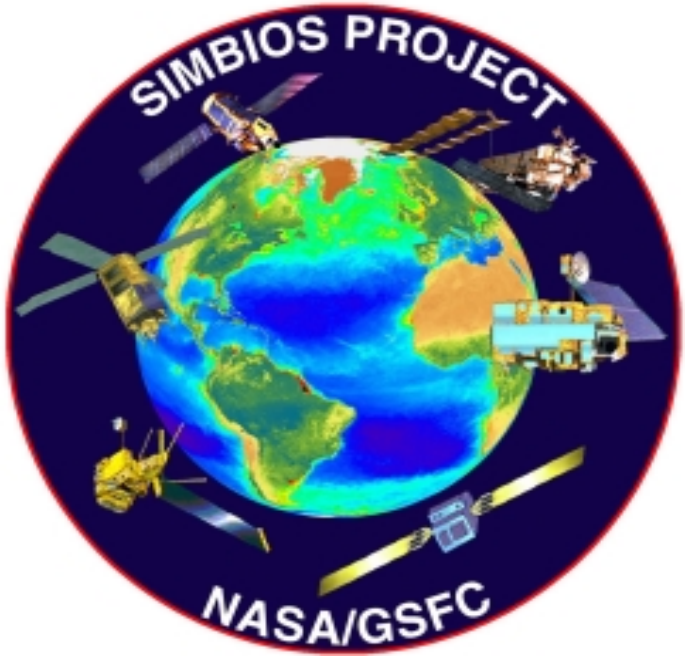
Data Merger Activities
SIMBIOS Project FY2001



Ewa J. Kwiatkowska
-Ainsworth
Giulietta S. Fargion

NASA SIMBIOS Project
GSFC Mail Code 970.2
Greenbelt, Maryland, USA

SIMBIOS Science Team Meeting
January 15 - January 17, Baltimore

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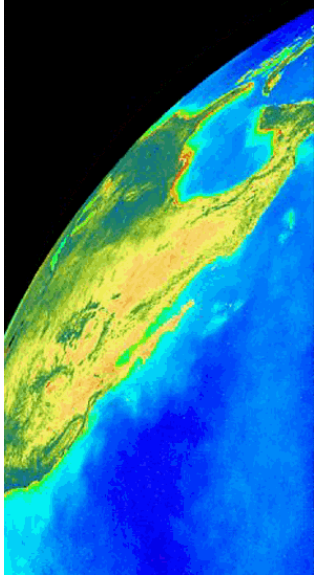

Benefits of the Data Merger

- Improvement in spatial and temporal ocean color coverage.
- Increased statistical confidence in generated bio-optical parameters.
- Support for specialized ocean color applications by taking advantage of sensor-varying characteristics:
  - calibration/validation accuracies,
  - spectral,
  - spatial,
  - temporal,
  - ground coverage.

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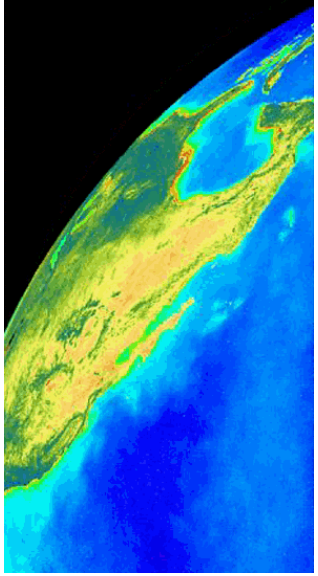

Benefits of the Data Merger cont.

- Definition of a variety of ocean color products, including
  - daily global product maps at the highest feasible spatial resolution,
  - regional and local products for a variety of local applications at the highest feasible spatial resolution,
  - long-term time series (longer than 5 years),
  - climatological data.

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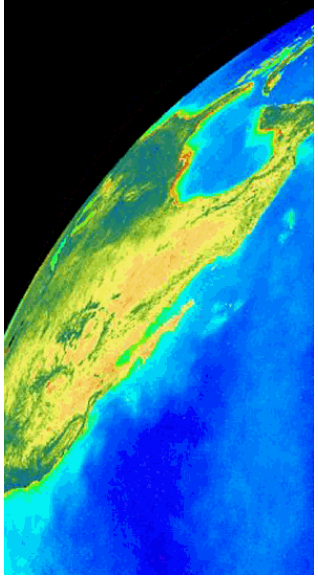

Data Merger Difficulties

- Varying designs and characteristics of ocean color sensors, instrument calibration, and data processing algorithms.
- Differences in mission standard products.
- Complexity of data acquisition and retrieval (e.g. file formats, geometric projections, data set subsampling).
- Management of very large data sets.

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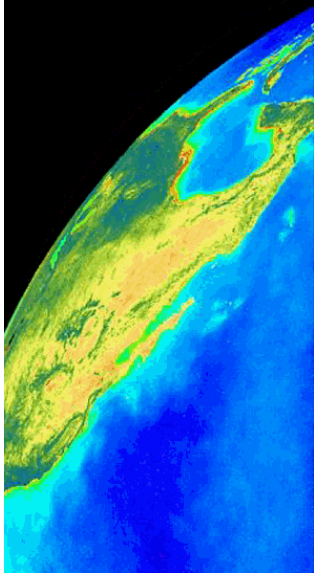

SIMBIOS Merger Solutions

- In-house data extraction expertise.
- Uniform calibration and processing of selected ocean color missions to improve the level of compatibility among products, e.g. OCTS GAC, POLDER I, MOS and SeaWiFS.
- A thorough ocean color validation program to quantify the accuracies of the missions' products in comparison to *in situ* measurements.

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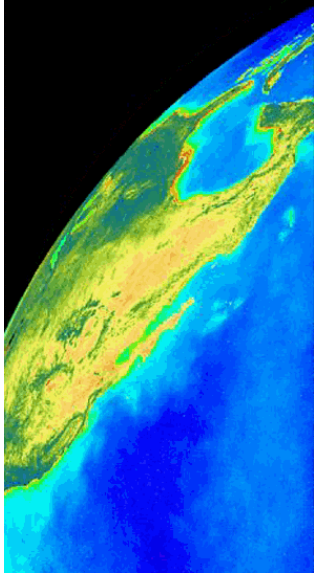

SIMBIOS Merger Solutions cont.

- Evaluation of mission product differences, e.g. MODIS and SeaWiFS.
- Development of methodologies for generating merged ocean color products to uniformly overcome mission-specific parameters.

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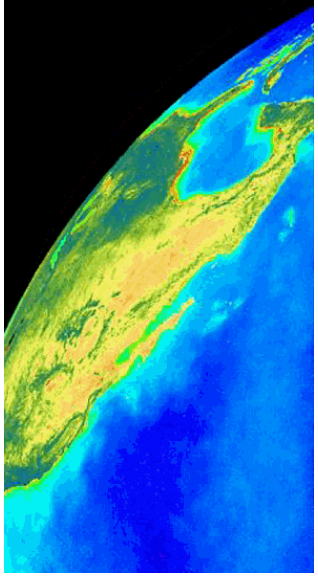

SIMBIOS Project Research and Development in FY2001

❶ Improvement of ocean color global coverage (MODIS and SeaWiFS).

❷ Merger of ocean color data of different spatial resolutions (MOS and SeaWiFS).

❸ Merger of satellite and *in situ* measurements (CalCOFI and SeaWiFS).

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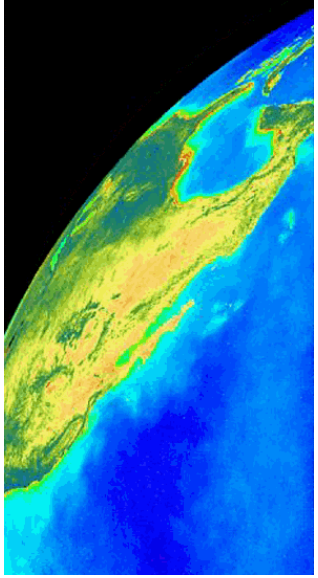

❶ Improvement of ocean color global coverage: MODIS & SeaWiFS

- Identification of common data formats
  - L3 binned daily products at 4.63km resolution,
  - chlor_a_2 MODIS/chlor_a SeaWiFS,
  - recent Miami MODIS/4th reprocess. SeaWiFS.
- Development of algorithms for combined extraction and analysis of MODIS and SeaWiFS bins.
- Evaluation of MODIS and SeaWiFS product differences for overlapping bins
  - the total data set,
  - open ocean and clear atmosphere data only.

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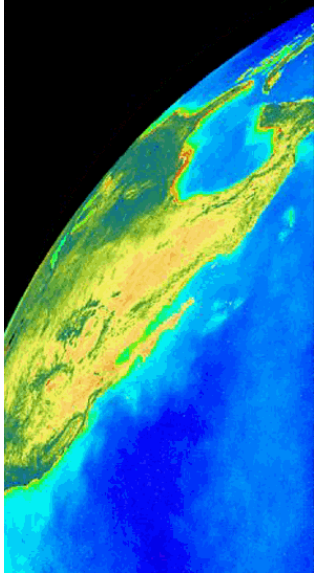
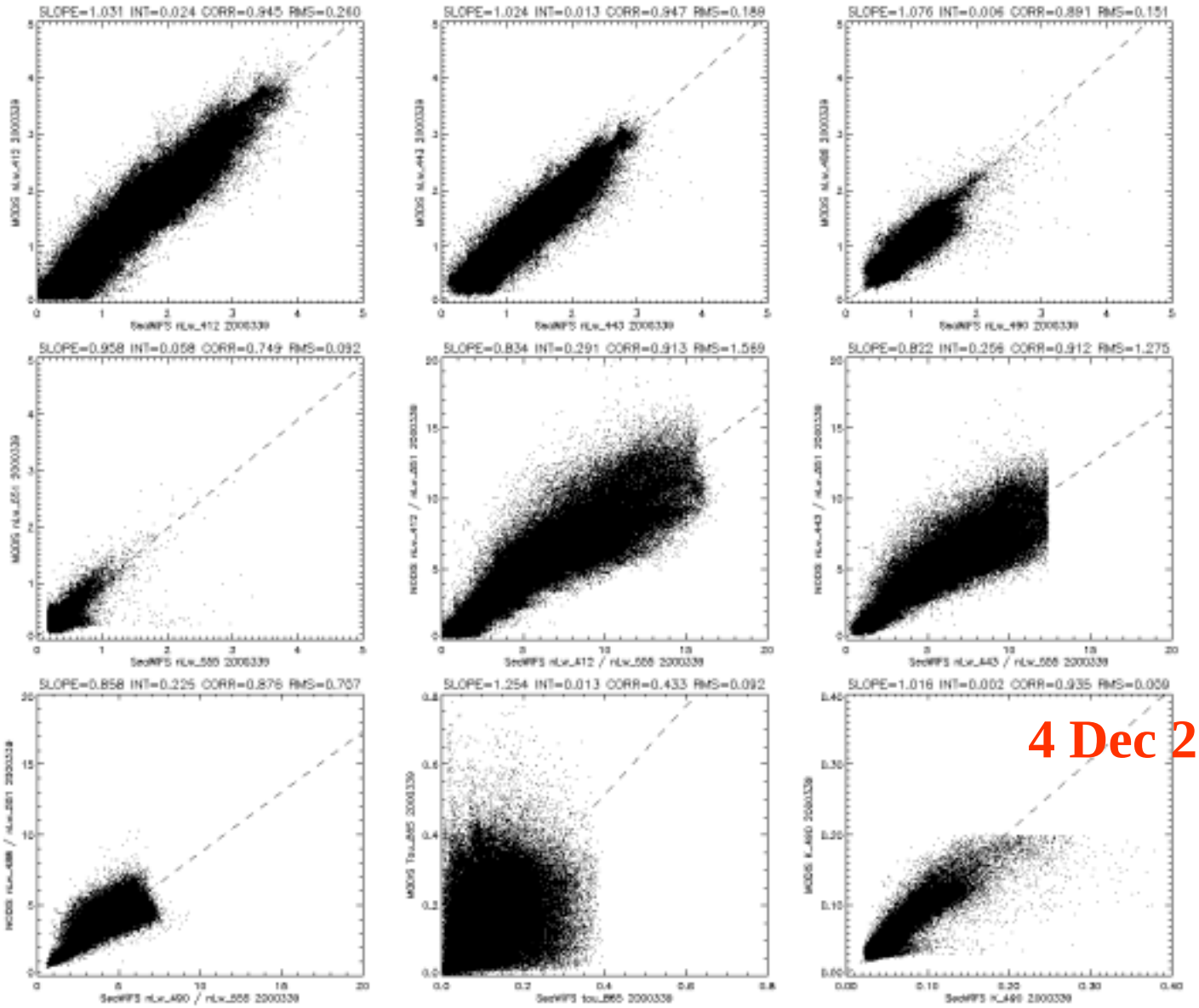


MODIS and SeaWiFS nLw comparisons total dataset



4 Dec 2000

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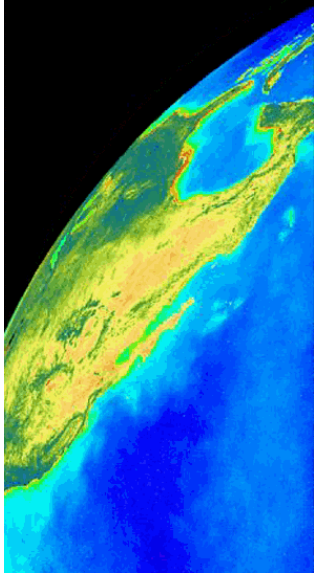
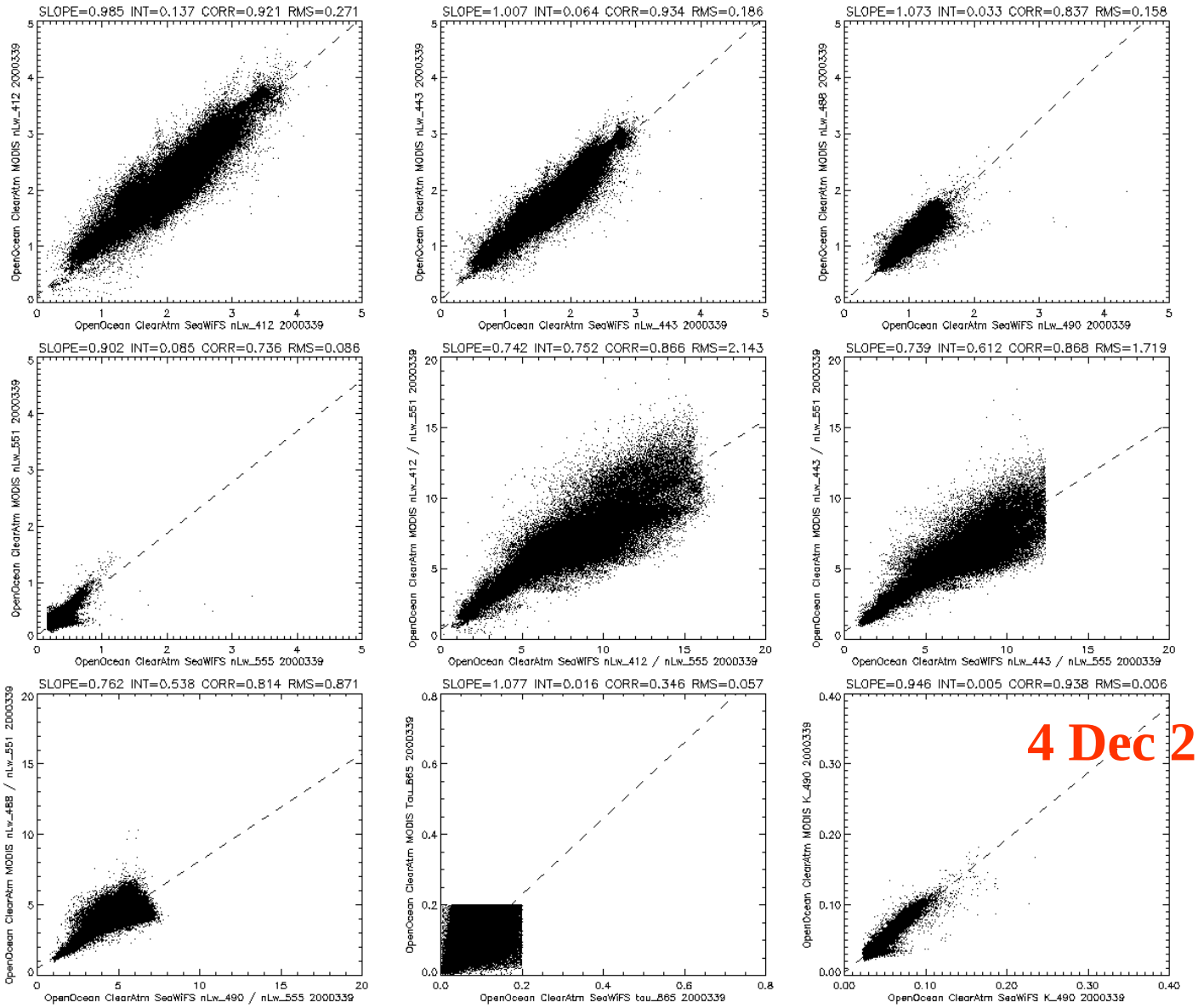


MODIS and SeaWiFS nLw comparisons open ocean clear atmosphere



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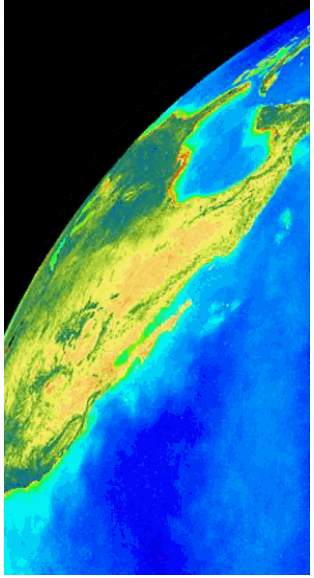
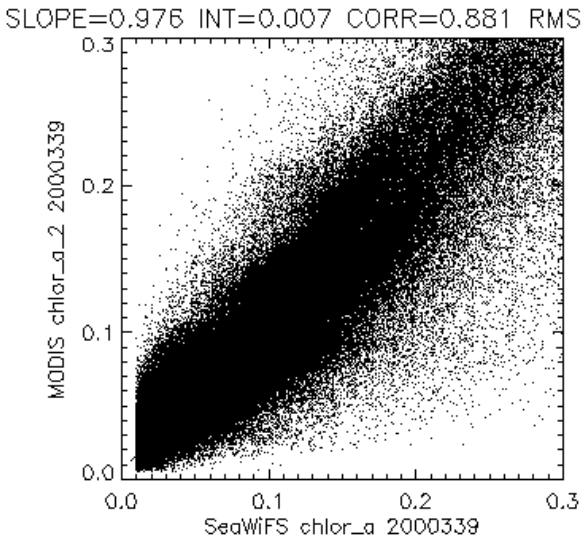
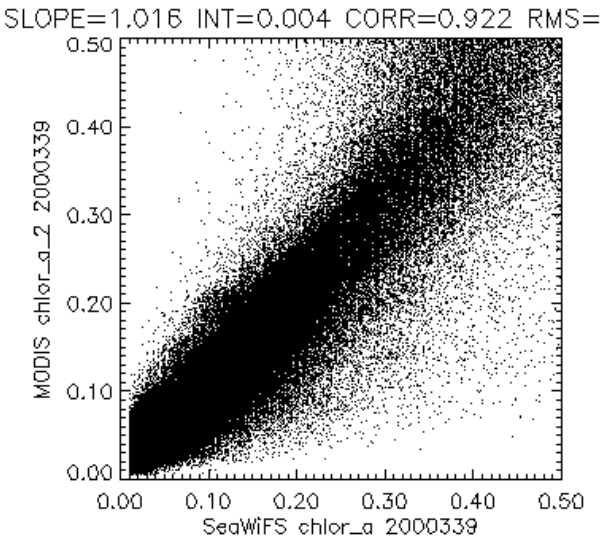
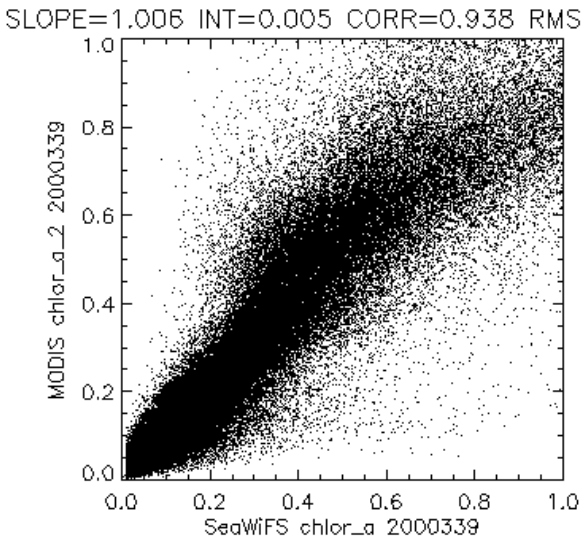


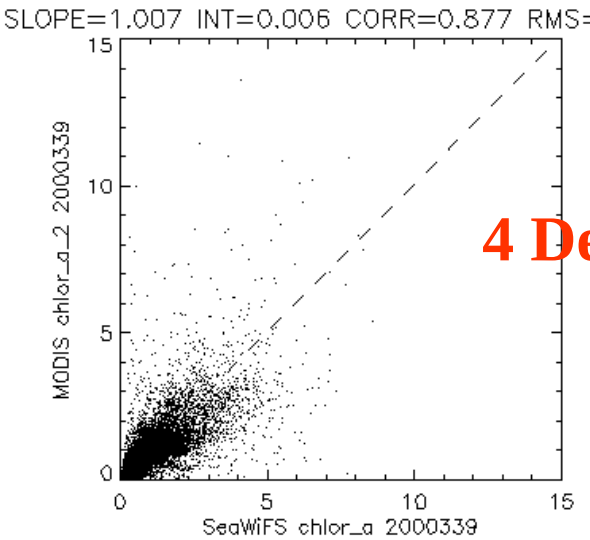
MODIS and SeaWiFS chlorophyll comparisons

total dataset









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SIMBIOS

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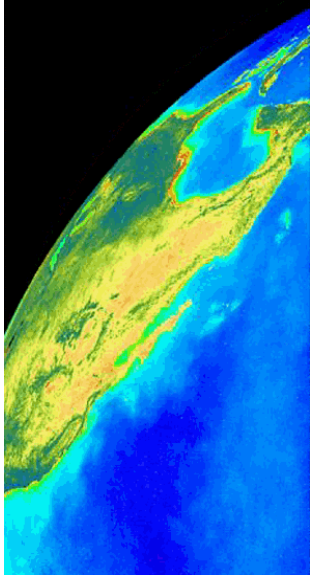
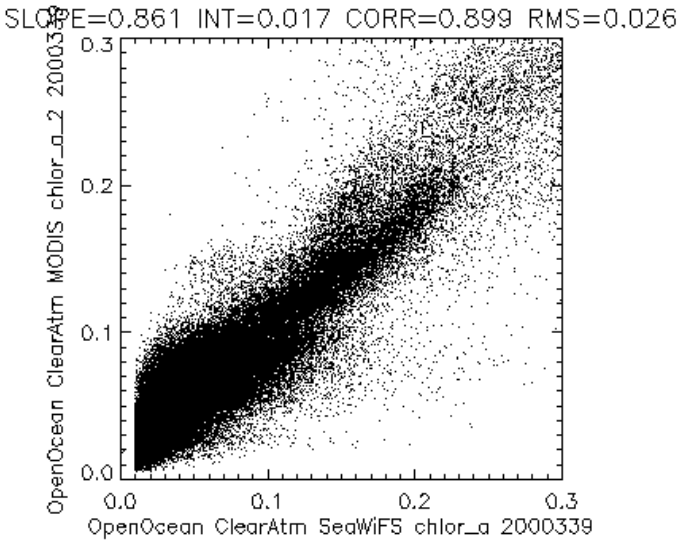
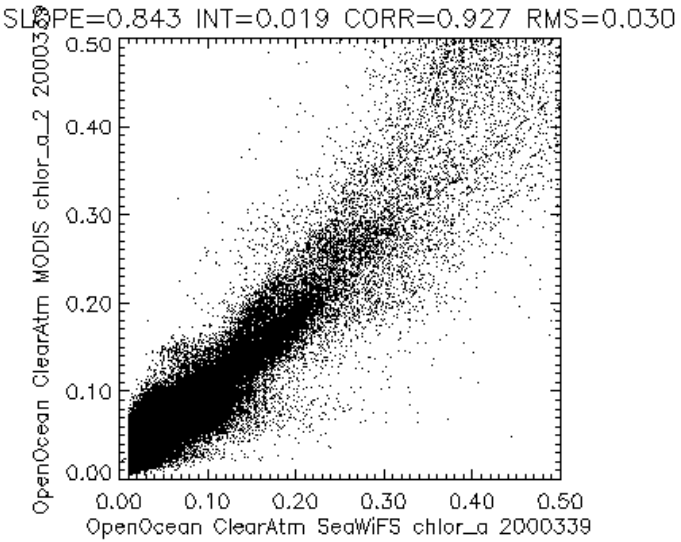
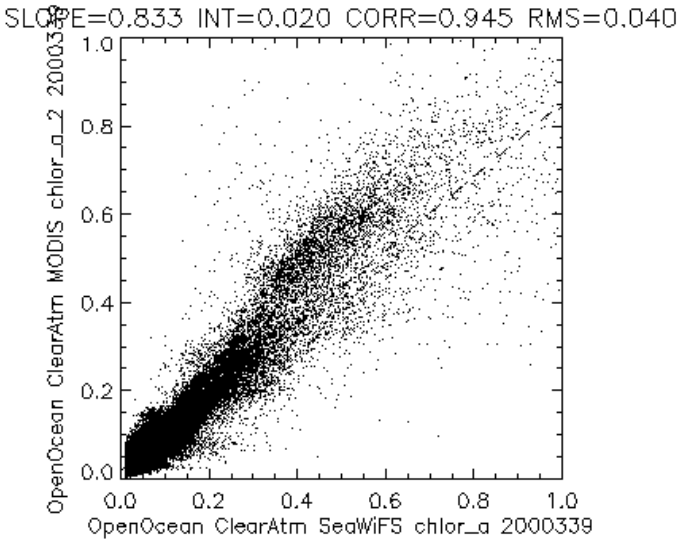


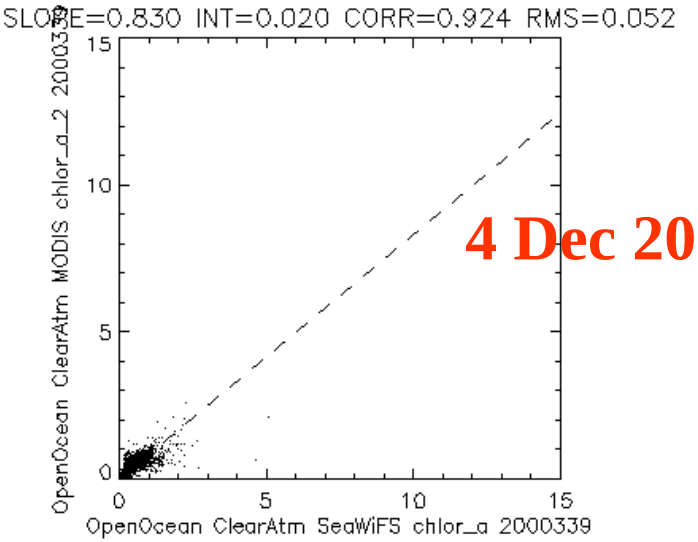
MODIS and SeaWiFS chlorophyll comparisons

open ocean clear atmosphere



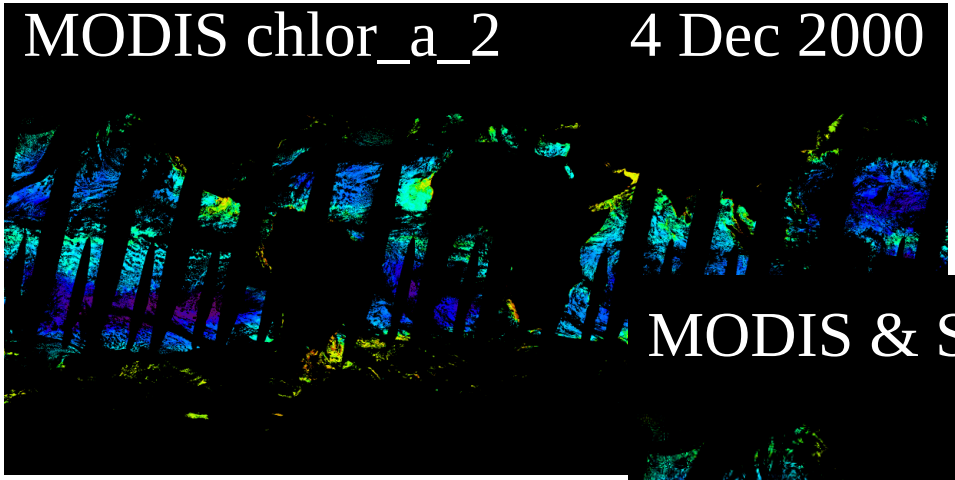




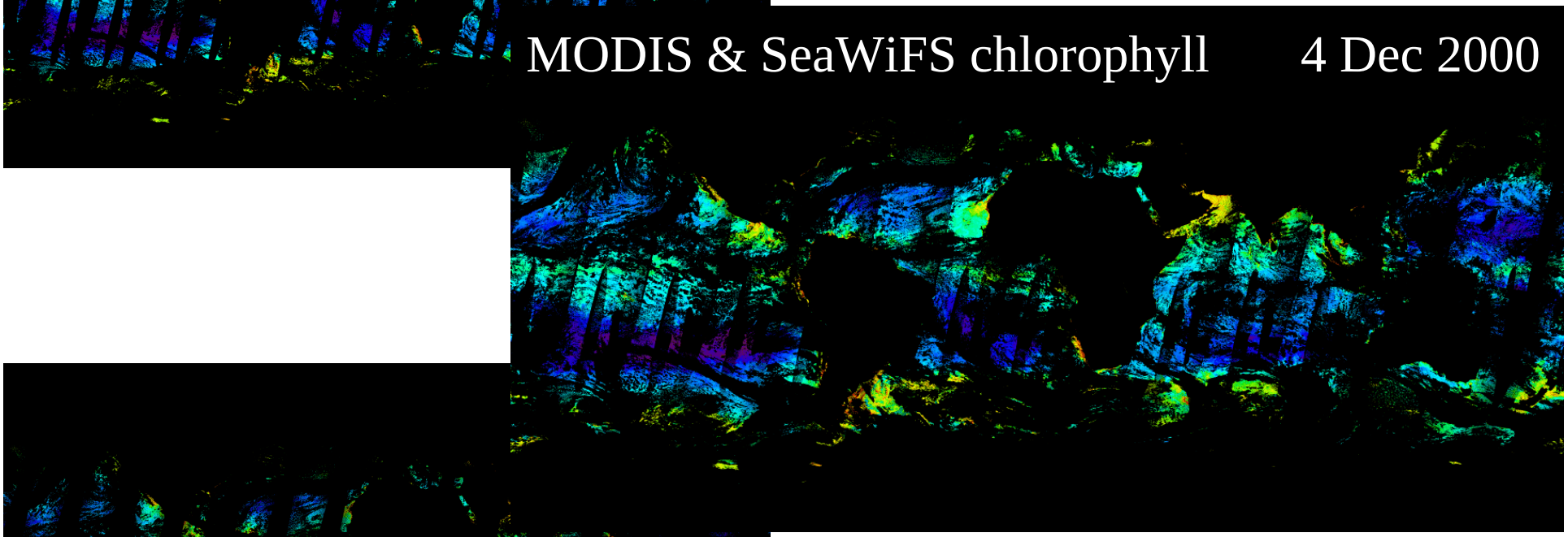


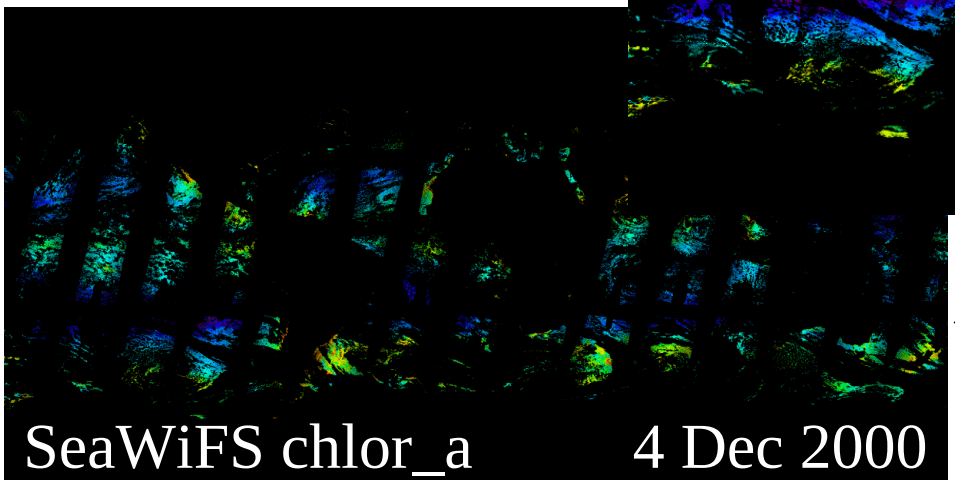
4 Dec 2000

Improvement of daily global coverage: MODIS and SeaWiFS



- Improvement of MODIS coverage ≈ 37%.





- Improvement of SeaWiFS coverage ≈ 177%.

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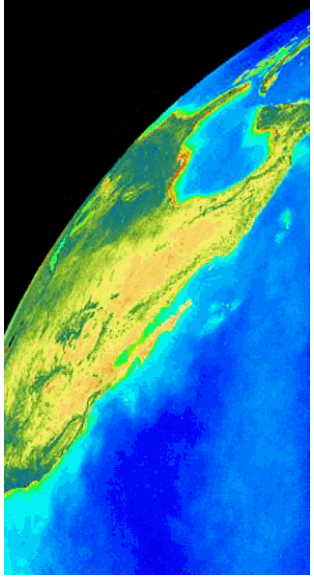
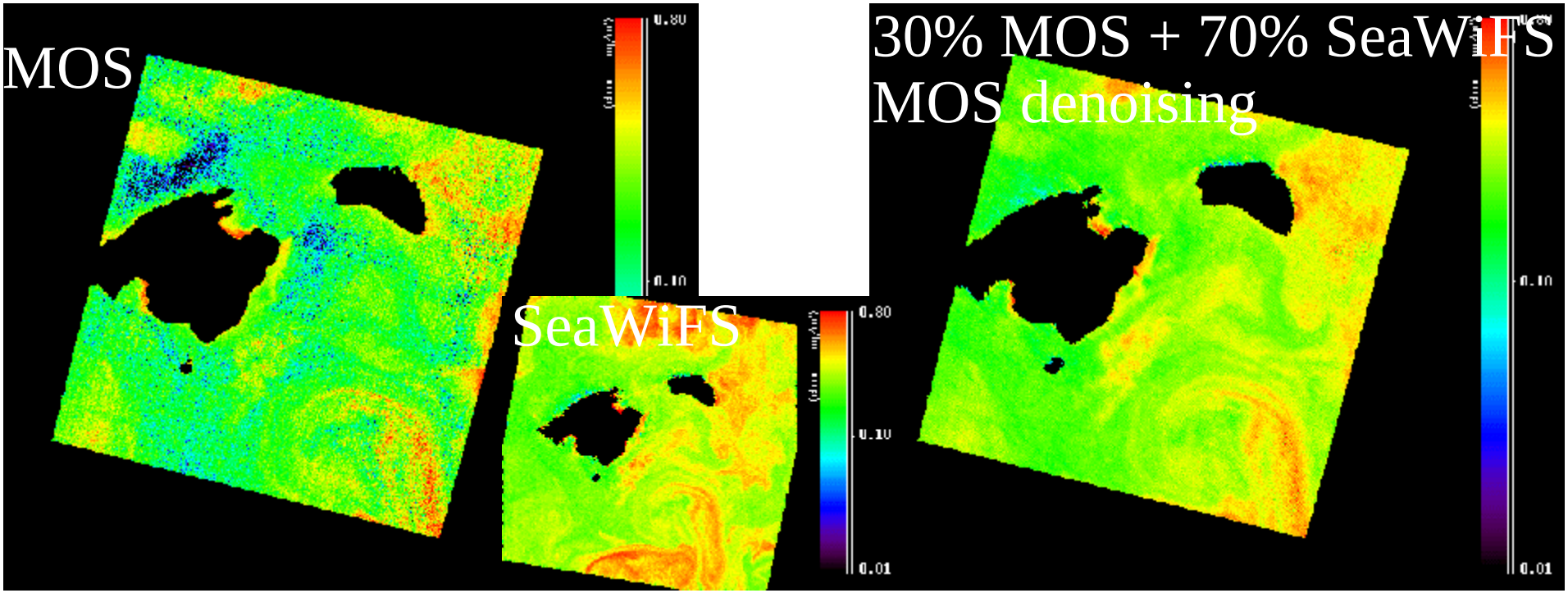


Merger of MODIS and SeaWiFS global data

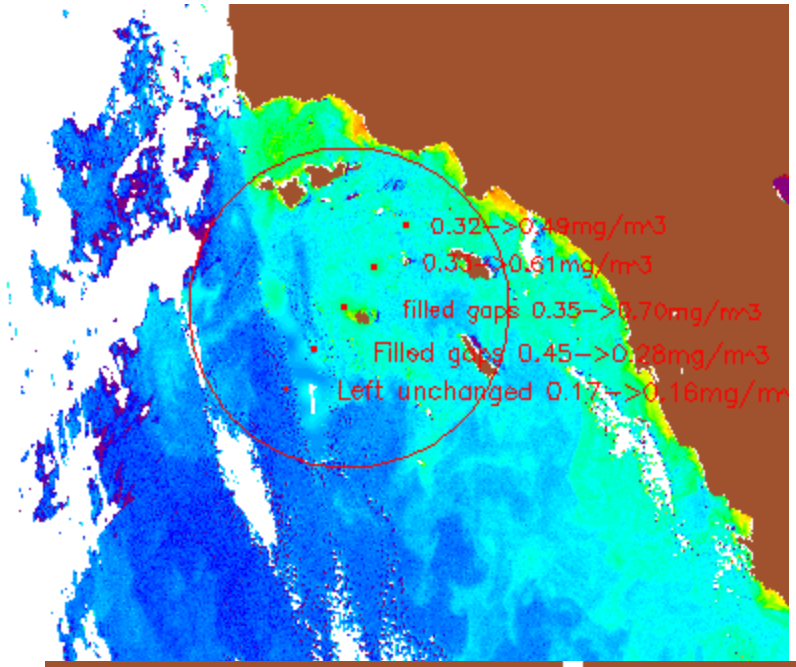
- Goals:
  - create a merged product with a consistent accuracy for all data bins/pixels,
  - overcome differences in sensor characteristics, instrument calibration, and data processing algorithms,
  - incorporate the product accuracy levels.
- Possible solutions:
  - mapping of ocean color retrievals from one sensor into the other using statistical regression or neural networks (non-parametric mapping) using a number of products and quality-control parameters,
  - averaging, blending algorithms (Gregg),
  - merger of optical parameters (Maritorena).

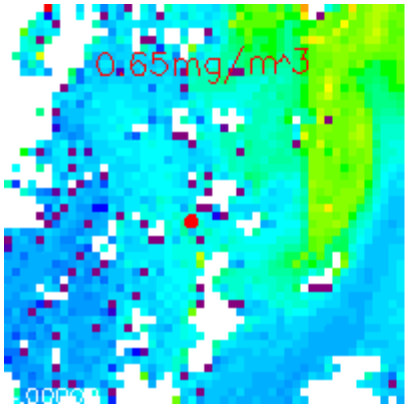
❷ Merger of ocean color data of different spatial resolutions: MOS & SeaWiFS

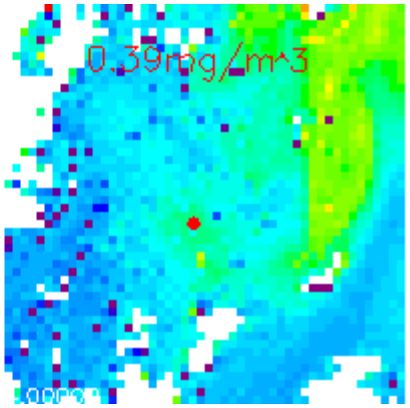
- Definition of local products at the highest feasible spatial resolution.
- Wavelet extraction of spatial detail in high-resolution imagery and transfer of the detail to low-resolution images.
- Poster presented at AGU Fall 2001.

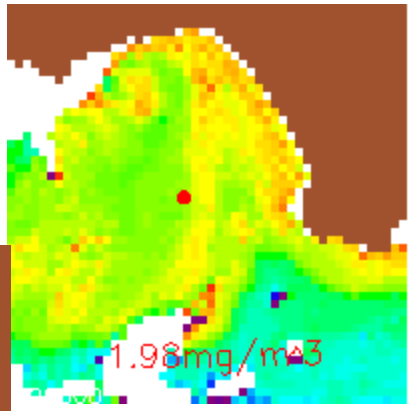


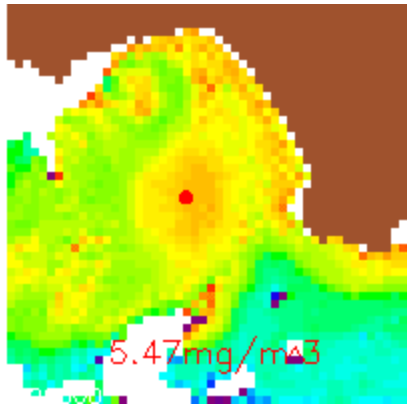
❸ Merger of satellite data and *in situ* measurements: CalCOFI & SeaWiFS

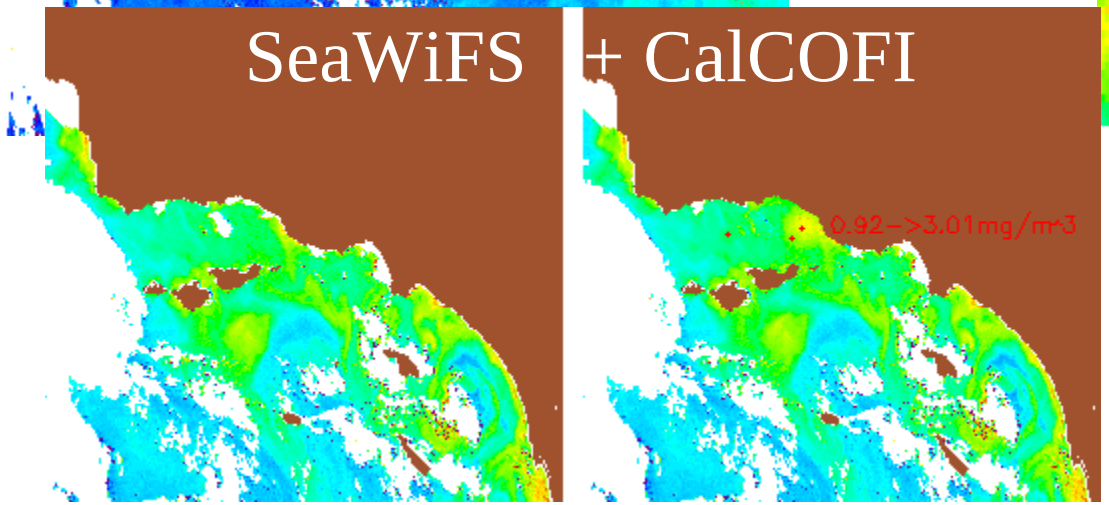












- Level 2 SeaWiFS data.
- 12h. max time difference.
- Wavelet-based gap filling.

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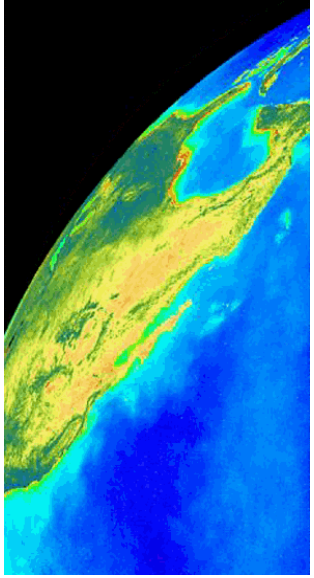

Future Plans

- Cooperation with SIMBIOS Science Team on sensor intercomparisons, data merger, and algorithm implementation.
- Cooperation with the MODIS Team and DAAC.
- Definition of an optimal mapping algorithm for MODIS and SeaWiFS and creation of daily merged global chlorophyll products.
- Merger of other ocean color products, such as aerosol optical thickness (?).
- Work with MERIS, GLI and POLDER II data.

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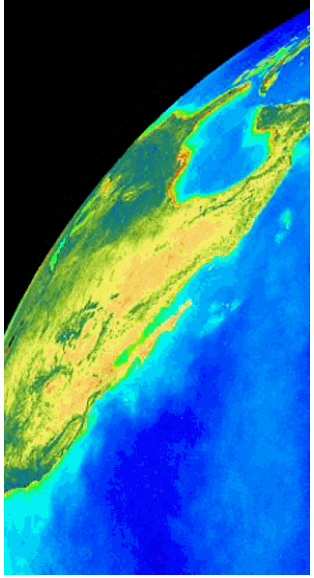

Improvement of daily global coverage: MODIS & SeaWiFS

	Total MODIS bins	*Total SeaWiFS bins*	*Number of common bins*	*Percent. improve-ment MODIS*	*Percent. improve-ment SeaWiFS*
4 Dec 2000	2088811	1024947	274777	35.914%	176.988%
8 Apr 2001	2147755	1023575	220401	37.396%	188.296%
10 Jun 2001	1948698	1010637	276803	37.658%	165.430%
Average				36.989%	176.905%

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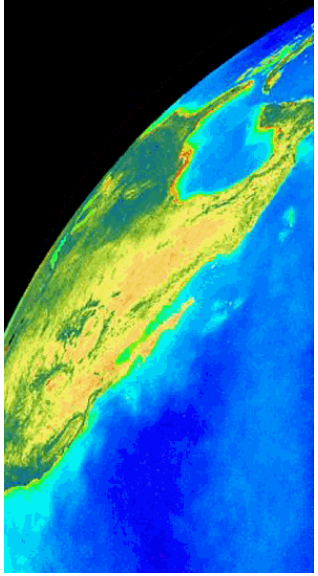
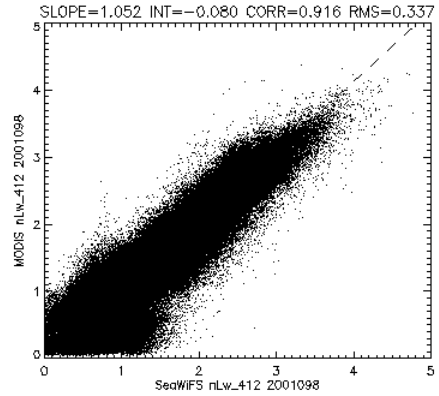
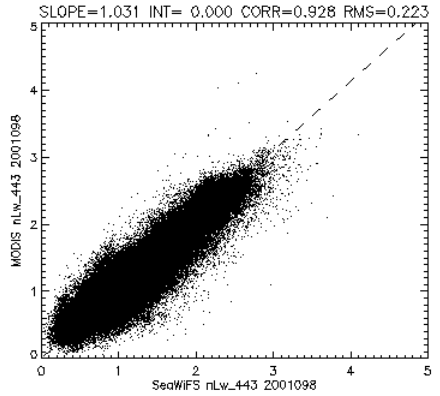
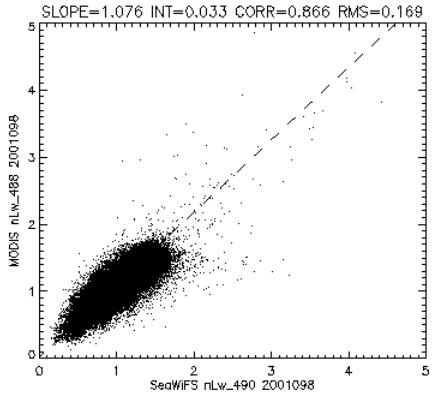
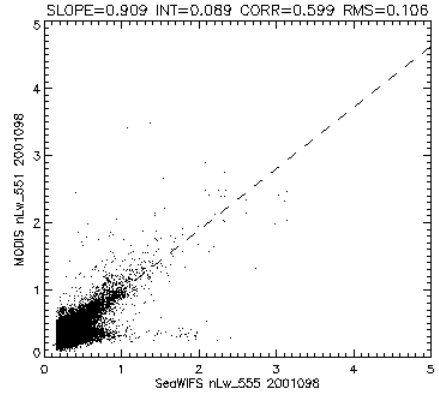


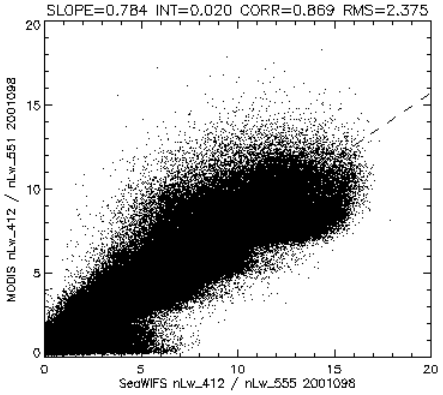
MODIS and SeaWiFS nLw comparisons total dataset

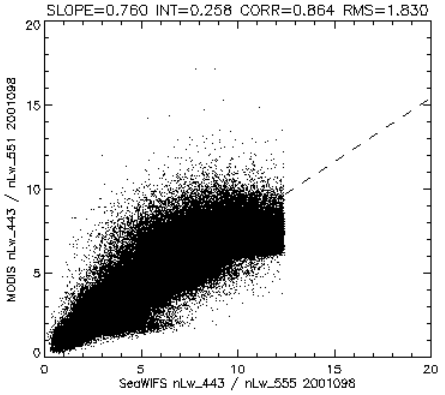


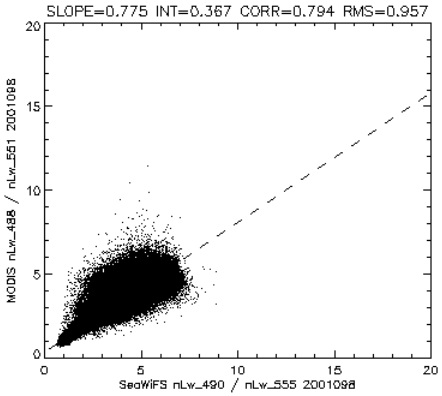


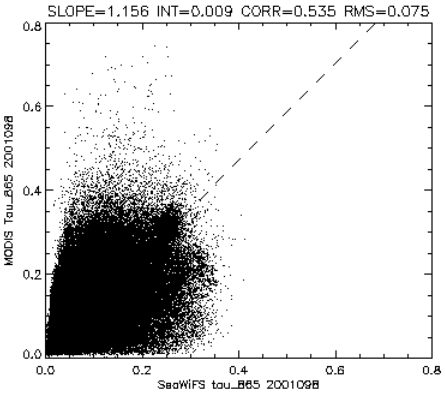


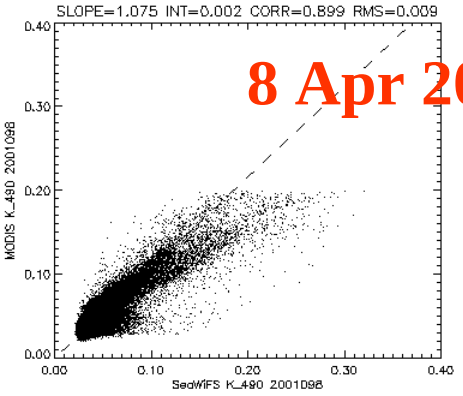












8 Apr 2001

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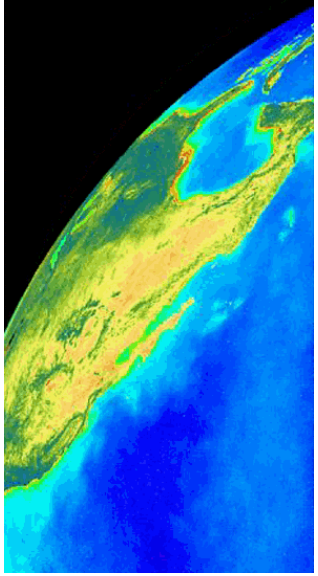
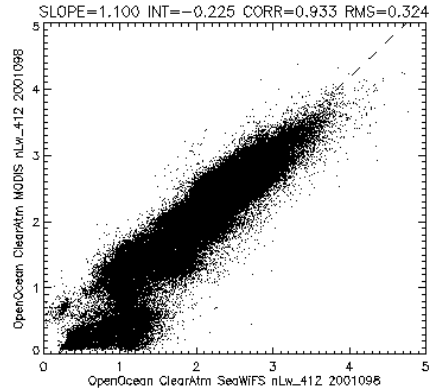
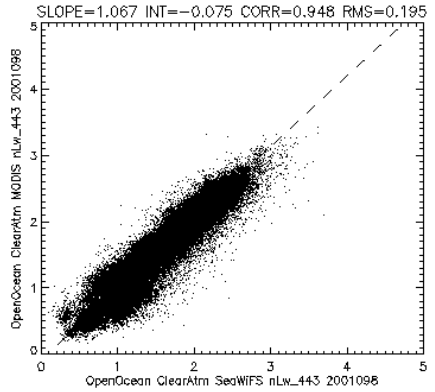
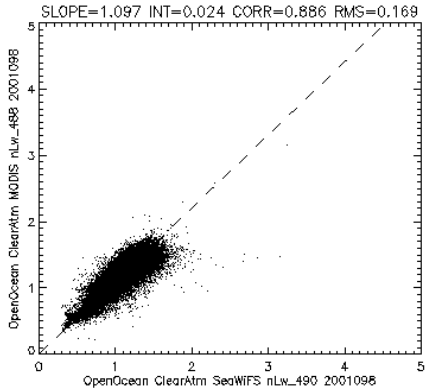
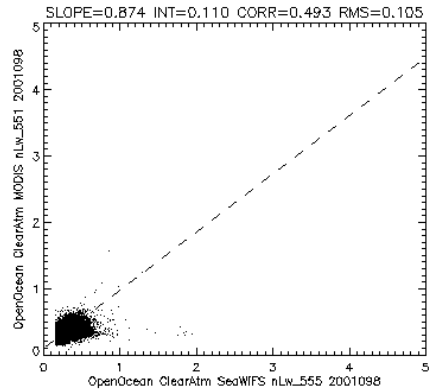


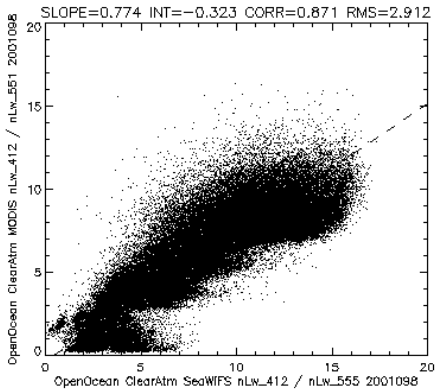
MODIS and SeaWiFS nLw comparisons open ocean clear atmosphere

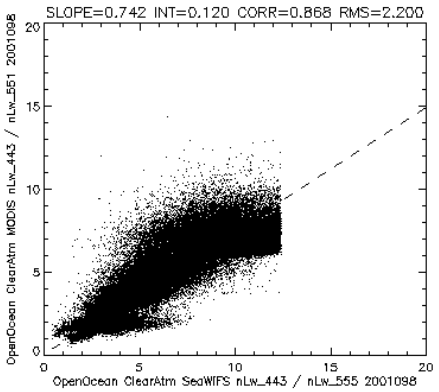


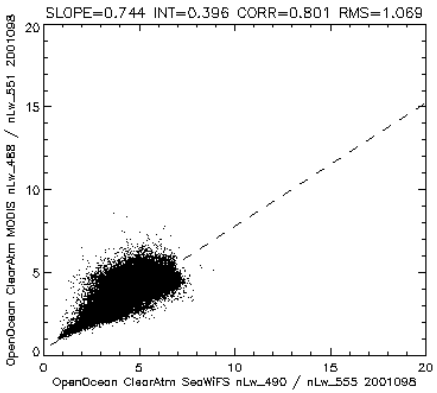


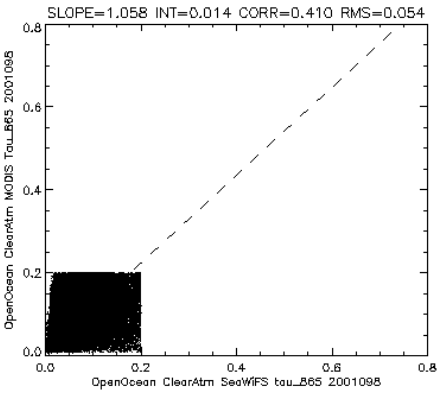


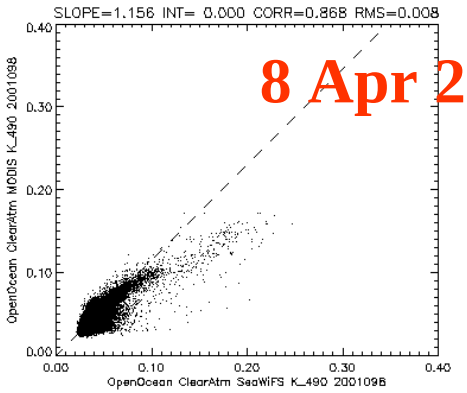












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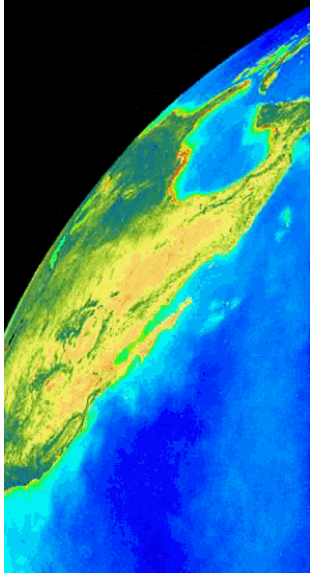
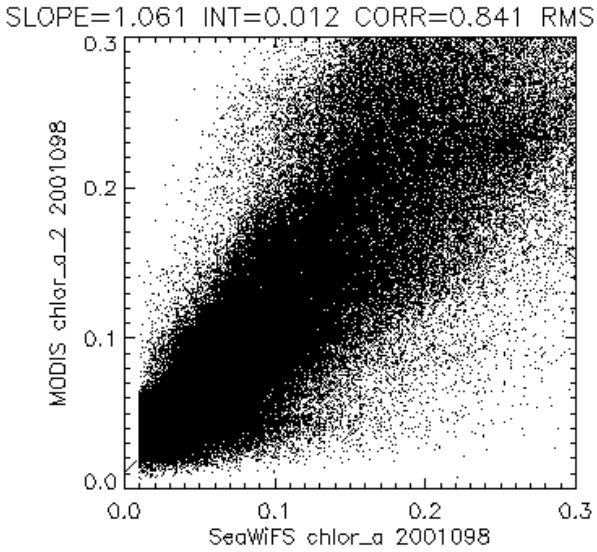
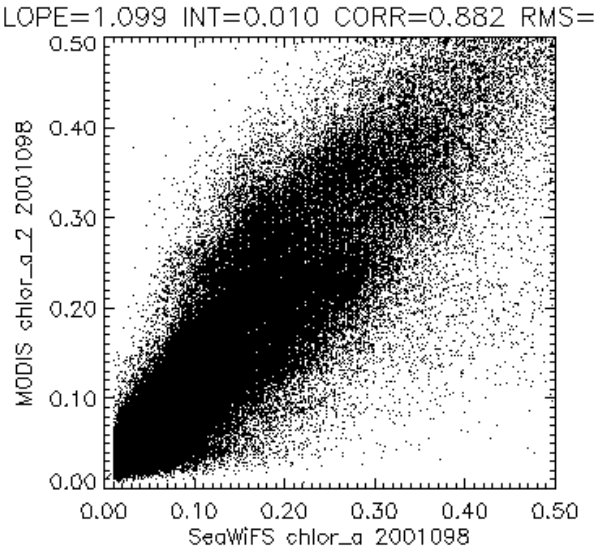
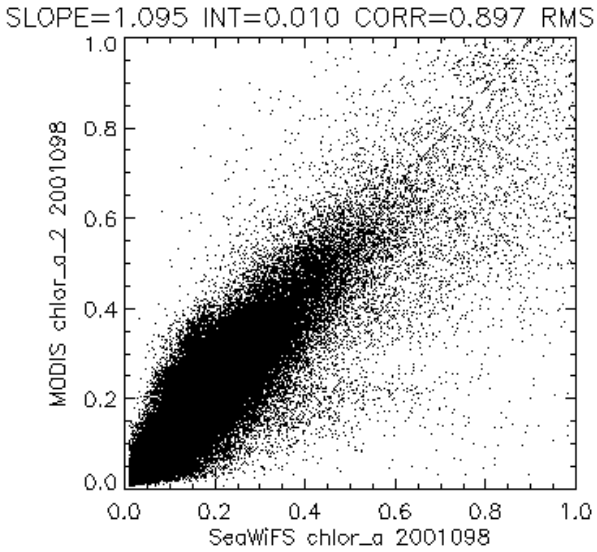


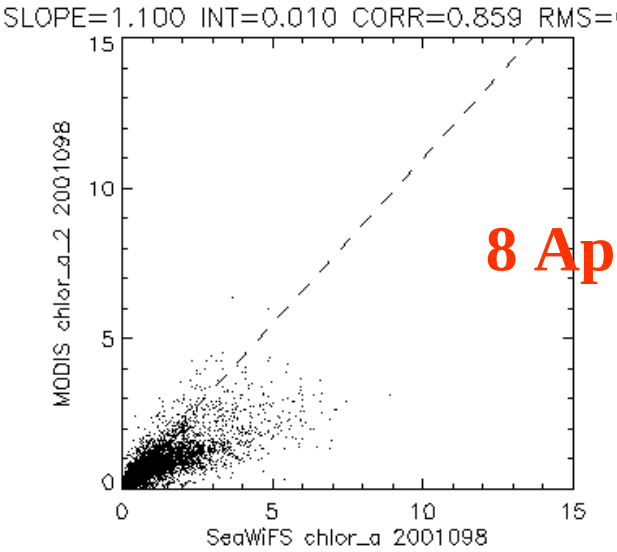
MODIS and SeaWiFS chlorophyll comparisons

total dataset









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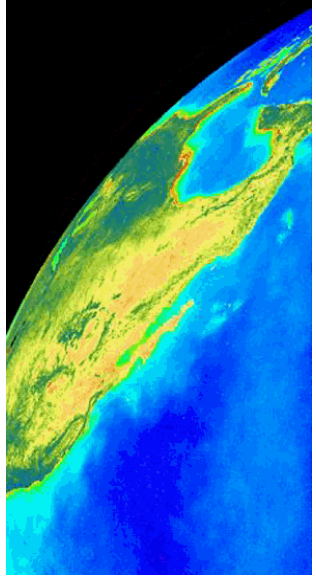
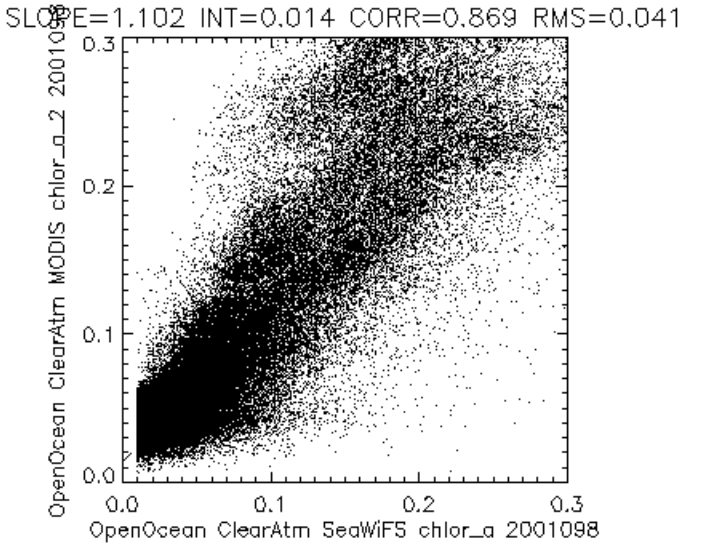
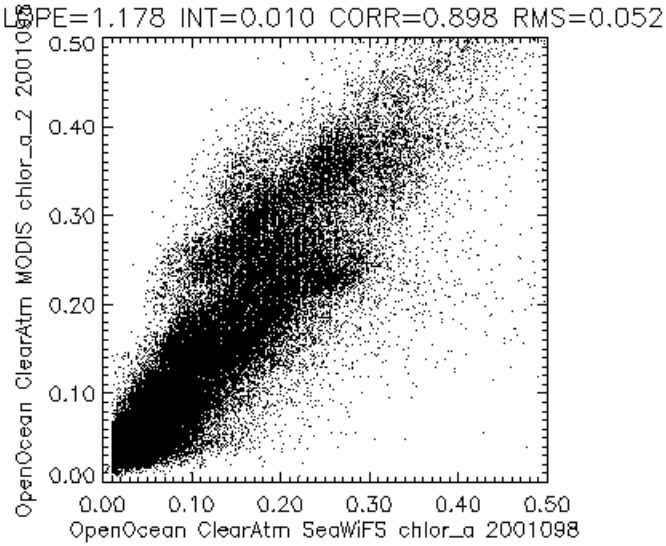
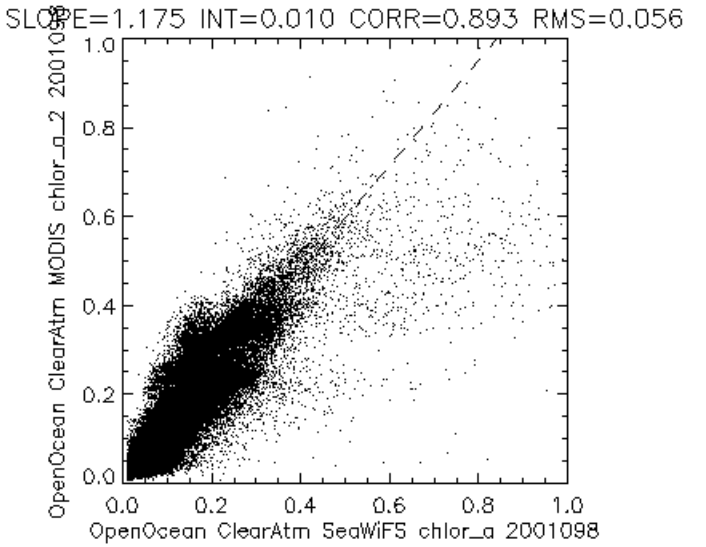


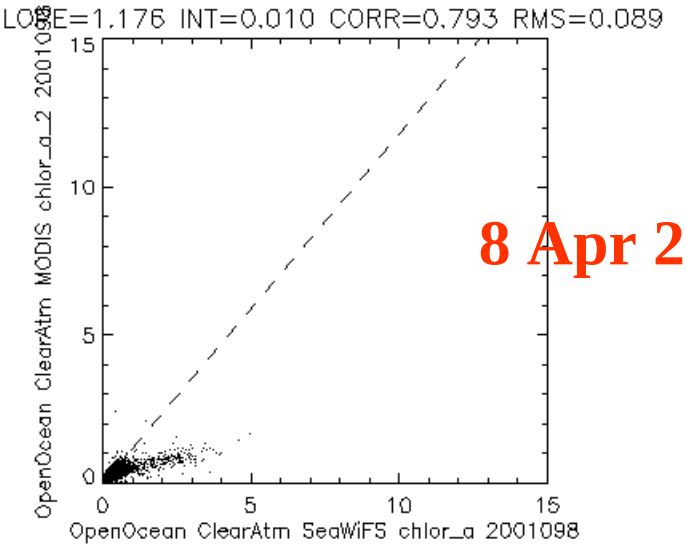
MODIS and SeaWiFS chlorophyll comparisons

open ocean clear atmosphere









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