MODIS Ocean Primary Productivity Data Product

January 22, 2001

MODIS / OCEANS / W. Esaias, PI / K. Turpie

OCEAN PRODUCTIVITY DATA PRODUCTS

- This product provides model estimates of Ocean Net Primary Production and Annual Export.

- The models used derive production from Chlorophyll, Light, SST, and Mixed−Layer Depth.

- Results in grams of Carbon fixed m^{-2} day^{-1} issues of interest:

  Magnitude and Variability of ONPP
  Ecosystem dynamics (coupling with physical forcings)
  Food chain efficiency (fisheries resources)
  Carbon cycle (carbon export, pCO2 and hence air sea C flux)

  (ocean NPP is 40−50% of global total production)

RELEVANT SCIENCE QUESTIONS

- **Variability** − How are global ecosystems changing?

- **Response** − How do ecosystems respond to and affect global environmental change and the carbon cycle?

- **Consequences** − What are the consequences of climate and sea level changes and increased human activities in the coastal regions?

- **Prediction** − How well can cycling of carbon through the Earth system be modeled, and how reliable are predictions (e.g., cal/val, scaling).

ACTIVITIES AND DIRECTIONS

- Significant improvement is expected over time.
- Extensive research will continue using SeaWiFS data.
- Negotiating ESDT problems and product inserts w/ GDAAC and SDST; awaiting testing of inserts.
- β−Release expected late Jan 2001.
- Provisional Release of P1,P2 indices may be achieved as early as May−Jun 2001.
- Changes to algorithms expected, including possibly a new model of P^b_{opt} and new input products.
- Open Issues will be address in coming months.

PROCESSING ISSUES

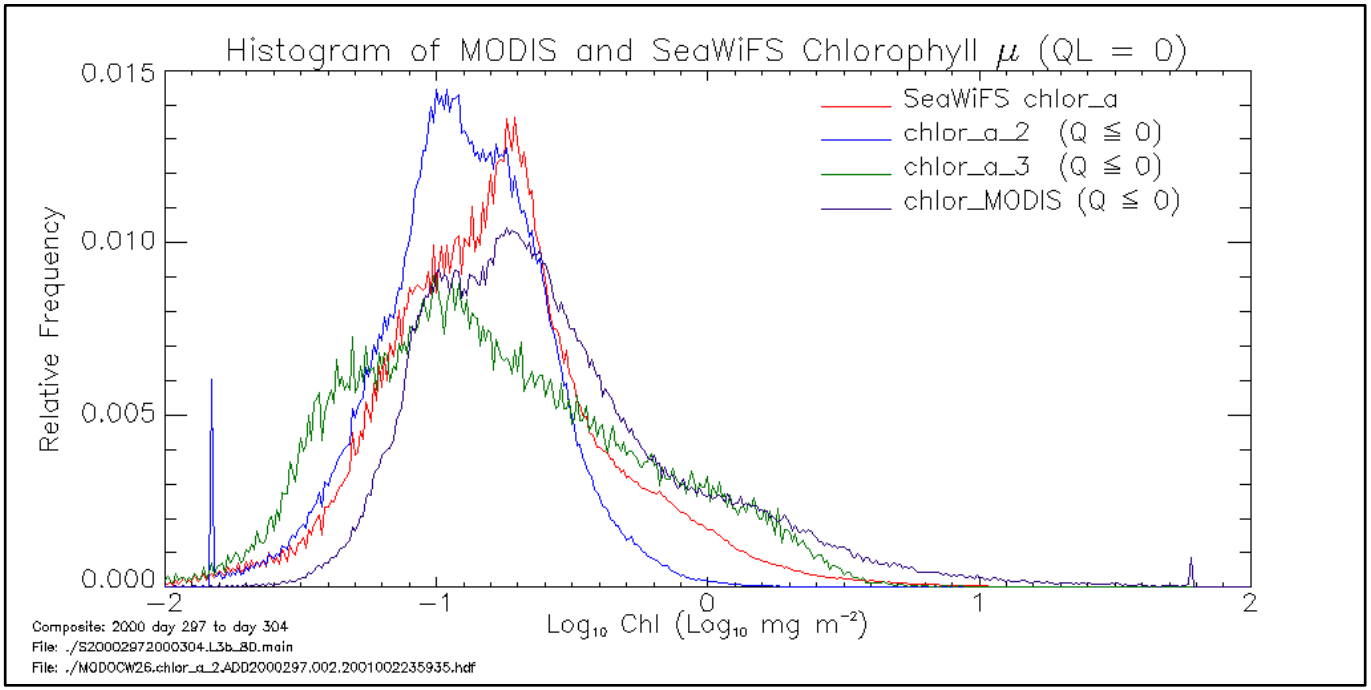
- Reprocessing (for 1 year of data).
- Annual production estimate code deferred.
- ESDT and DAAC insert problems.
- Effect of chlorophyll quality and model choice (currently use chl_a_3).
- Choice and usage of PAR data product (currently use DAO's ENG RadSWG).
- Use of Reynold's SST as back−up.

MODEL / DATA ISSUES

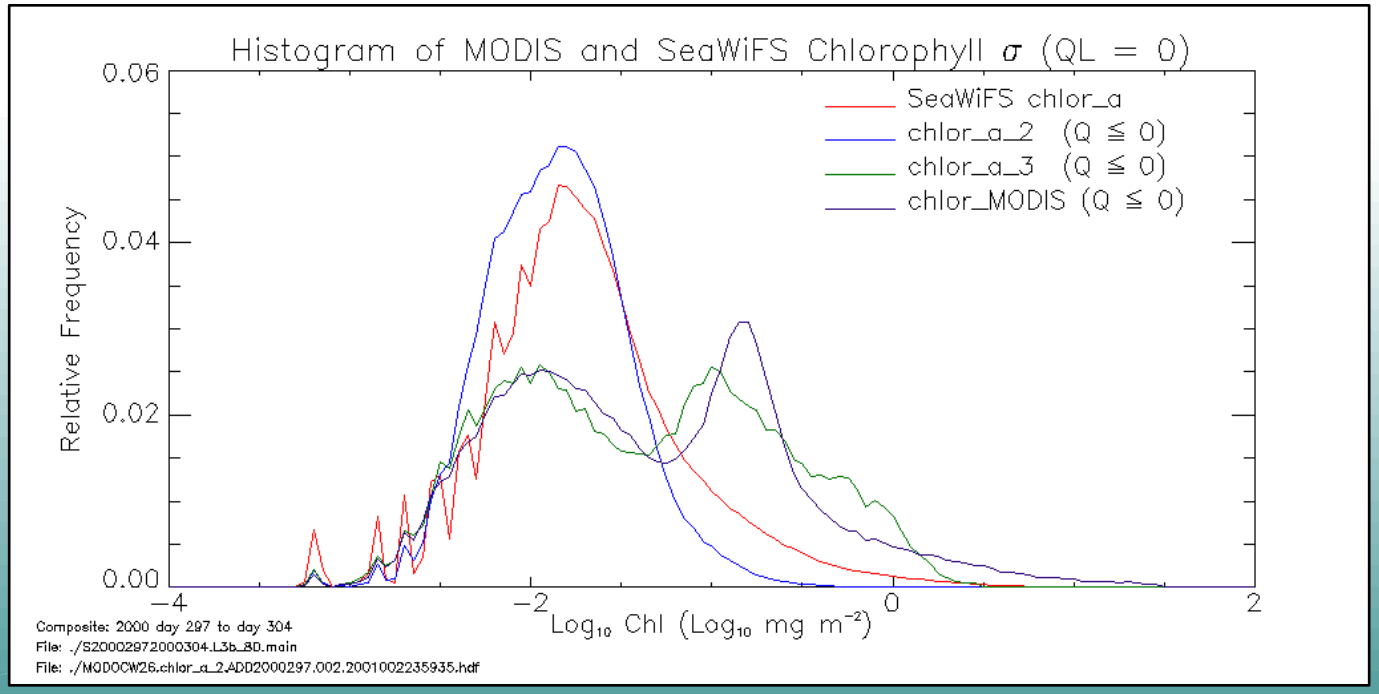
- Usage and aggregation of flags.
- Usage of quality levels and coverage.
- Model Accuracy, Effect of Input Uncertainty, and Aggregation Biases (scaling issues).
- Filling in missing input data.
- Quantitative sensitivity studies of OPP models.
- Further studies of classification techniques.
- Use of PhotoAcc model for P1 (or P3?); needs NDT.

Chl Product Distribution

L3 Bin Mean

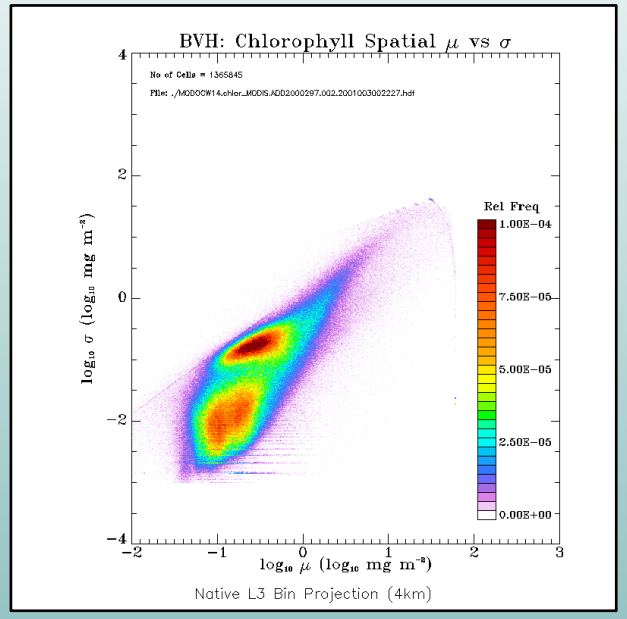


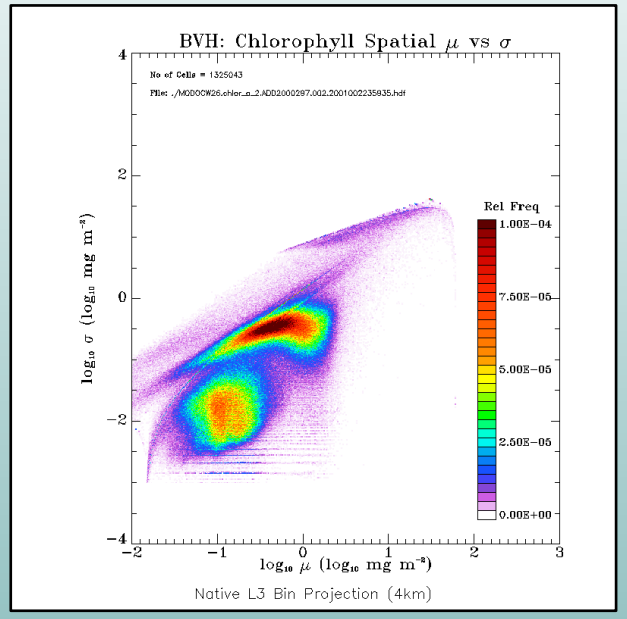
L3 Bin Std Dev

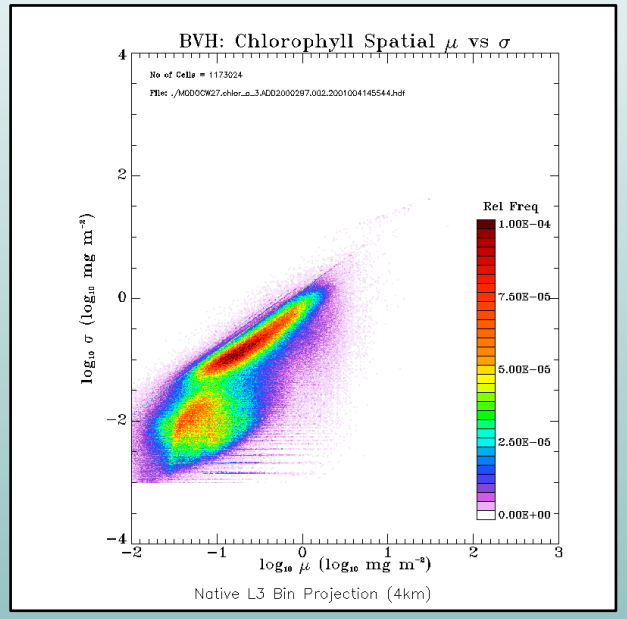


Bivariate Histograms of Chl Product σ and μ

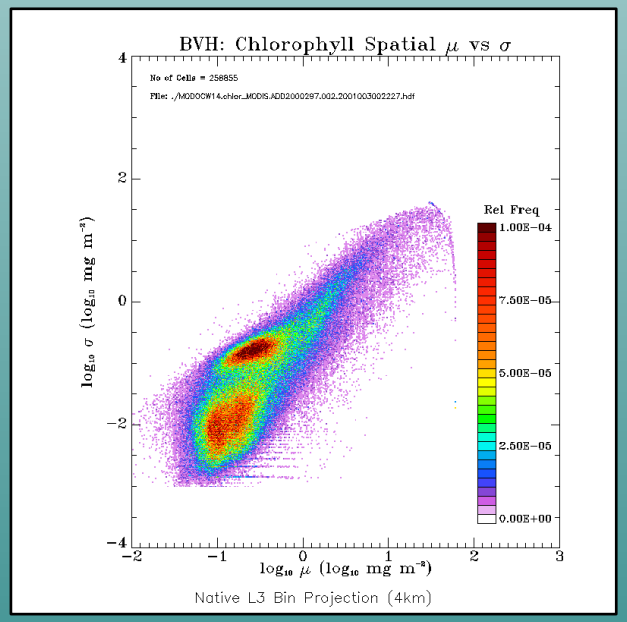
L2 QL = 0,1,2,3

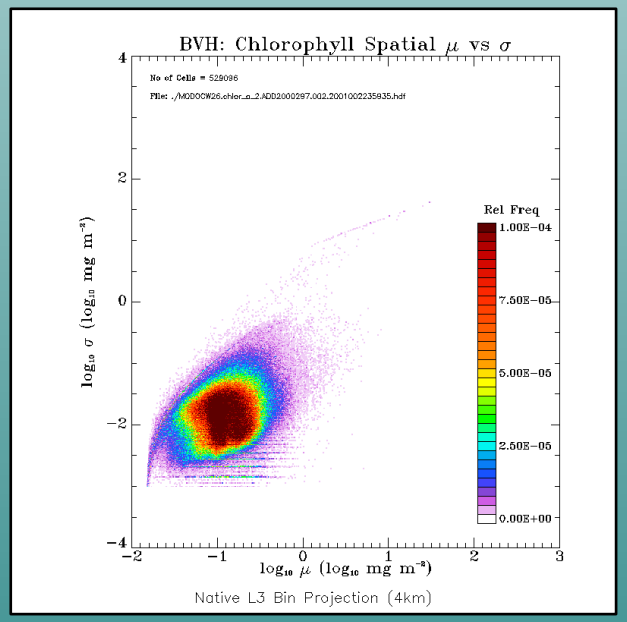


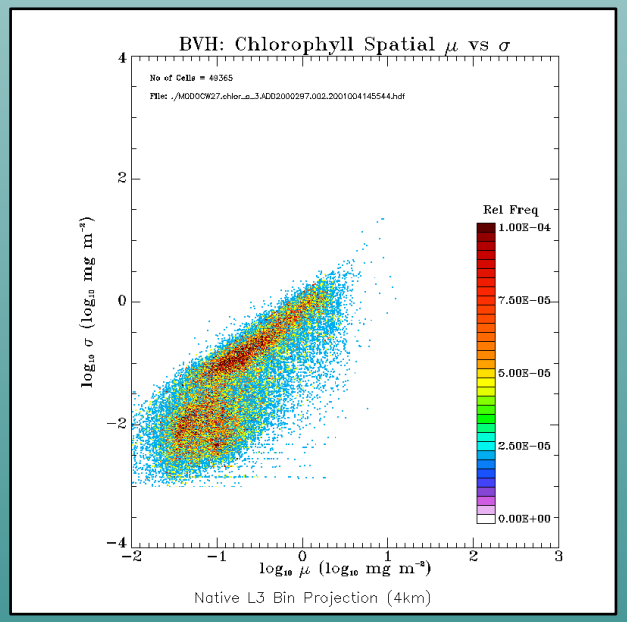




L2 QL = 0





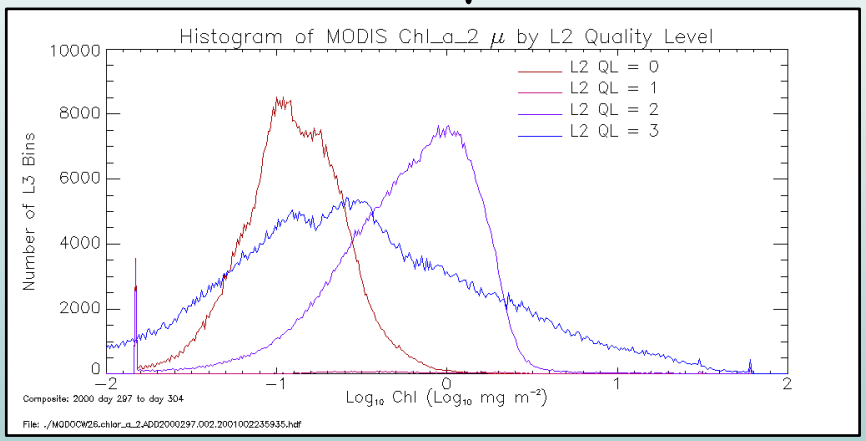


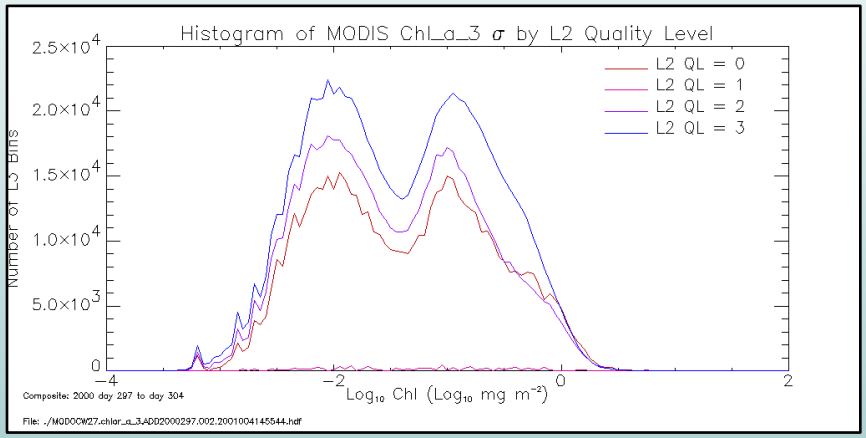
MODIS / OCEANS / W. Esaias, PI / K. Turpie

Chl Product Distribution by L2 Quality Level

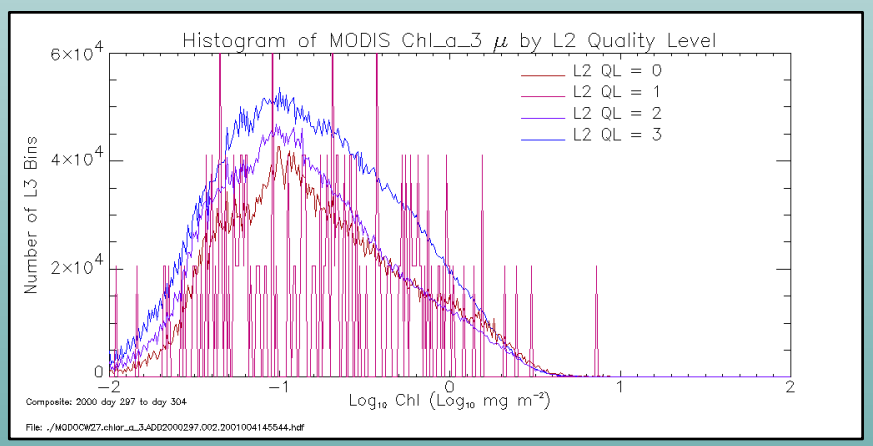
Bin μ | Bin σ

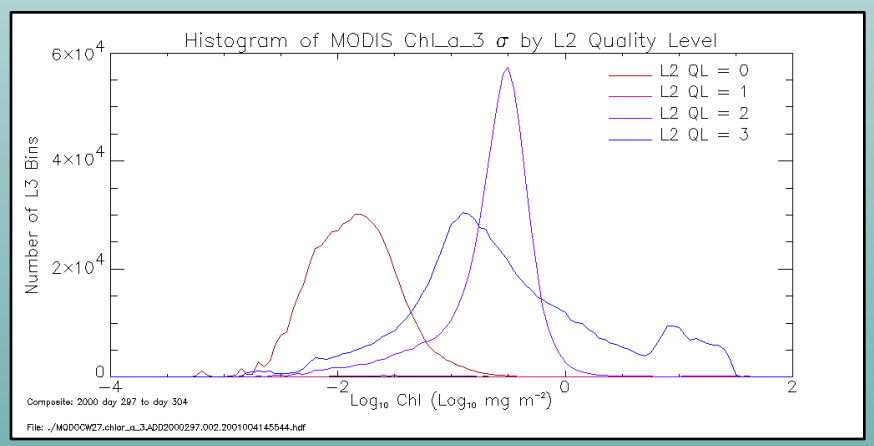
chl_a_2



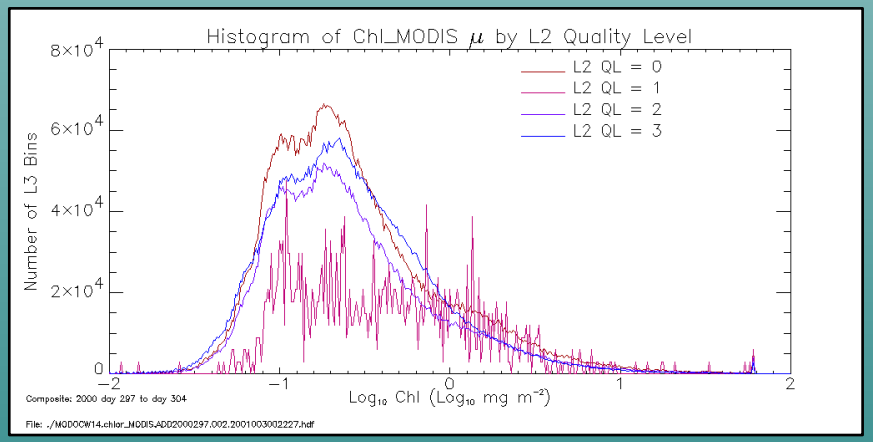


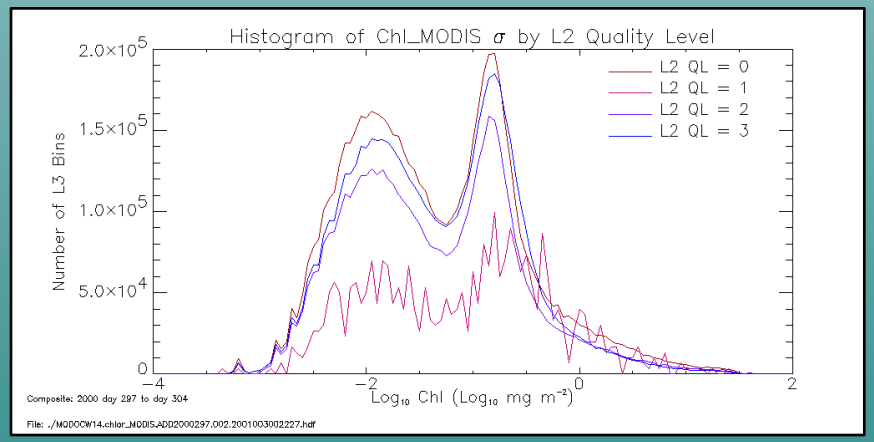
chl_a_3





chl_MODIS





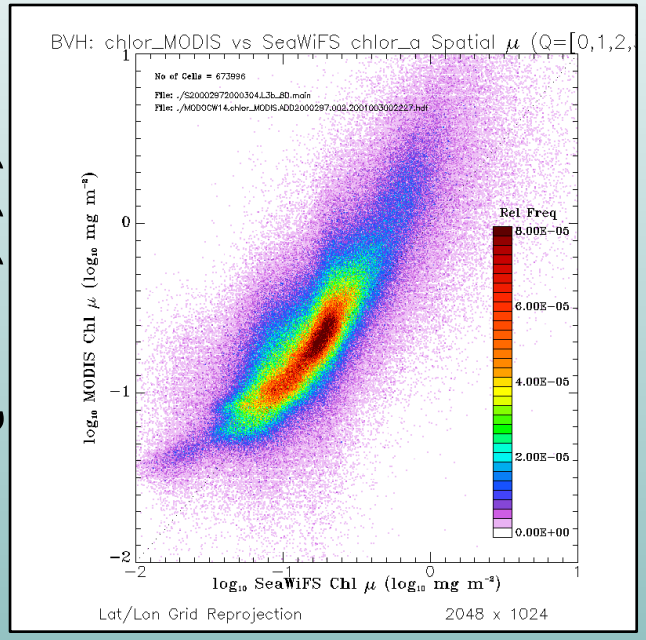
MODIS Chl Products vs SeaWiFS chlor_a

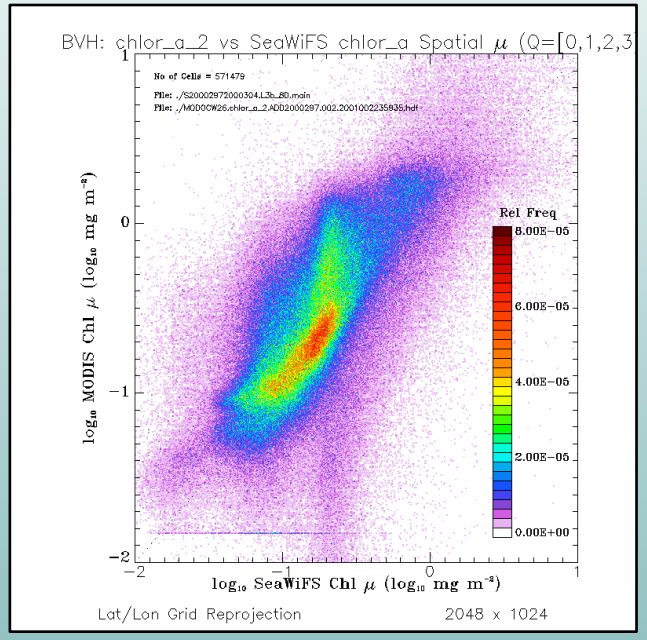
chl_MODIS

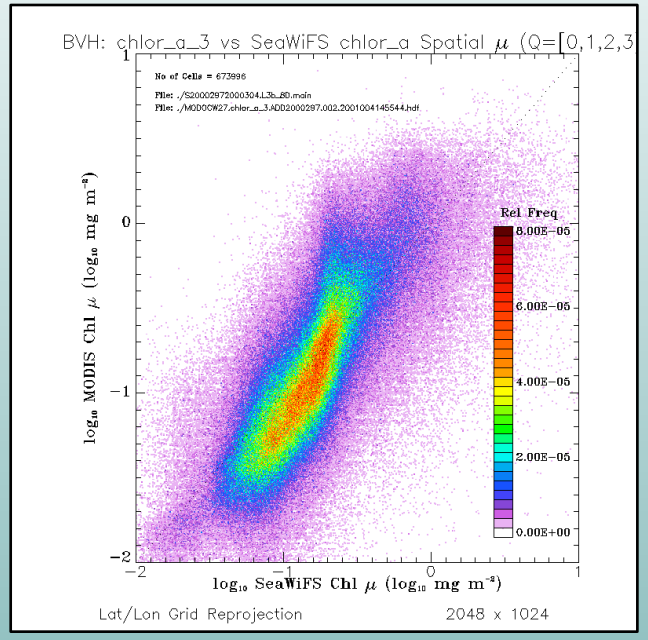
chl_a_2

chl_a_3

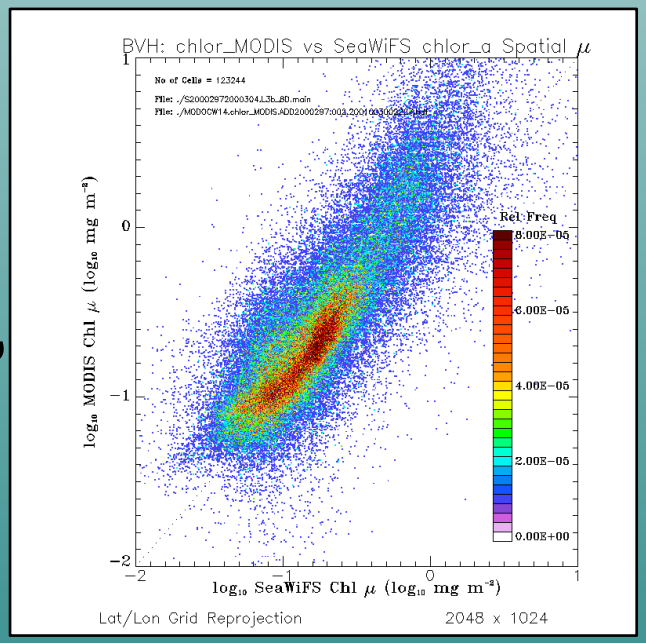
L2 QL = 0,1,2,3

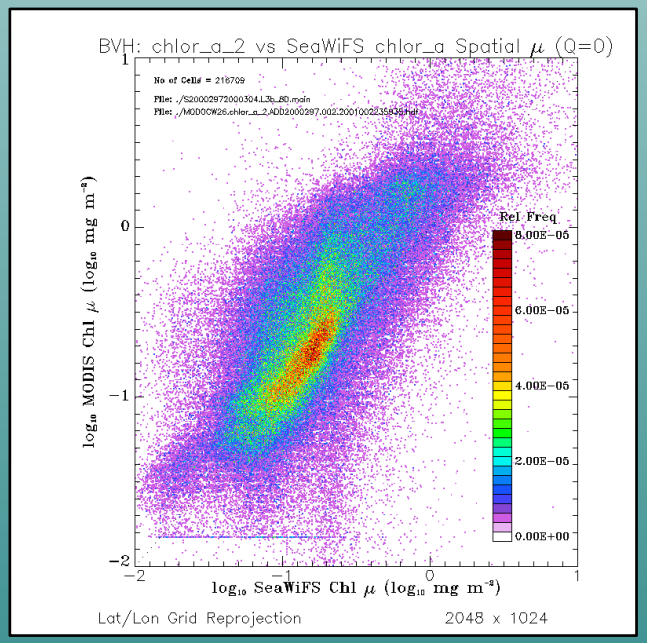


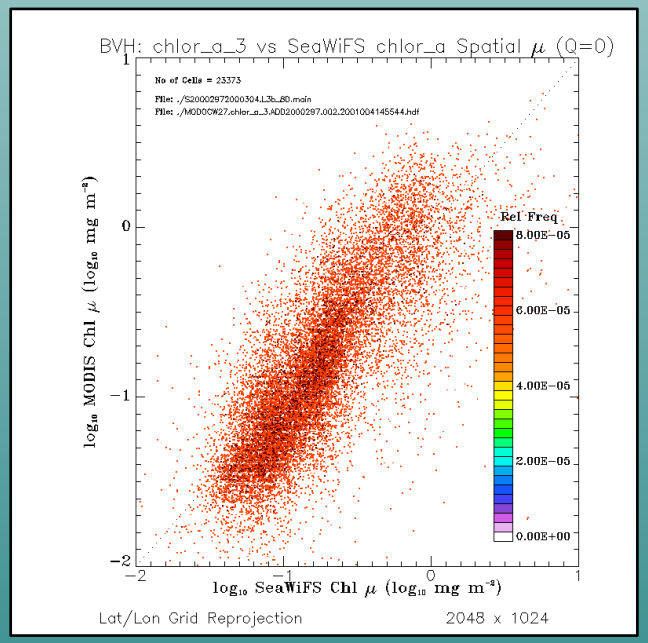




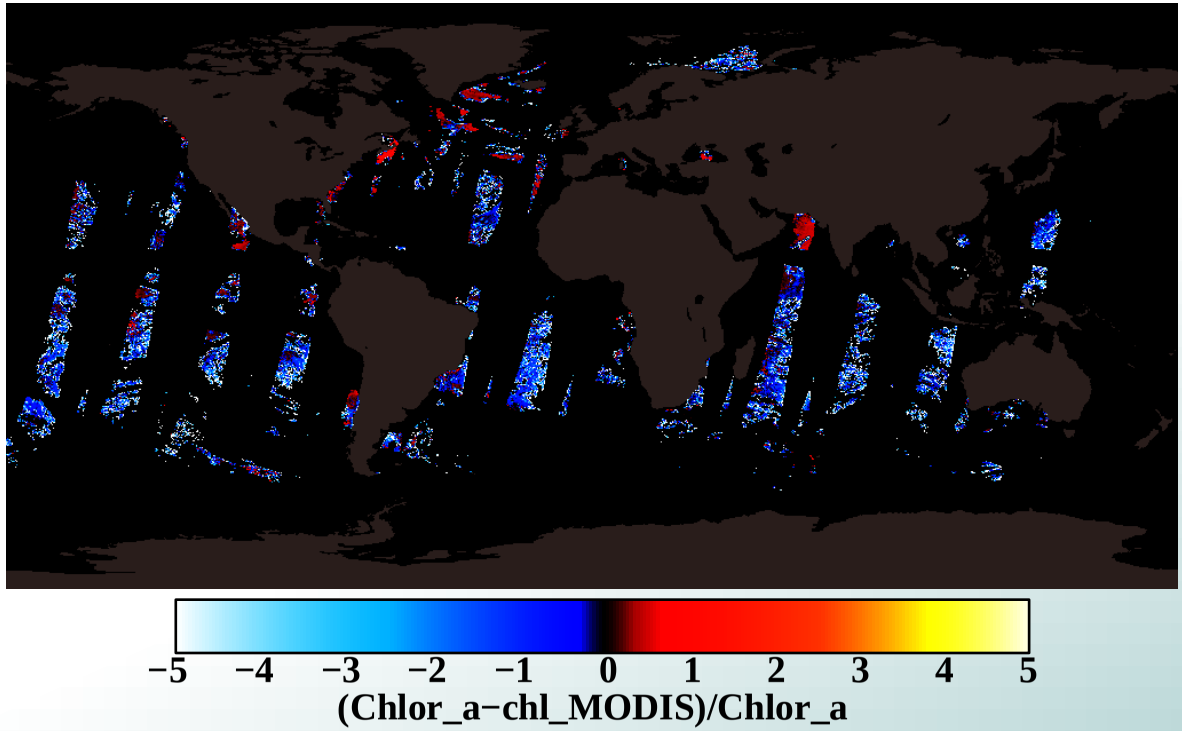
L2 QL = 0

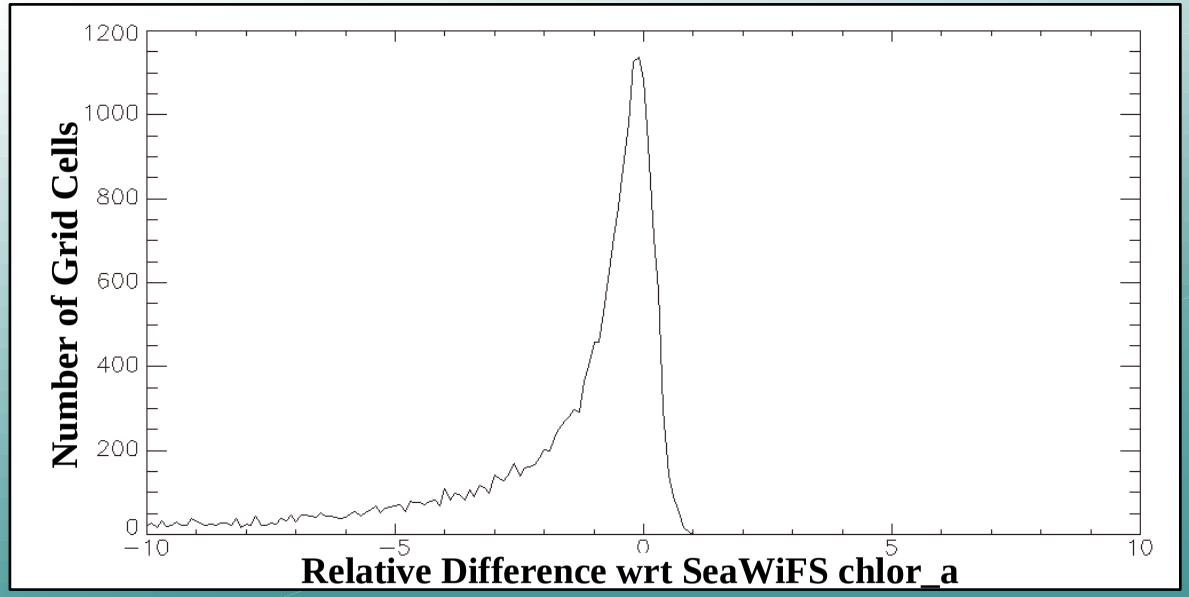


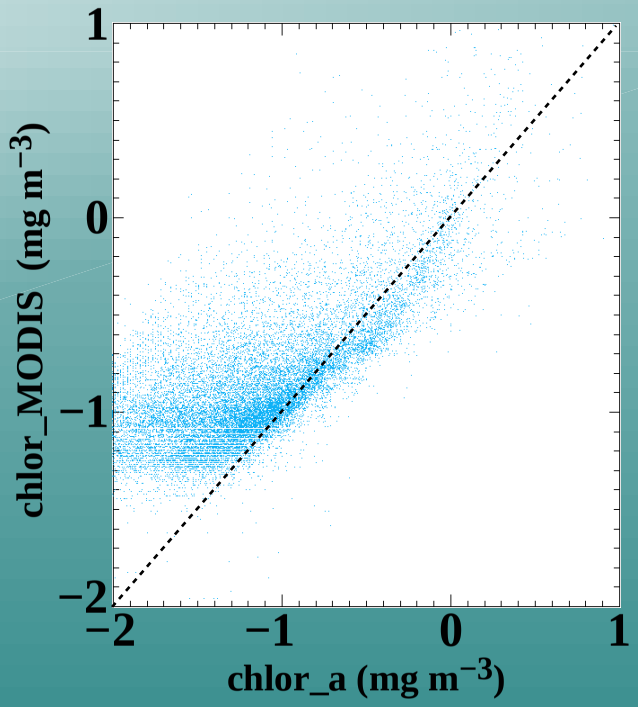




Chl_MODIS vs SeaWiFS chlor_a (Apr 11, 2000)

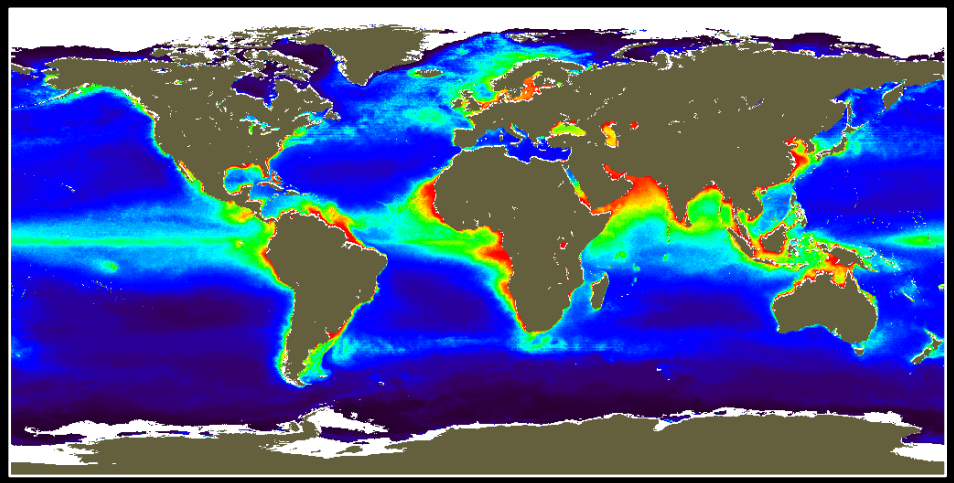




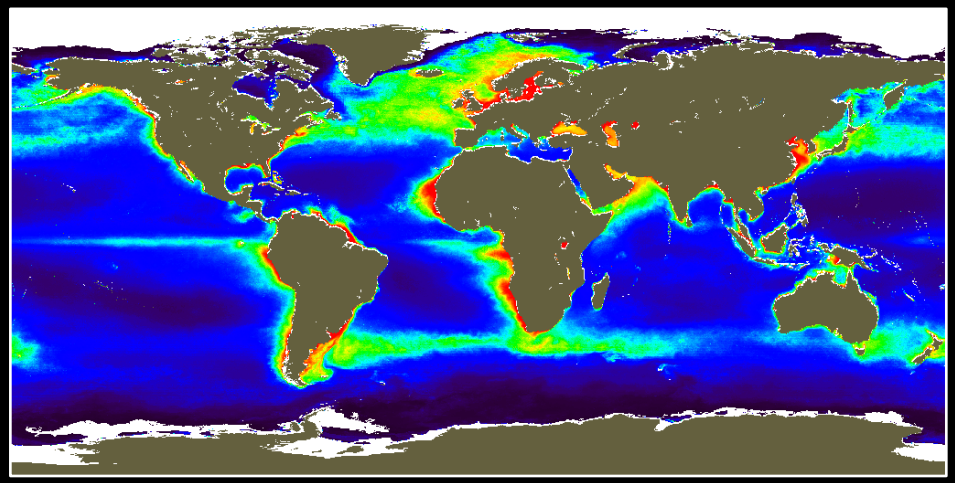


MODIS / OCEANS / W. Esaias, PI / K. Turpie

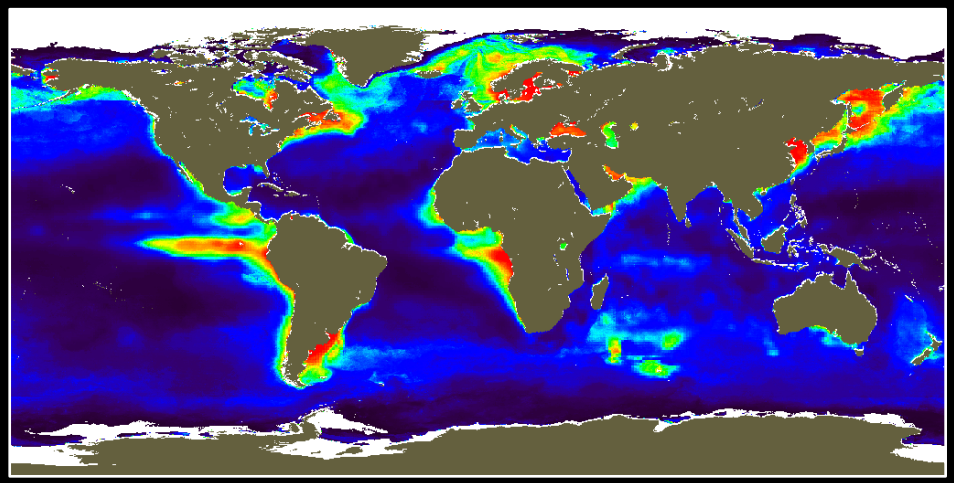
OPP Model Runs with SeaWiFS Data (09/1997−10/2000)



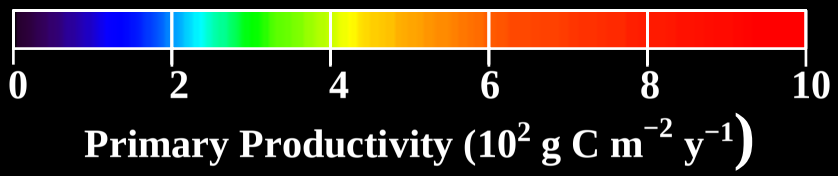
P1 (Behernfeld−Falkowski)



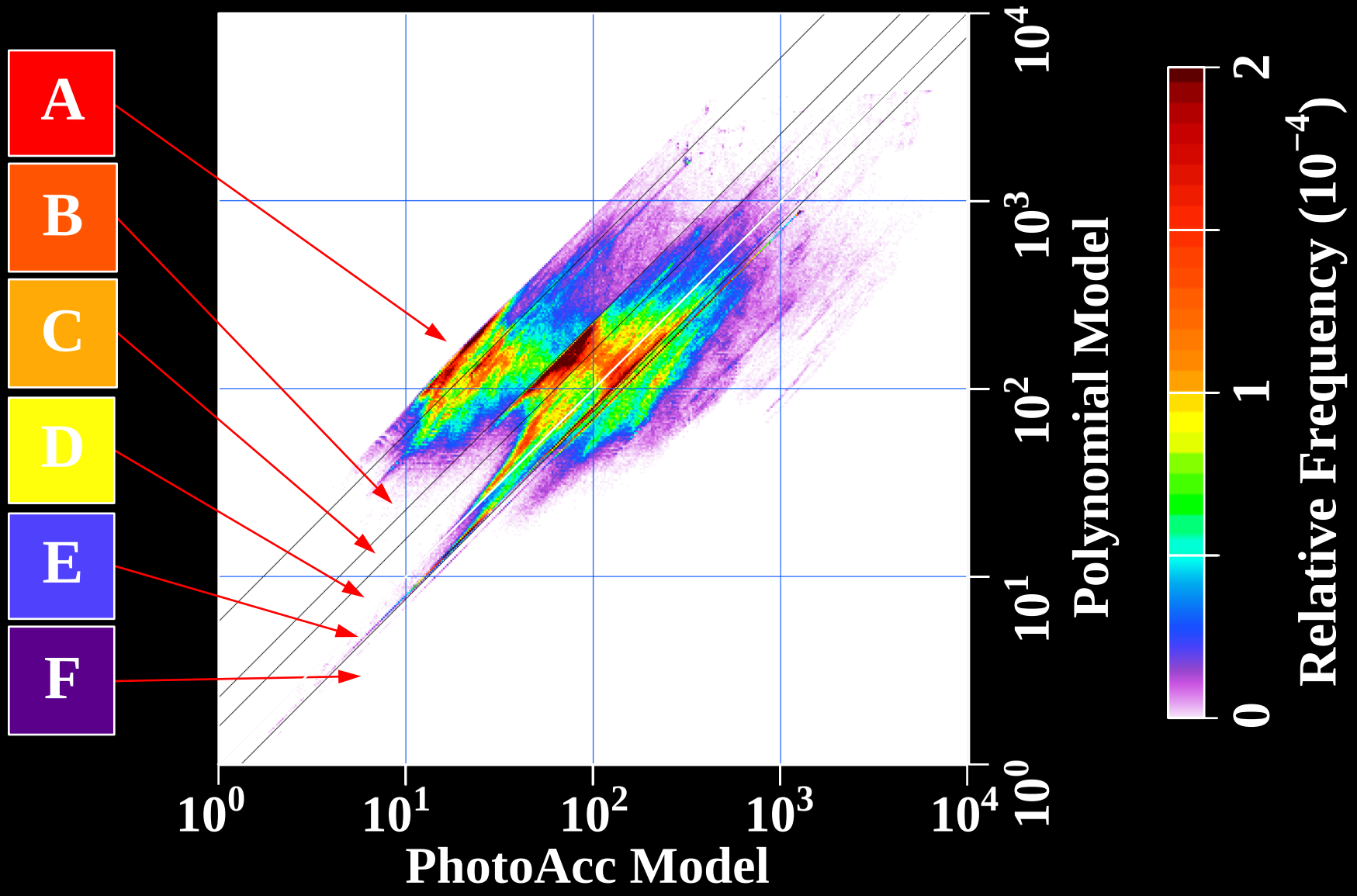
P2 (Howard−Yoder−Ryan)



PhotoAcc



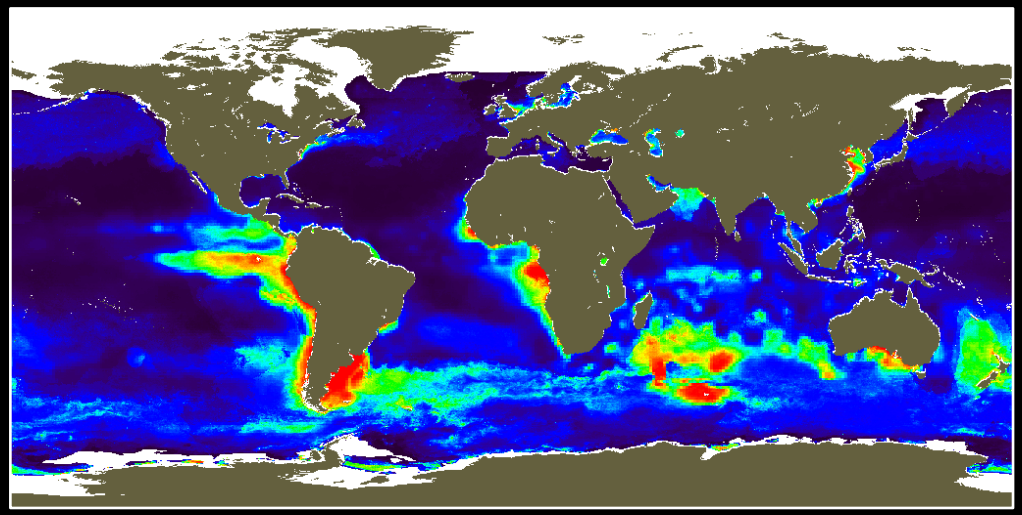
Classification Analysis of PhotoAcc Model

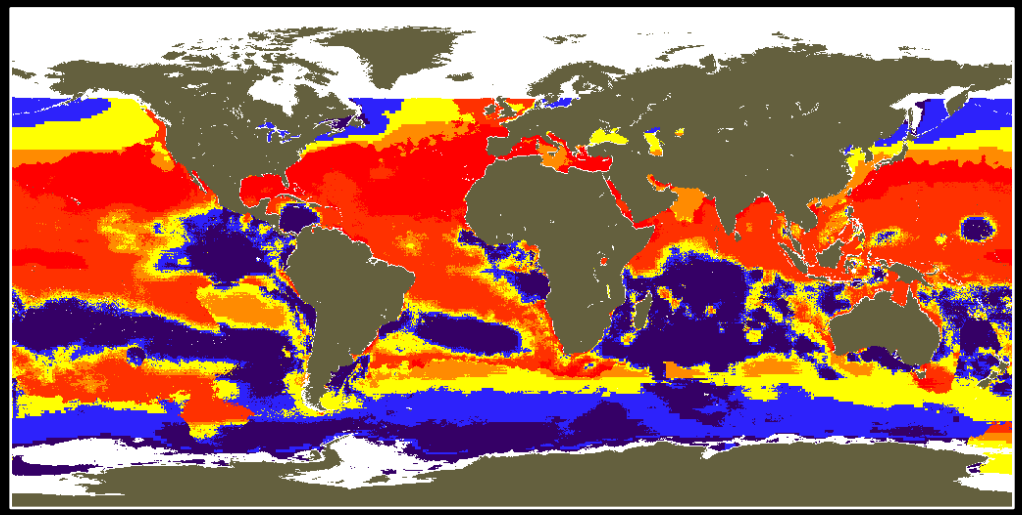


MODIS / OCEANS / W. Esaias, PI / K. Turpie

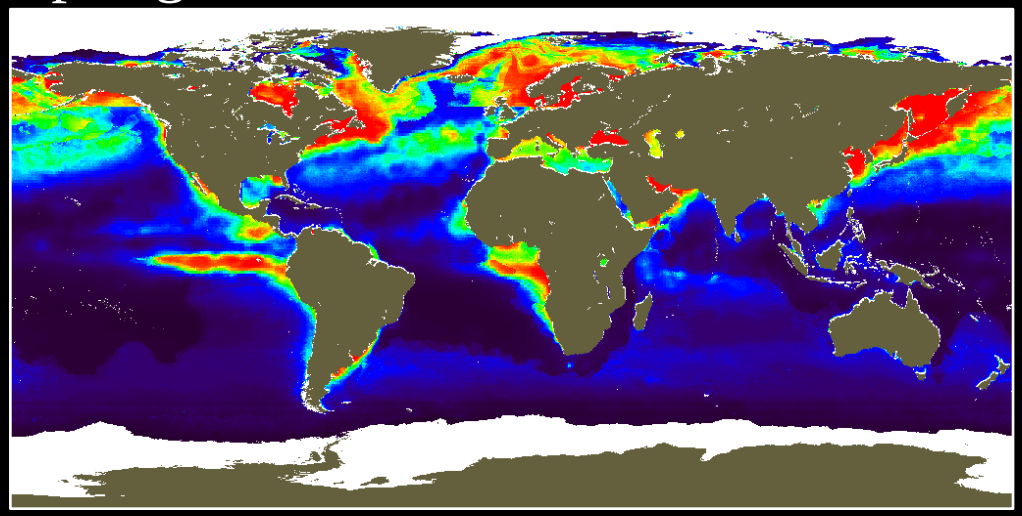
Classification Analysis of PhotoAcc Model

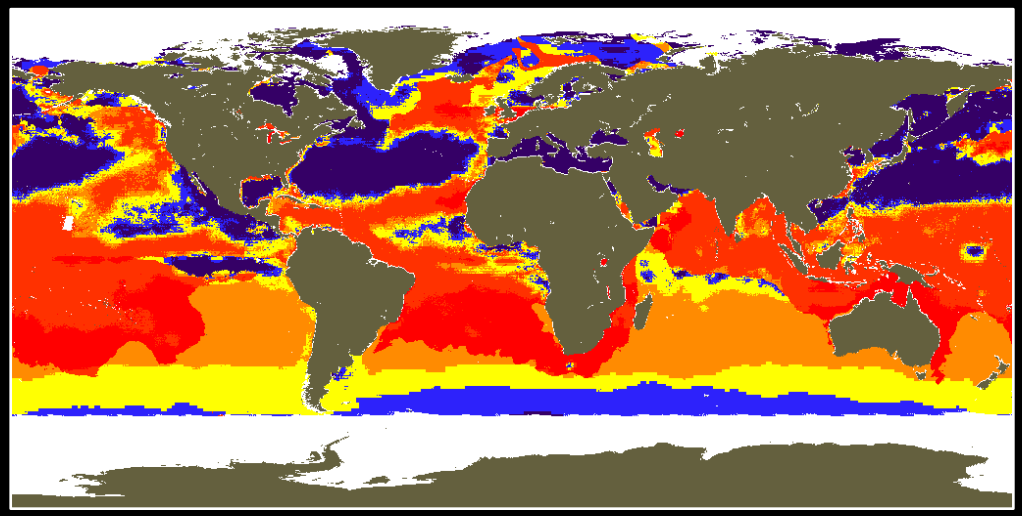
Winter

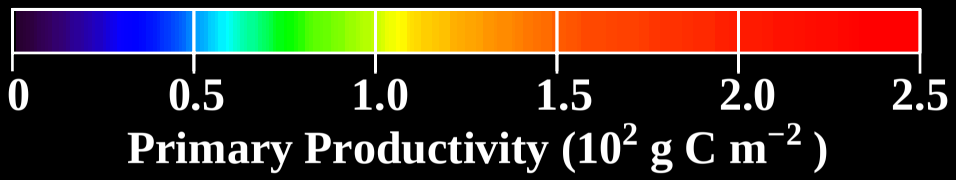




Spring







MODIS / OCEANS / W. Esaias, PI / K. Turpie

MODIS OCEANS Developers Telecon
January 25, 2001

Attendance: Kay Kilpatrick, Sue Walsh, Ron Vogel, Mark Dowell, Kevin Turpie, Mike Ondrusek, Bob Woodward.

1. QL Aggregation – It was suggested that it is a bad practice to include any information that could not be considered geophysical data in the aggregated products. Kevin suggested that lowest quality could be excluded from the mapped products. Kay said that this would be easy change to the binning rules and added that the binning rules can be as restrictive as we want.
2. The subject of the number of quality levels came up. Sue and Kay indicated that there is a plan to include one addition bit for each QL, giving a total of 8 possible levels. This is slated for the next major improvement delivery in perhaps late spring.
3. It was brought up that the SDS arrays in each binned product are padded (~10% or more). Sue explained that the SDS size is estimated before writing to the file and to remove the excess would require a second pass through the data and thus more processing time. Therefore, users must use the global attribute for the total number of bins to extract that actual data from each SDS. No improvement on this was apparent.
4. As of Dec 20, 2000, PGE51 began processing only a very small number of bins. If was found that the number of bins in SST with QL =0 had dropped from several million to several thousand. Kay said that she and Sue would look into the problem, however they added that there were no changes to QL computation and that the change in QL was purely from instrument changes. Bob would provide information on which code changes were made at what time (already done).
5. It was noted that the QL map metadata did not indicate the sharing of QL bits between two chlorophyll products. Sue said she would change the metadata to reflect the appropriate association.
6. It was suggested that the known problems page was too busy. Kay suggested that Ron make a simple list of problems and correction dates with links to the known problems page for more detailed information.