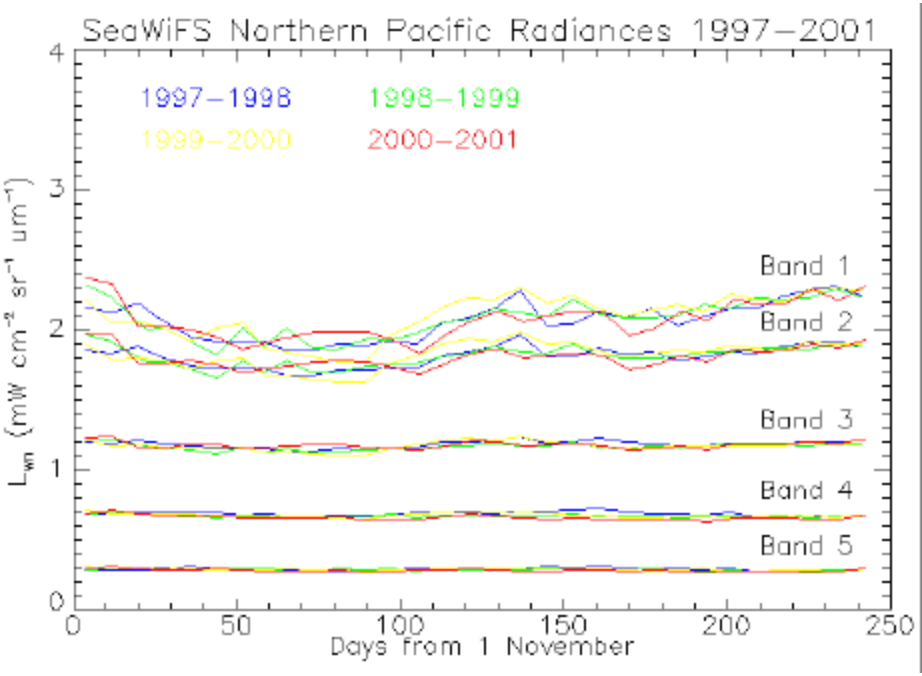
POLDER data courtesy of Jean-Marc Nicolas, Univ. des Sciences et Tech. de Lille, France

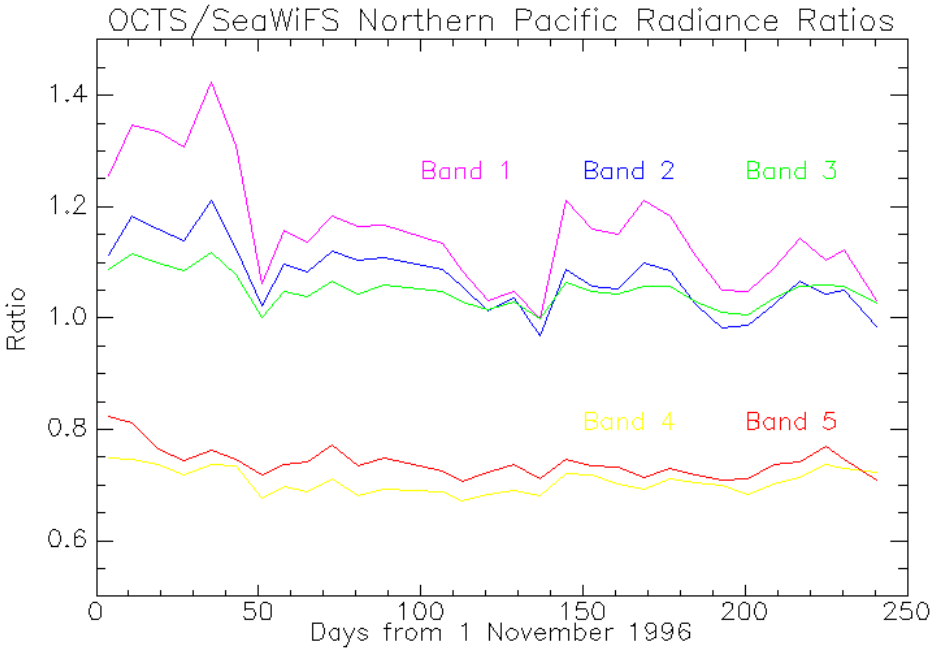
Temporal Variability: OCTS vs SeaWiFS

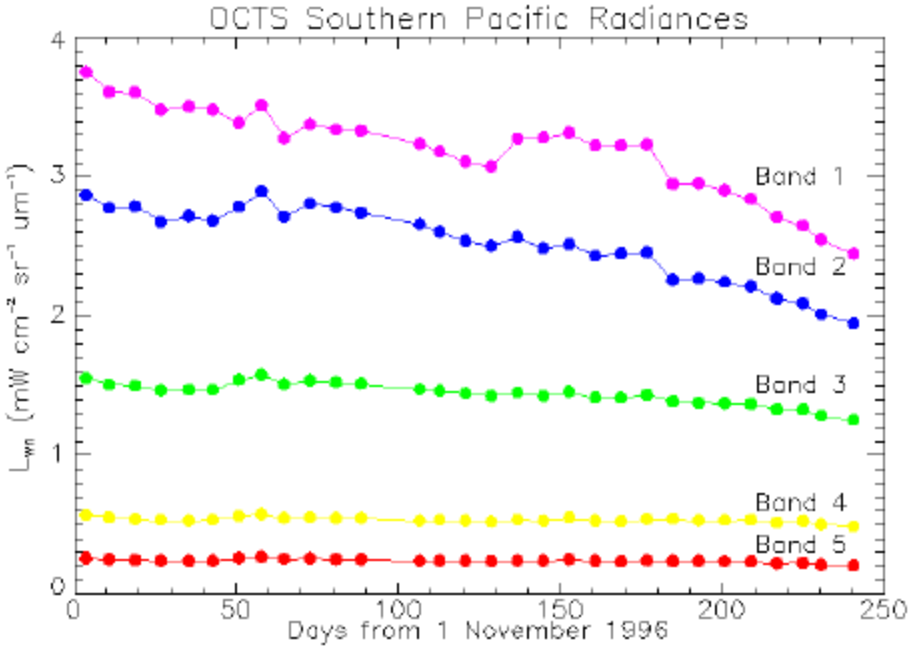
comparing oceanic optical properties retrieved by OCTS to the subsequent 4-year record of colocated SeaWiFS measurements

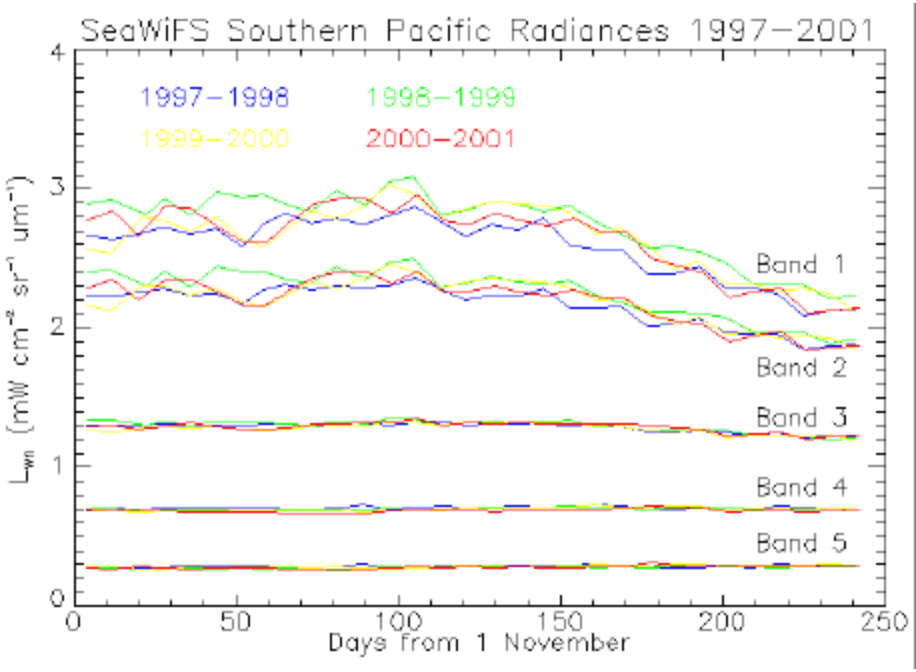


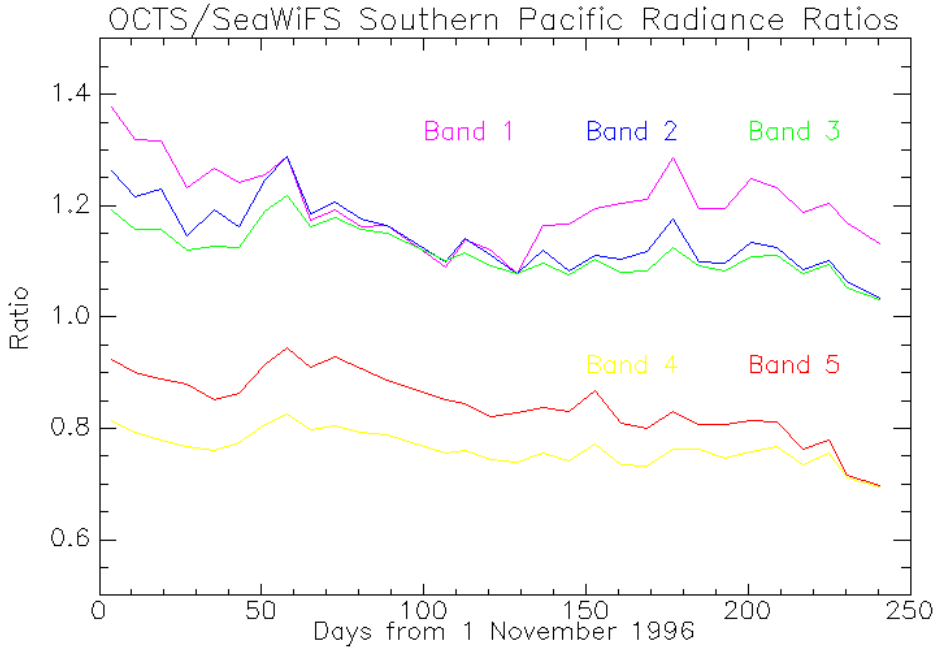

OCTS Northern Pacific Radiances
L_{wn} (mW cm^{-2} sr^{-1} um^{-1})
Band 1
Band 2
Band 3
Band 4
Band 5
0
50
100
150
200
250
Days from 1 November 1996

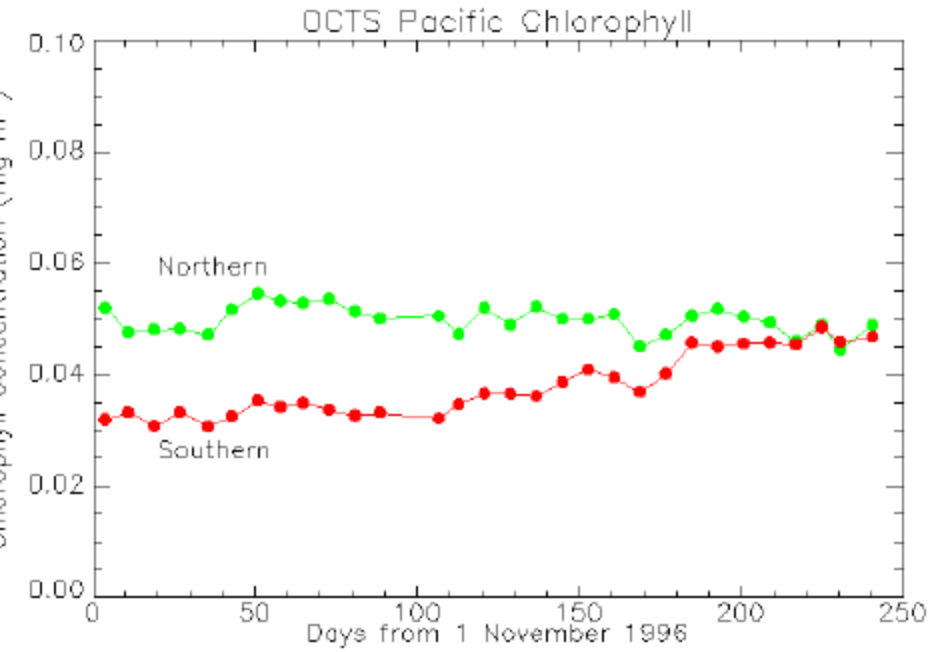

SeaWiFS Northern Pacific Radiances 1997–2001
1997–1998
1998–1999
1999–2000
2000–2001
L_{wn} (mW cm^{-2} sr^{-1} um^{-1})
Band 1
Band 2
Band 3
Band 4
Band 5
Days from 1 November

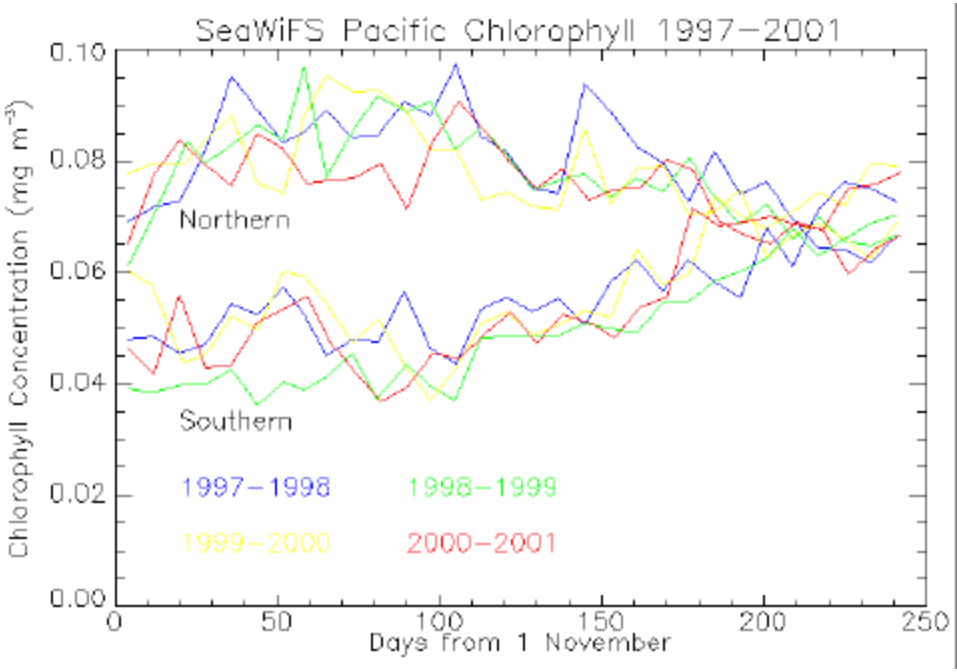

OCTS/SeaWiFS Northern Pacific Radiance Ratios
Ratio
Band 1
Band 2
Band 3
Band 4
Band 5
Days from 1 November 1996

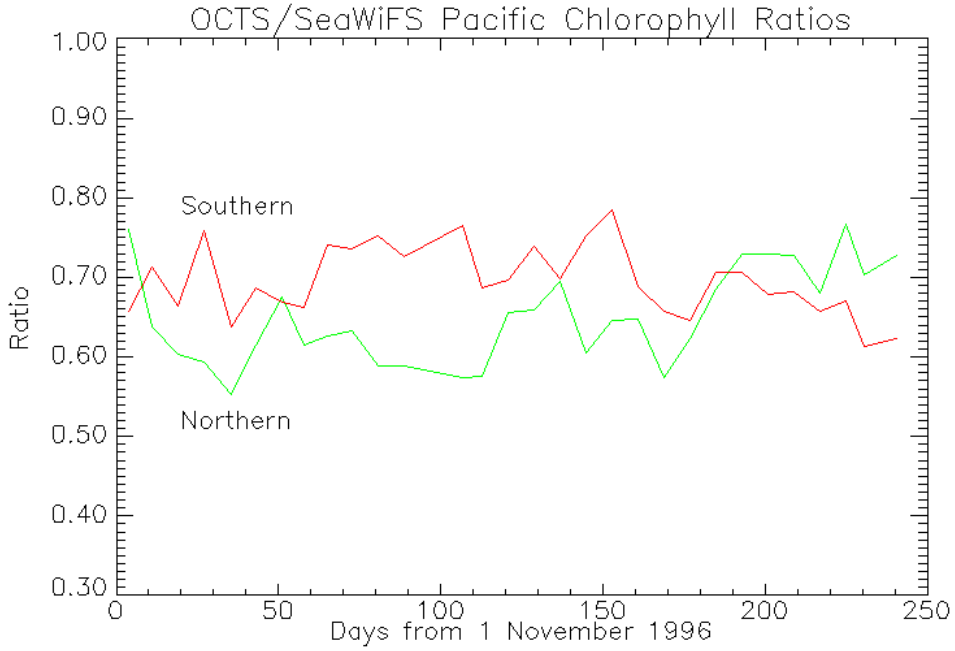

OCTS Southern Pacific Radiances
L_{wn} (mW cm^{-2} sr^{-1} um^{-1})
Band 1
Band 2
Band 3
Band 4
Band 5
0
50
100
150
200
250
Days from 1 November 1996


SeaWiFS Southern Pacific Radiances 1997–2001
1997–1998
1998–1999
1999–2000
2000–2001
L_{wn} (mW cm^{-2} sr^{-1} um^{-1})
Band 1
Band 2
Band 3
Band 4
Band 5
Days from 1 November


OCTS/SeaWiFS Southern Pacific Radiance Ratios
Ratio
Band 1
Band 2
Band 3
Band 4
Band 5
Days from 1 November 1996


OCTS Pacific Chlorophyll
0.10
0.08
0.06
0.04
0.02
0.00
Northern
Southern
0
50
100
150
200
250
Days from 1 November 1996


SeaWiFS Pacific Chlorophyll 1997–2001
Chlorophyll Concentration (mg m⁻³)
0.10
0.08
0.06
0.04
0.02
0.00
Northern
Southern
1997–1998
1998–1999
1999–2000
2000–2001
0
50
100
150
200
250
Days from 1 November


OCTS/SeaWiFS Pacific Chlorophyll Ratios
Ratio
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
Southern
Northern
0
50
100
150
200
250
Days from 1 November 1996

NASA OCTS GAC Data Distribution

Long-term Archive and Distribution via Goddard DAAC:

- **http://daac.gsfc.nasa.gov/**
- level-1A through level-3 mapped data available
- free and open access to all
- temporal/spatial search and order capabilities
- interactive browse
- level-3 parameter subsetting
- concurrent ancillary meteorlogical and ozone data

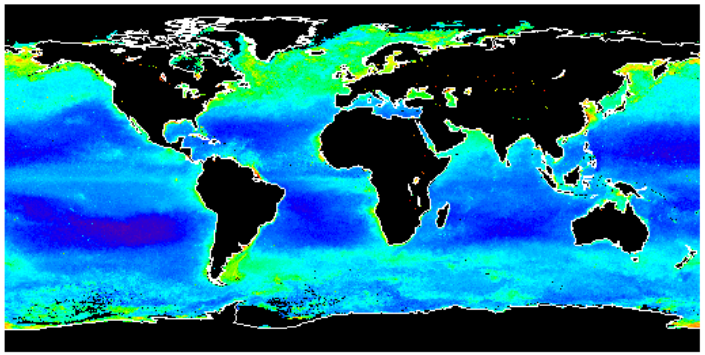
Additional Access via NASDA EORC:

- **http://www.eorc.nasda.go.jp/ADEOS/**

NASA OCTS GAC Data Distribution via NASA SIMBIOS Project

http://simbios.gsfc.nasa.gov/

OCTS Browse : Friday, 1 November 1996
through
Monday, 30 June 97



Friday, 1 November 1996
through
Monday, 30 June 97

1996 | 1997

View quasi-true-color images

The following level-3, standard-mapped, HDF files, corresponding to this time period, are available for download.

CHLO	K490	L565	T865	A520

Processing and Display Software

http://seadas.gsfc.nasa.gov/

Additional Information

http://simbios.gsfc.nasa.gov/

Summary

- A successful and rewarding collaboration has been established between NASDA and NASA to enhance the consistency between two global ocean color missions.
- Access and use of OCTS and SeaWiFS products has been greatly simplified through common data formats, software tools, and distribution systems.
- Algorithm enhancements developed for SeaWiFS can be easily propogated to OCTS through future reprocessing.
- The 4-year record of SeaWiFS data in the north and south Pacific regions shows excellent repeatablility.
- Oceanic optical properties retrieved from OCTS show reasonable agreement with SeaWiFS in the same north and south Pacific regions. Are remaining differences real?

Supporting Slides

Abstract

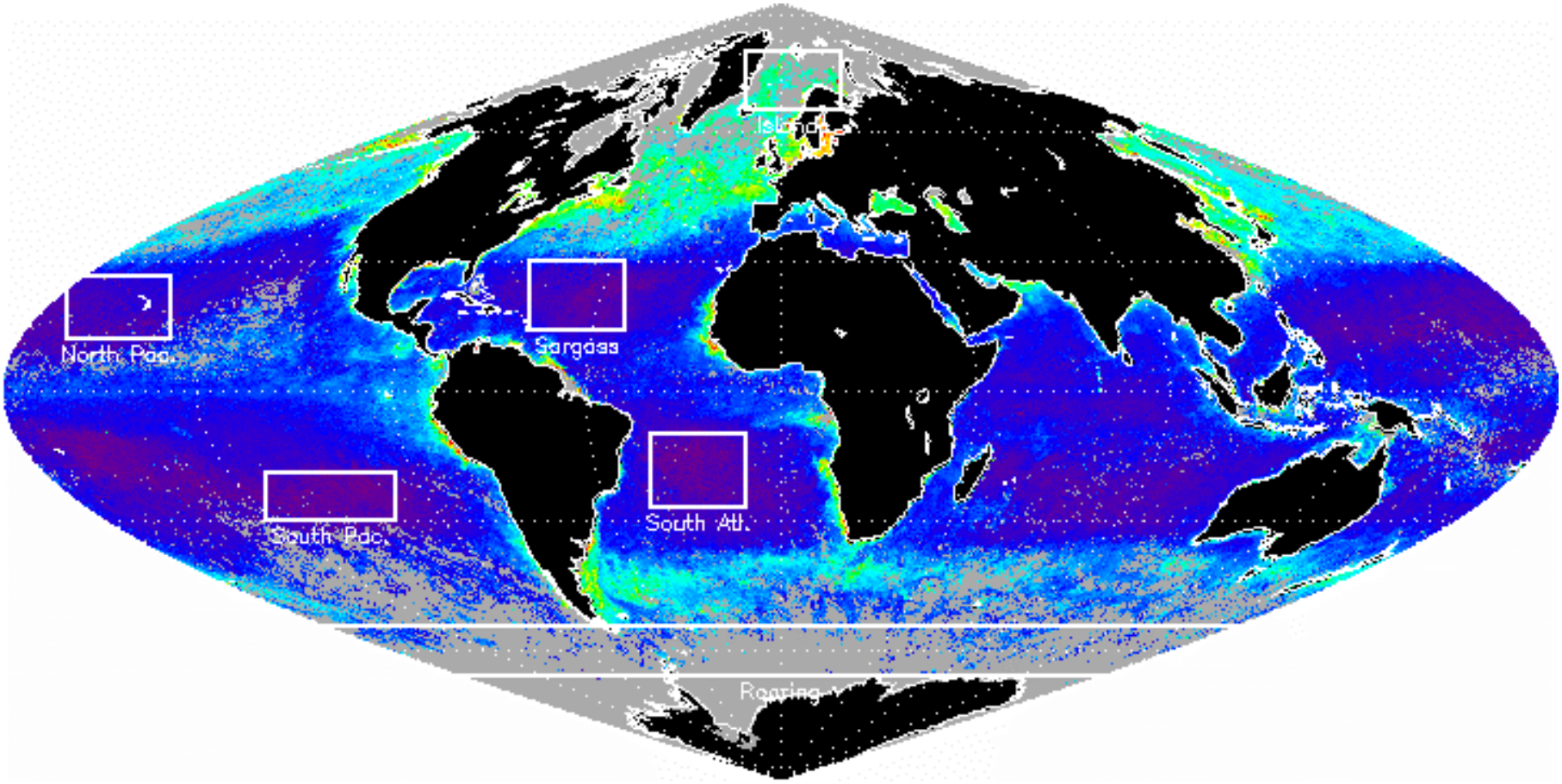
As a payload on the ADEOS spacecraft, the Ocean Color and Temperature Scanner (OCTS) was launched and operated by the National Space Development Agency (NASDA) of Japan in August of 1996. The OCTS instrument began routine imaging in November of 1996, making it the first operational mission dedicated to the acquisition and monitoring of oceanic chlorophyll concentration on a global scale. Although the ADEOS spacecraft suffered a catastrophic failure less than eleven months after launch, the data collected during the OCTS mission lifetime is of great value to the Earth science community, as it can provide important information on the baseline state of the worlds oceans prior to the El Nino event of 1997-1998.

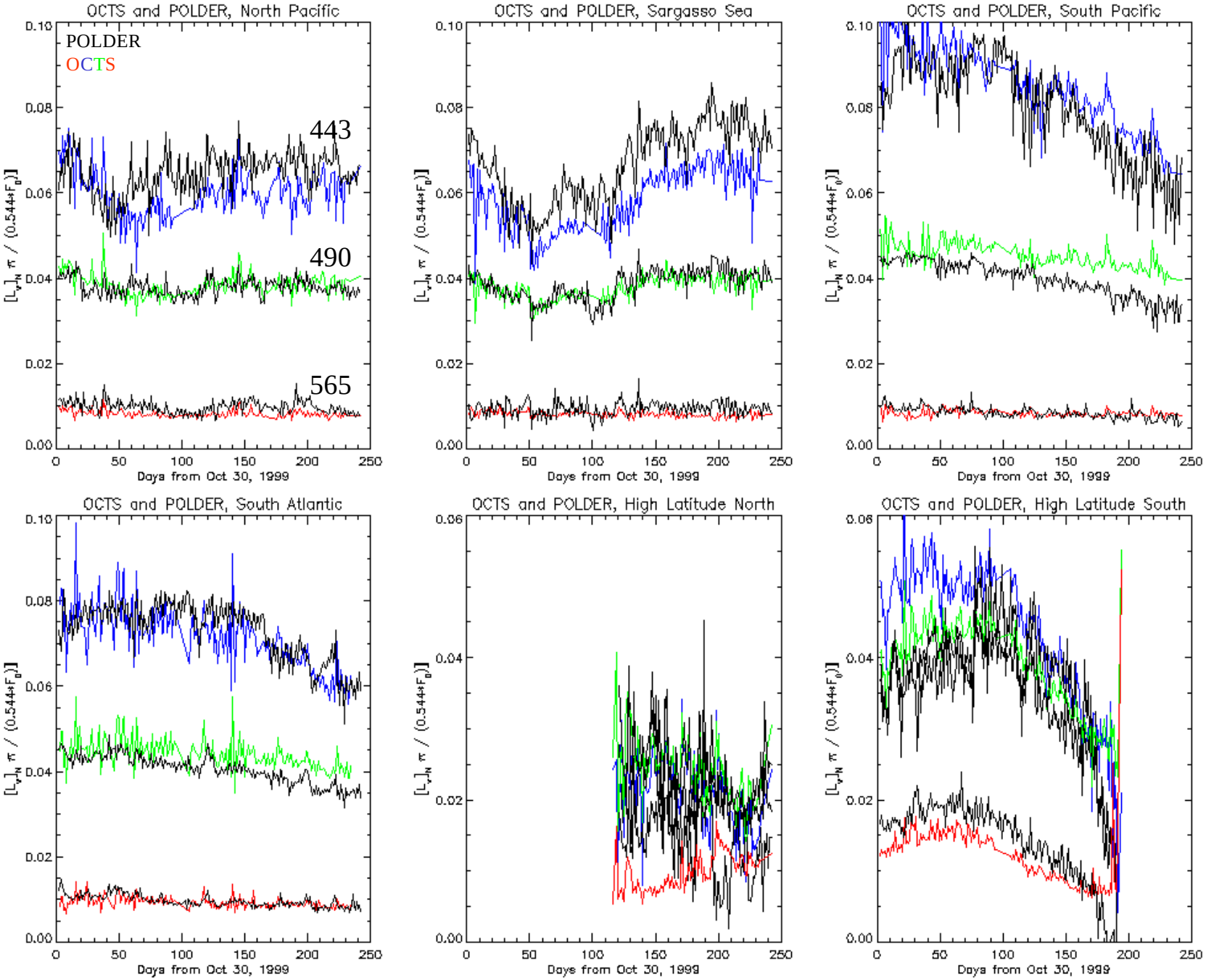
The second global ocean color mission to be launched was the Sea-viewing Wide Field-of-view Sensor (SeaWiFS), which has been collecting global data continuously since September of 1997. The unfortunate gap between the end of OCTS operations and the start of SeaWiFS operations makes direct sensor to sensor comparisons impossible, thus leaving considerable uncertainty in any effort to extend the SeaWiFS global ocean color timeseries back to the pre-1997 El Nino period, or to study the propagation of Kelvin and Rossby waves associated with the transition into El Nino. This uncertainty can result from relative differences in instrument calibrations, as well as differences in the atmospheric correction and bio-optical algorithms employed.

The focus of the present work is to minimize the potential differences in the atmospheric correction and bio-optical algorithms between the two sensors, by reprocessing the entire OCTS GAC mission archive using the same software and algorithms employed for standard SeaWiFS processing. The data processing stream will be presented, and OCTS-specific modifications to the algorithms will be discussed. Statistical comparisons between OCTS and SeaWiFS will be shown, and remaining processing issues will be highlighted. Finally, the OCTS product list and data distribution procedures will be provided.

Temporal Variability: OCTS vs POLDER

POLDER data courtesy of Jean-Marc Nicolas, Univ. de Lille




OCTS and POLDER, North Pacific
POLDER
OCTS
443
490
565
OCTS and POLDER, Sargasso Sea
OCTS and POLDER, South Pacific
OCTS and POLDER, South Atlantic
OCTS and POLDER, High Latitude North
OCTS and POLDER, High Latitude South
Days from Oct 30, 1999