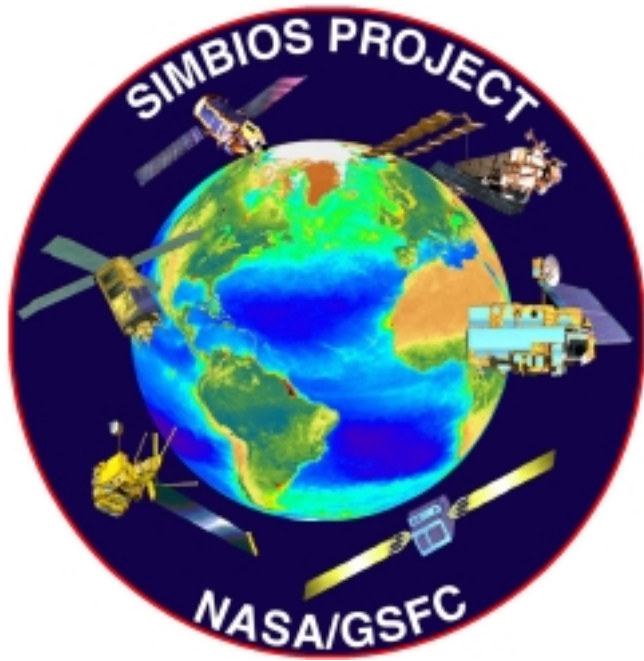# 2001 Achievements & Activities SIMBIOS Project

Giulietta S. Fargion

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

SIMBIOS Science Team,
January 15 - January 17, 2002

SIMBIOS Project Achievements 2001

◆ **Satellite Characterization**
- ‣ Bob Barnes and Brian Franz

◆ **Satellite Data Processing**
- ‣ Brian Franz, Joel Gales, Sean Bailey, Jeremy Werdell and SeaWiFS staff

◆ **Data Merging**
- ‣ Ewa Kwiatkowska-Ainsworth

◆ **Data Product Validation**
- ‣ Sean Bailey, Jeremy Werdell, Christophe Pietras and Kirk Knobelspiesse

◆ **Calibration Round Robin**
- ‣ Gerhard Meister, Bob Barnes

◆ **Support Services**
- ‣ Sean Bailey, Jeremy Werdell, Christophe Pietras, Kirk Knobelspiesse

SIMBIOS Project Achievements 2001

◆Satellite characterization:

• The Project is hosting a NASDA representative (Mr. Tanaka) for one year (June 01-June 02) at Goddard Space Flight Center to assist in the GLI preparations. The Project worked on a document entitled "Instrument characterization of the GLI".

• KOMPSAT/OSMI characterization work was done in collaboration with KARI. Joint scientific papers were presented at Fall AGU meeting in San Francisco. In addition, KARI requested assistance from the Project to identify a schedule to record onboard OSMI data. Our recommendation is now implemented.

SIMBIOS Project Achievements 2001

Satellite Data Processing: OSMI

◆ No meaningful oceanic optical properties retrievable from using pre-launch calibration and processing software.

In collaboration with KARI, SIMBIOS agreed to:

- evaluate TRW pre-launch calibration of OSMI.

- adapt SIMBIOS software (MSL12) to process OSMI data and retrieve oceanic optical properties.

- develop OSMI vicarious calibration to *in situ* (MOBY) and/or another sensor.

- evaluate quality of derived ocean color products.
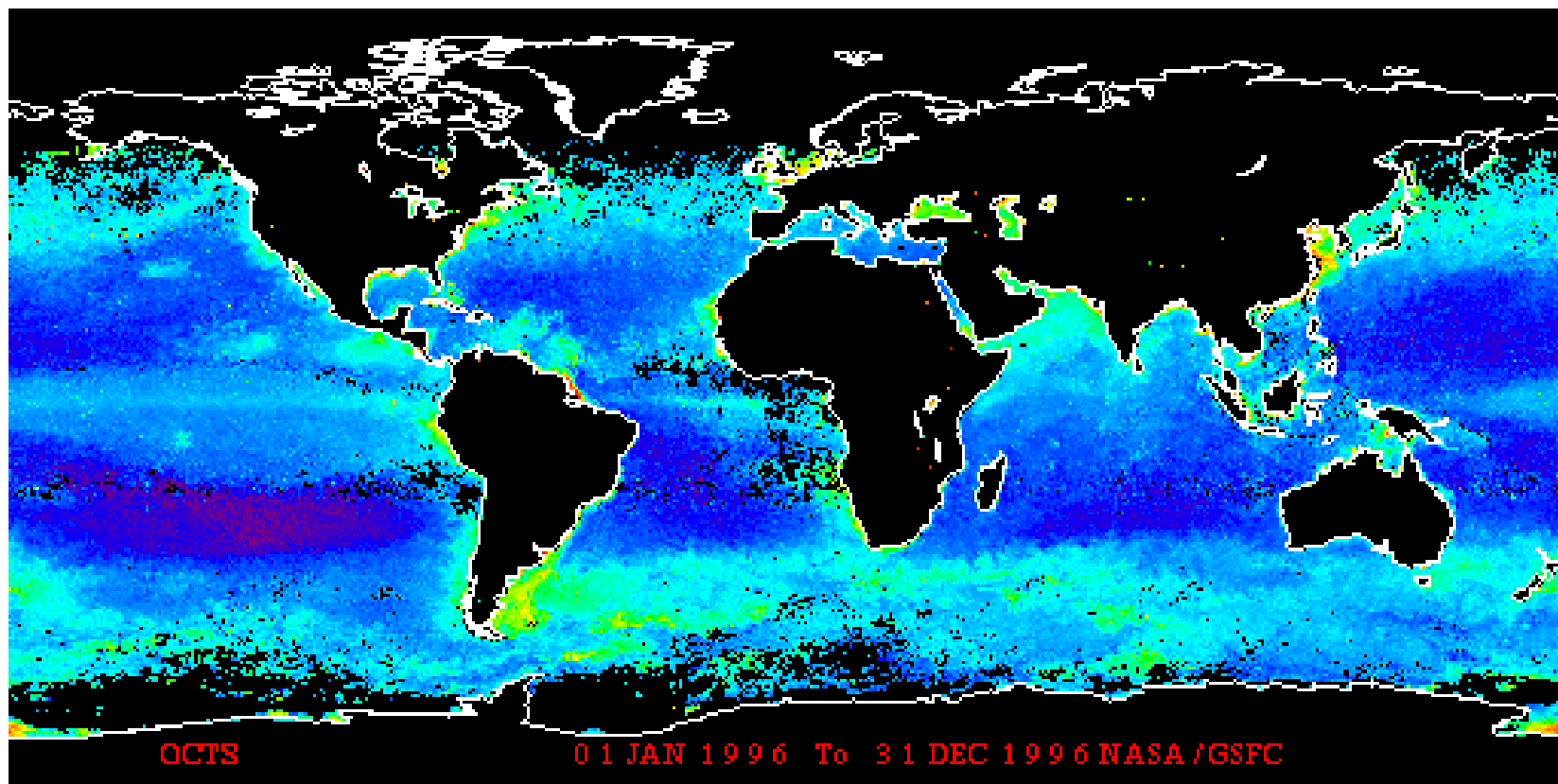
SIMBIOS Project Achievements 2001

Satellite Data Processing: OCTS

◆ OCTS GAC data reprocessing – completed
A very productive collaboration effort with NASDA and Japanese scientists. Scientific presentation was given at AGU Fall meeting in San Francisco.

Descriptions of the data processing stream, OCTS-specific modification to the algorithms, and statistical comparison between OCTS and SeaWiFS can be found at:

http://seawifs.gsfc.nasa.gov/SEAWIFS/RECAL/OCTS_Repro1/

NASDA & NASA Collaboration: OCTS-GAC

- Web browse and download utility for Level-1, Level-2 and Level-3 products can be found at:

  http://seawifs.gsfc.nasa.gov/cgibrs/octs_browse.pl

- SeaDAS 4.03p released on 11/9/01 - supports OCTS-GAC
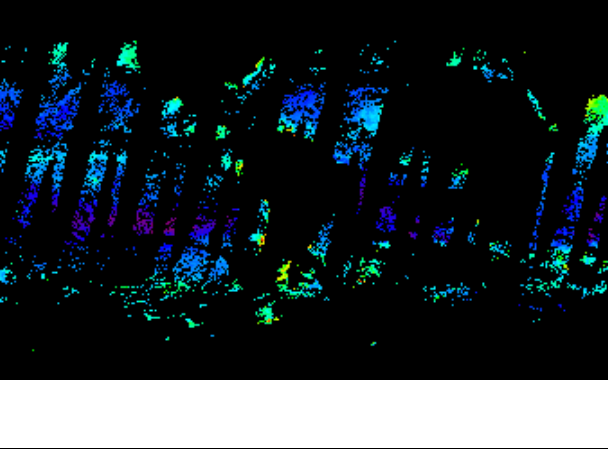
SIMBIOS Project Achievements 2001

◆**Data Merging:** MODIS & SeaWiFS

- MODIS data from GSFC DAAC:
        identification of common data formats
        binned daily files at 4.63km resolution, chlor_a_2 MODIS
        algorithm (version issue)

- MODIS data from Miami

- Development of algorithms for combined extraction and processing of MODIS and SeaWiFS bins

- Comparison of MODIS and SeaWiFS ocean color retrievals for overlapping bins with water-leaving radiance and chlorophyll products

Increase in daily global coverage : MODIS & SeaWiFS

MODIS chlor_a_2   5 Dec 2000

MODIS & SeaWiFS chlorophyll   5 Dec 2000

SeaWiFS chlor_a   5 Dec 2000
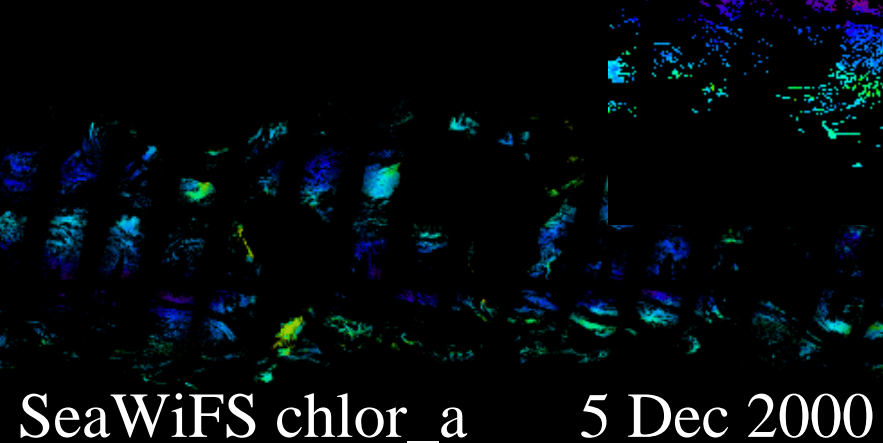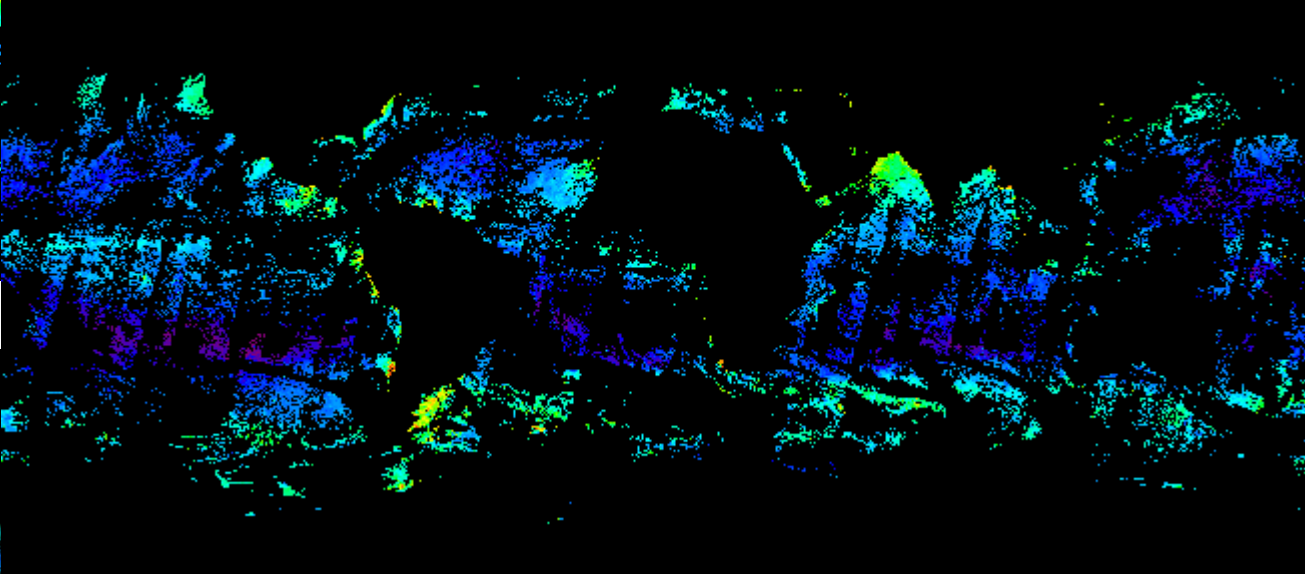
- Bins are mapped using an Equidistant Cylindrical projection of the globe

SIMBIOS Project Achievements 2001

◆Data Merging cont. :

• Ensure development of internally consistent research products and time series from multiple satellite ocean color data sources.
• Overcome differences in sensor characteristics, instrument calibration, and data processing algorithms.
• Create a merged product of consistent accuracy for all data bin - pixels.

Proposed solution: Neural Network (NN) (non-parametric function) mapping of ocean color retrievals from one sensor into the other. NN merging techniques were applied to SeaWiFS-MODIS (level 3), by Project staff.
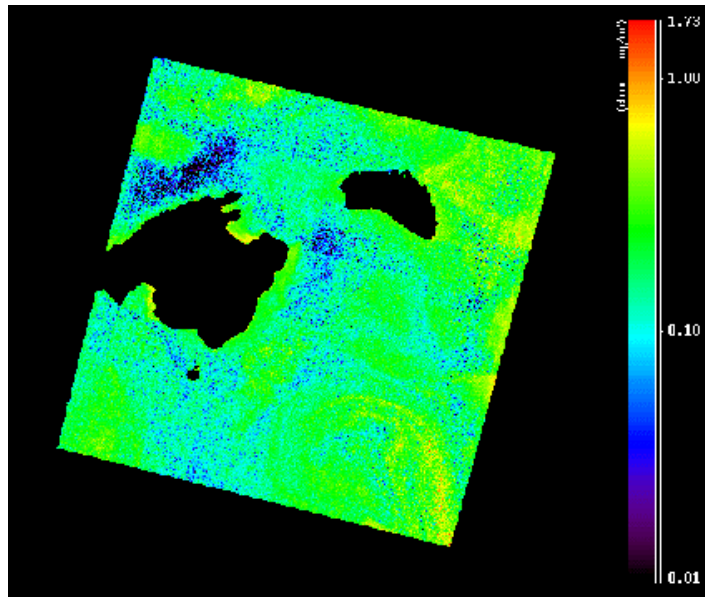
SIMBIOS Project Achievements 2001

◆Data Merging cont.:

Goal: merger of ocean color data of different spatial resolution
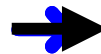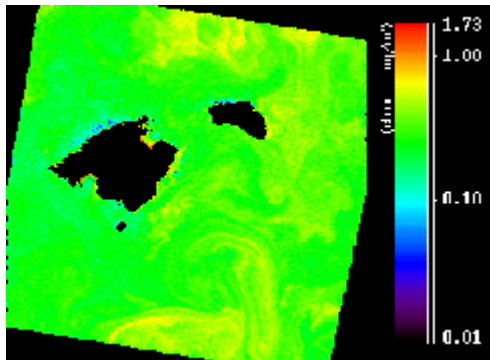to the highest feasible spatial resolution

• MOS and SeaWiFS data are cross calibrated and processed with identical code.

•Wavelet merging techniques were applied to SeaWiFS-MOS (level 2) by Project staff.

•First scientific results were presented at Fall AGU.

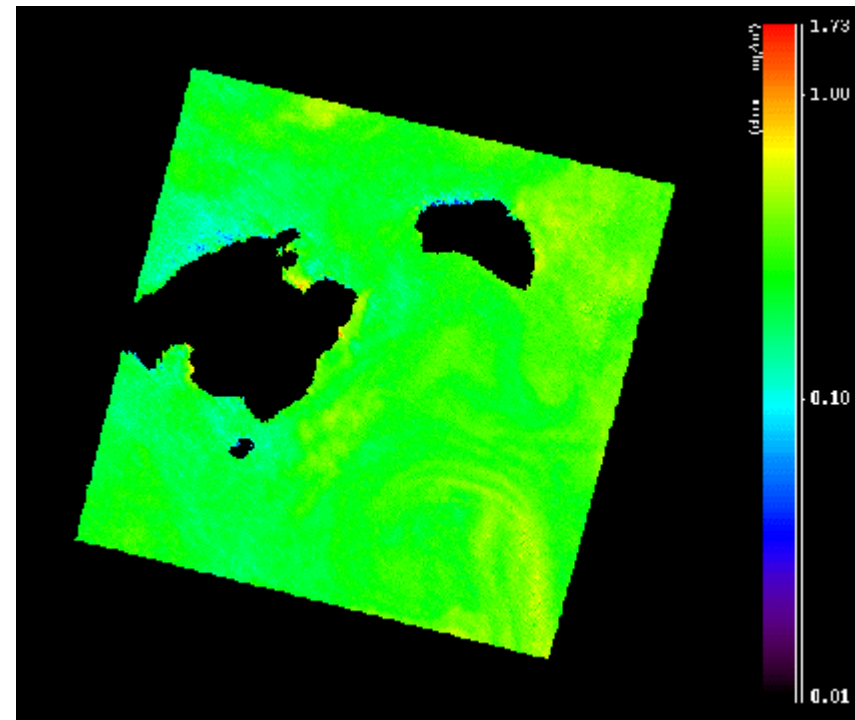# Data Merging: Wavelet-based Merger of Ocean Color Data of Different Spatial Resolutions

MOS

30% MOS + 70% SeaWiFS + MOS denoising

+   SeaWiFS

SIMBIOS Project Achievements 2001

◆ **Data Merging:** implemented diagnostic data set

- **The ocean sites are intended to facilitate future data merging activities**. The regions were discussed at several SIMBIOS Team and IOCCG meetings.

- Approximately 30 SeaWiFS ocean sites implemented as a collaboration of SeaWiFS and SIMBIOS Projects. We had constant and large browse and download traffic of these ocean sites.

- MOS and OCTS-GAC diagnostic data sets will be made available in Winter 2002.
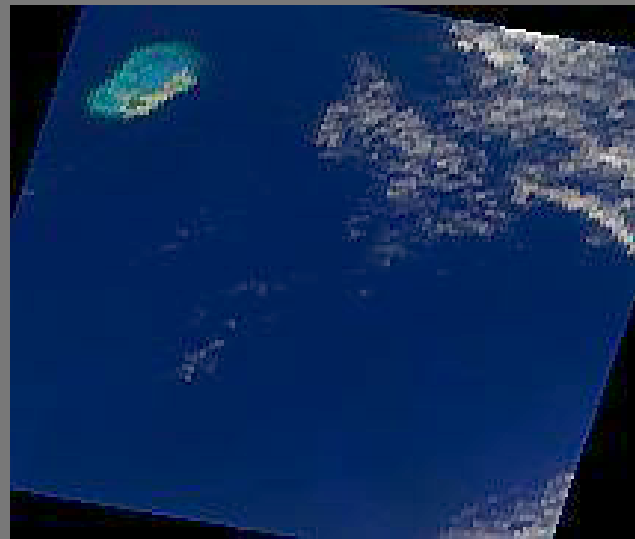
  http://seawifs.gsfc.nasa.gov/cgibrs/eos_core_sites.pl

Diagnostic Data Set

Multiple
Satellite
Capability

MOS (above) and **SeaWiFS** (right) data extracts of Bermuda collected on 15 March 2000

S2000075165409.L1A_HNSG.BBOP.extract

S2000075165409.L2_HNSG.BBOP.extract

SIMBIOS Project Achievements 2001

◆Data Product Validation:

- Multisensor *in-situ* bio-optical and atmospheric match-up **analysis routines are in place** for MOS, SeaWiFS, OCTS-GAC, OSMI and **MODIS**.

- Improved QC and diagnostic bio-optical algorithms used prior to archiving *in-situ* data in SeaBASS.

- Started work on rebuilding SeaBAM data set

QUALITY CONTROL
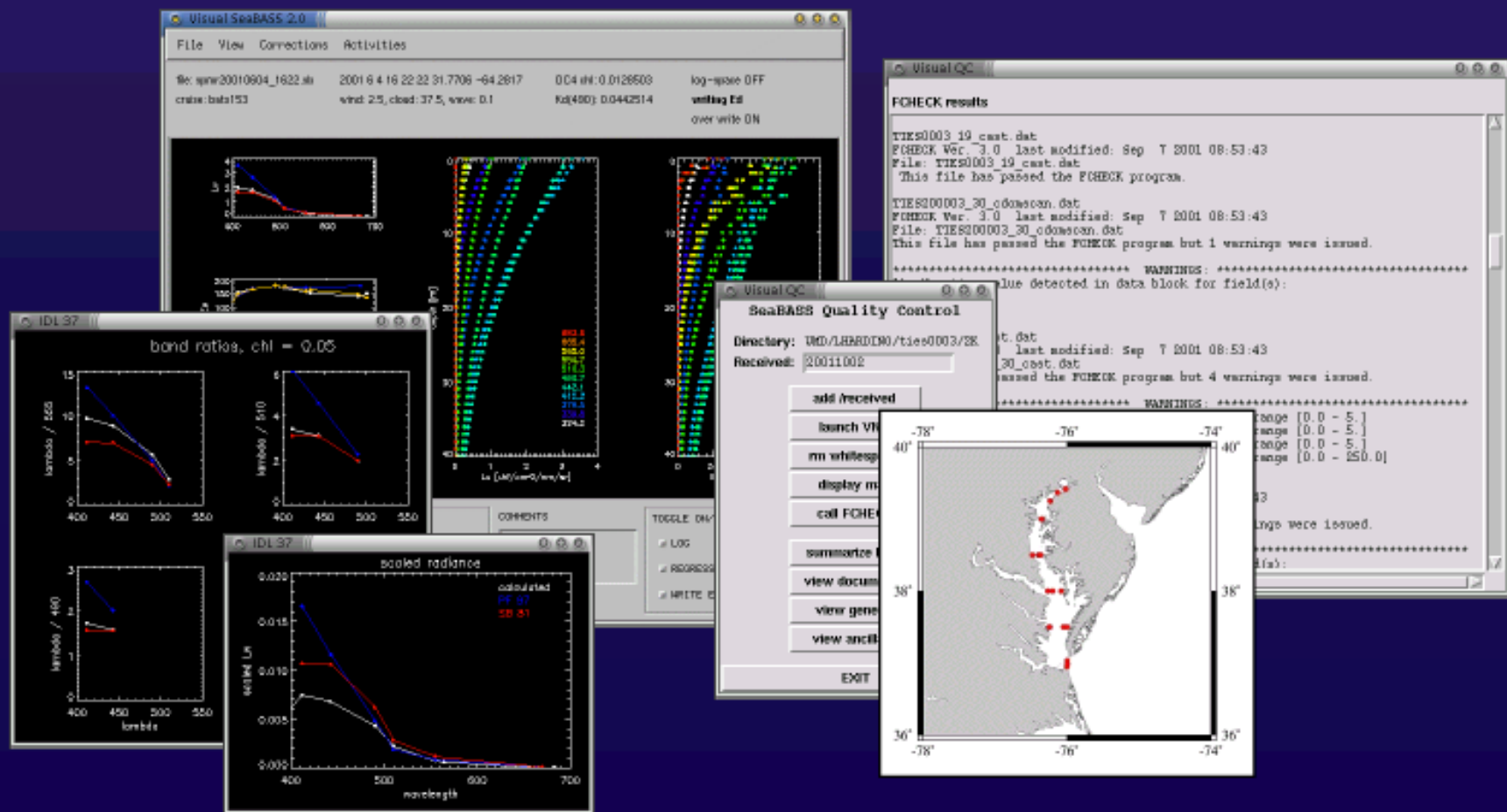
Examples of software used to verify SeaBASS data file format and evaluate and analyze radiometric depth profiles are shown. The principle component of the format-verification software is known as FCHECK. Contributors may test a data file for compatibility with the SeaBASS format by electronically mailing the file to *fcheck@seabass.gsfc.nasa.gov*. Additional quality control methods include generation of regional maps and comparison of field data with theoretical and modeled values.

SIMBIOS Project Achievements 2001

◆**Data Product Validation:**

- • New SeaBASS data archive and **relational database**.We now have password-protected and public SeaBASS archive versions.

- • **Public data** is currently from 1975 to 1999 and includes all data collected by the first SIMBIOS Team.

- • An agreement is in place between the National Oceanographic Data Center (NODC) and the Project (SeaBASS CD-ROM and data archive depository).

- • Submitted all SeaBASS data collected prior to 31 December 1999 to NODC.

SeaBASS search engines:
bio-optical database, pigment locator and aerosol locator
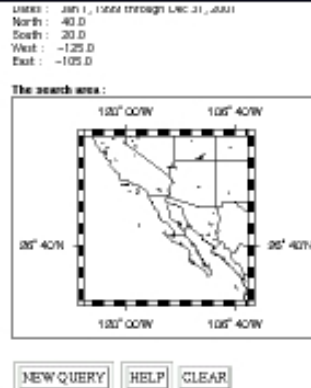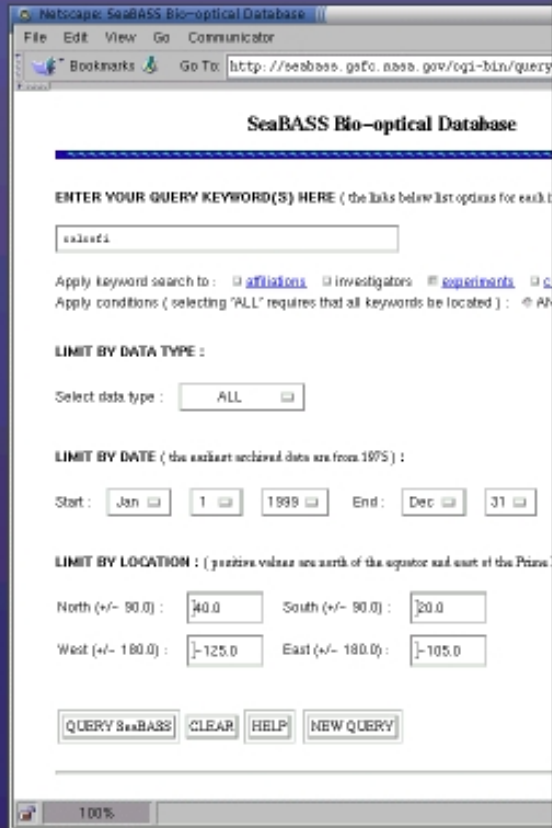
http://seabass.gsfc.nasa.gov
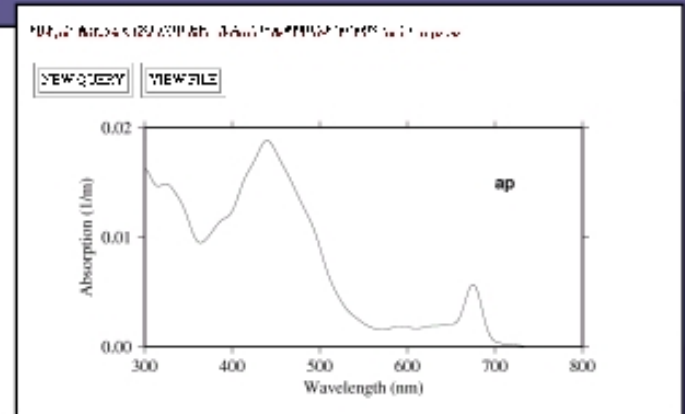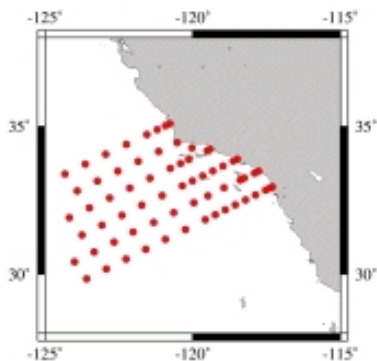
Daily mission-specific SeaBASS data points generated for OCTS / POLDER, SeaWiFS and MODIS

MODIS
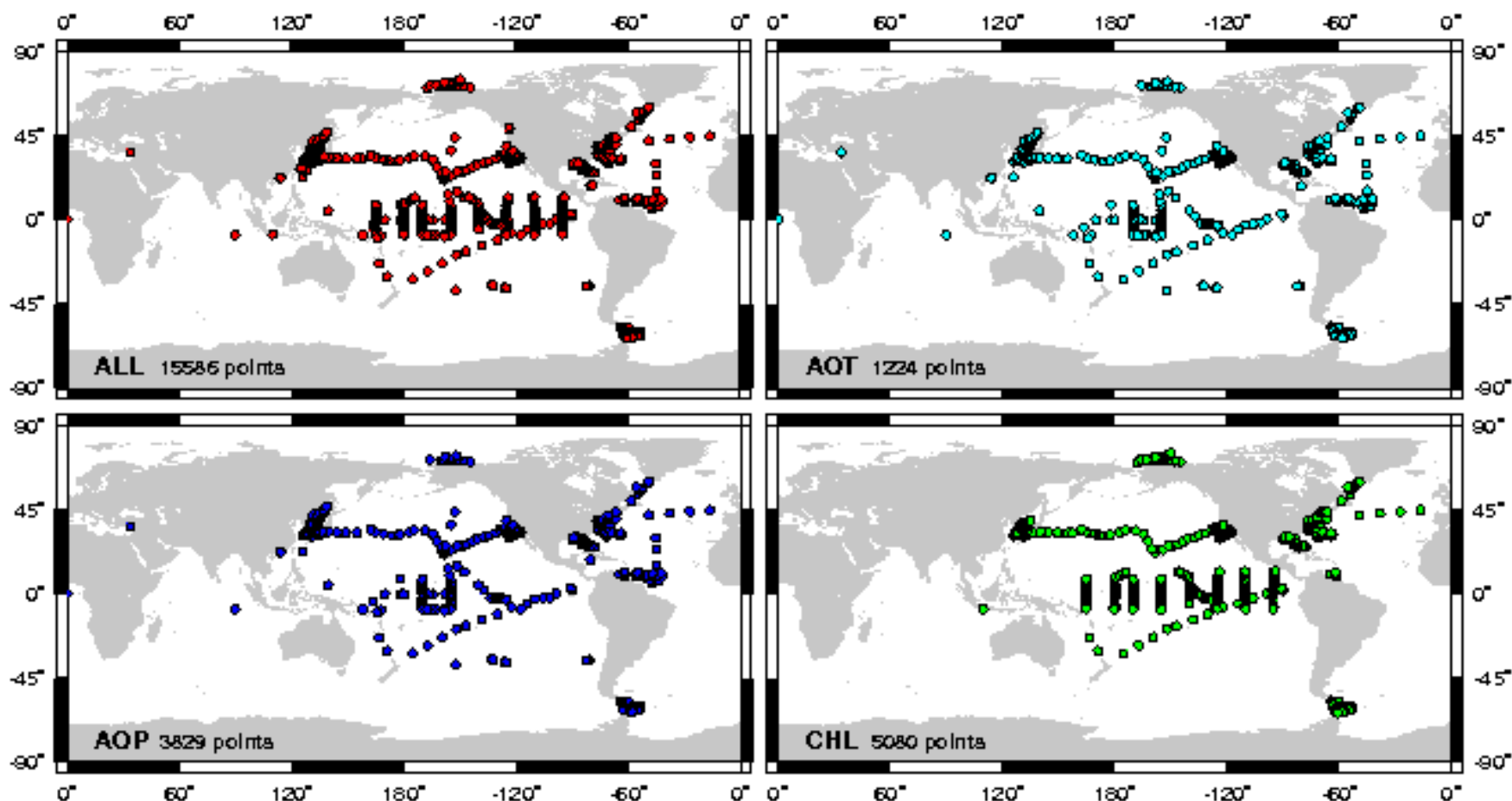
SIMBIOS Project Achievements 2001

◆**Sun Photometer Activities:**

  • A total of 14 coastal and island CIMEL stations (1998-2001) were contributed to the NASA AERONET network. This year, SIMBIOS CIMEL sun photometer data were used by the community in more than 20 scientific papers.
  • PREDE characterization and instrument hardening ongoing. PREDE and MPL were deployed during ACE-ASIA international campaign.
  •All sun photometer calibrations are done at GSFC.

◆ **Global Marine Atmosphere Database:**

Project has started working with Frouin (SIO), Miller (BNL) and AERONET to create an AOT database to develop alternative atmospheric models from those of Shettle and Fenn (1979).

Sun Photometer Calibration Activities
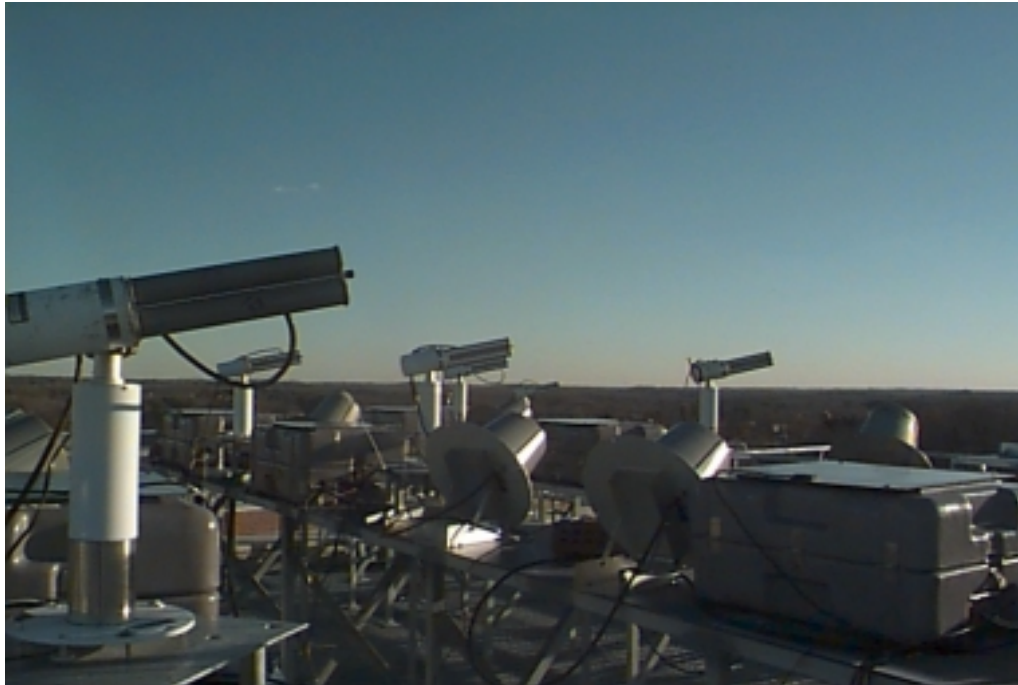
- Roof platform at GSFC used for transferring calibration to sun photometers

- Project has done ~ **55** instrument calibrations per year

- Integrating GSFC sphere "Hardy" used to calibrated SIMBIOS radiometers and sky radiometers.

SIMBIOS Project Achievements 2001

◆ **Calibration Round Robin Activities:**

SIMBIOS Radiometric Intercomparison (SIMRIC-1)

• SeaWiFS transfer Radiometer (SXR-II) was calibrated with SIRCUS at NIST in December 2000 and December 2001.

• SXR-II from November 2000 to December 2001 was monitored by a portable light source, the SQM-II (~ 50 HiBank and ~ 50 LoBank mode measurements).

• Measured with the SXR-II the following sources: NIST NPR, GSFC Hardy and Code 916 sphere (6 times or more) .

• Participated in EOS and NIST radiometric intercomparison round robin at GSFC (April 2001).

SIMBIOS Project Achievements 2001

◆ **SIMBIOS Radiometric Intercomparison (SIMRIC-1)**

• **SIMRIC goals are to**:
- verify that all laboratories are on the same radiometric scale
- detect & correct problems at any individual lab in a timely fashion
- enforce the common use of calibration protocols
- identify areas where the calibration protocols need to be improved
- document the calibration procedures specific to each laboratory

• SIMBIOS round robin radiance was measured at 5 laboratories & at 3 companies (Satlantic Inc., Biospherical Instruments Inc., HOBI Labs) with the NIST-calibrated SXR-II.

• Agreement was always (with one exception) within combined uncertainties (about **+/- 2%**). Spectralon bi-directional reflectance factors are important source of uncertainty.

SIMBIOS Project Achievements 2001

◆**Support Services:**

• Project provides to the ocean color community **satellite over-flight prediction** support for SeaWiFS, **MODIS**, MOS, OCI, OCM and OSMI; and near real-time SeaWiFS Level-1, 2 images in support of on-going cruises.

• **Image browser** may be used with SeaWiFS, MOS, OCTS-GAC or OSMI data sets.

•Sun photometer **instrument pool** deployment of 14 MicroTops, 2 PREDE, 1 SIMBAD and 2 SIMBADA.

• **To date, 278** cruises have been supported by the Project, including ACE-Asia (2-month) and SIMBIOS Validation Study (6-month) in the Atlantic Ocean and Antarctic on the R/V Akademik Ioffe. This campaign is in collaboration with Russian scientists.

SIMBIOS Validation Study (6-month) in the Atlantic Ocean and Antarctic on the R/V Akademik Ioffe.

Date: Sun, 30 Dec 2001 12:28:54 +0000
From: Ajit Subramaniam <ajit@essic.umd.edu>
Subject: notes from the drake passage

- ….. notes from 29th - today was amazing. the winds were sustained at 55 knots with gust over 60. many waves broke over the bow and there was spray all the way to the bridge (6th deck). it would seem that weather of this kind is not uncommon here - the captain said no sampling (i thought i was doing andrei a favor by saying that he could go back to his bunk because he was sea sick and that i would sample - but the captain said that it was not safe to go out. afterwards, seeing the seas from the bridge, i am happy i did not go out

- … re. personal comfort : the cabin i have is the best i have ever had on a ship (even though i am not sure that 6th deck is the most comfortable for crossing the drake passage 4 times in 2 weeks)……….

SIMBIOS Project Achievements 2001

◆SIMBIOS TM documentation:

• "In situ Aerosol Thickness Collected by the SIMBIOS   Program (19997-2000): Protocols, and Data QC and   Analysis" *NASA TM-2001-209982.*

• "SIMBIOS Project 2000 Annual Report" NASA   *TM-2001-209976.*

• "Ocean Optics Protocols for Satellite Ocean Color Sensor Validation, Revision 3" in the works.

• "SIMBIOS Project 2001 Annual Report" in the works.

• "SIMBIOS Radiometric Intercomparison (SIMRIC-1)   2001 Report" in the works.

pdf documents are at
http://simbios.gsfc.nasa.gov

SIMBIOS Project Achievements 2001

◆ Project 2001 Meetings:

- 4th SIMBIOS Science Team held at GSFC on January 29th through 31st of January 2001. Agenda and recommendations were posted on our web site.

- Project organized a special session at Fall AGU (13-14 December, 2001) on "*Calibration & Validation Efforts Under Way by the Ocean Color Missions*". We had a full day oral session and ½ day poster session. Substantial US and international SIMBIOS investigators are participating. For more see:

  ### http://agu.org/meetings

- 5th SIMBIOS Science Team in Baltimore (Maryland) on January 15th through 17th of January 2002.

Future Thrusts:

- Continuing work on MODIS with the MODIS Oceans Team and GSFC DAAC

- Continuing work on data merger: Project staff (L3) and team collaboration (diagnostic data set and L3)

- Begin preparations for the ADEOS-II/GLI/POLDER and ENVISAT/MERIS missions

- Continuing to assist KARI in the calibration and processing of the KOMPSAT/OSMI data

- Begin work with the MOS Science Team on the use of MOS for linking the SeaWiFS with the ADEOS-I OCTS and POLDER time series

- Assist the NASA SeaDAS group on incorporating OSMI processing capabilities into SeaDAS

- Continue work on the SIMBIOS NODC CD-ROM for planned release in Spring 2002

Extra

Calibration Round Robin Activities

◆ **Chlorophyll Round Robin:**

Glibert and Van Heukelem- Univ. MD

• Experiments were designed to investigate the sources of variability among SIMBIOS PIs (i.e., survey methods, instrument performance, extraction techniques, precision/accuracy, etc.).

• First results have been published in the "SIMBIOS Project 2000 Annual Report" *NASA TM-2001-209976*.

• Complete round robin document is underway

◆ **HPLC Pigments:**

Since November 2000, Trees' lab is performing pigment analysis for the US SIMBIOS Team and conducting a small round robin activity with European laboratories collaborating with the Project. Results will be presented at SIMBIOS science team meeting (15-17 January, 2002).

Accomplishments toward validation of MODIS using SeaBASS data

- The Project developed read routines for MODIS data to integrate MODIS into the existing SIMBIOS ocean color validation effort.

- Developed routines to apply MODIS quality flags to validation data sets.

- Submitted on September 12 and updated in December, a list of SeaBASS data holdings collected post-launch for MODIS to the MODIS ocean team leader. From 11/1/00 to 06/15/01 we have **56** cruises and from 12/18/99 to 12/11/01 we have **156** cruises.

- Assisted in the development of display capabilities of MODIS data, including all flags, for the **SeaDAS package**.

What we need from MODIS:

- Locating and retrieving MODIS L2 data from the submitted list.

- L2 parameters needed: all nLw and chlorophyll products, taua 865, epsilon and aerosol models.

- Extraction should be ~ 101x101 pixel box centered on the validation point