MODIS Ocean Primary Productivity Data Product

January 23, 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} $year^{-1}$ 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

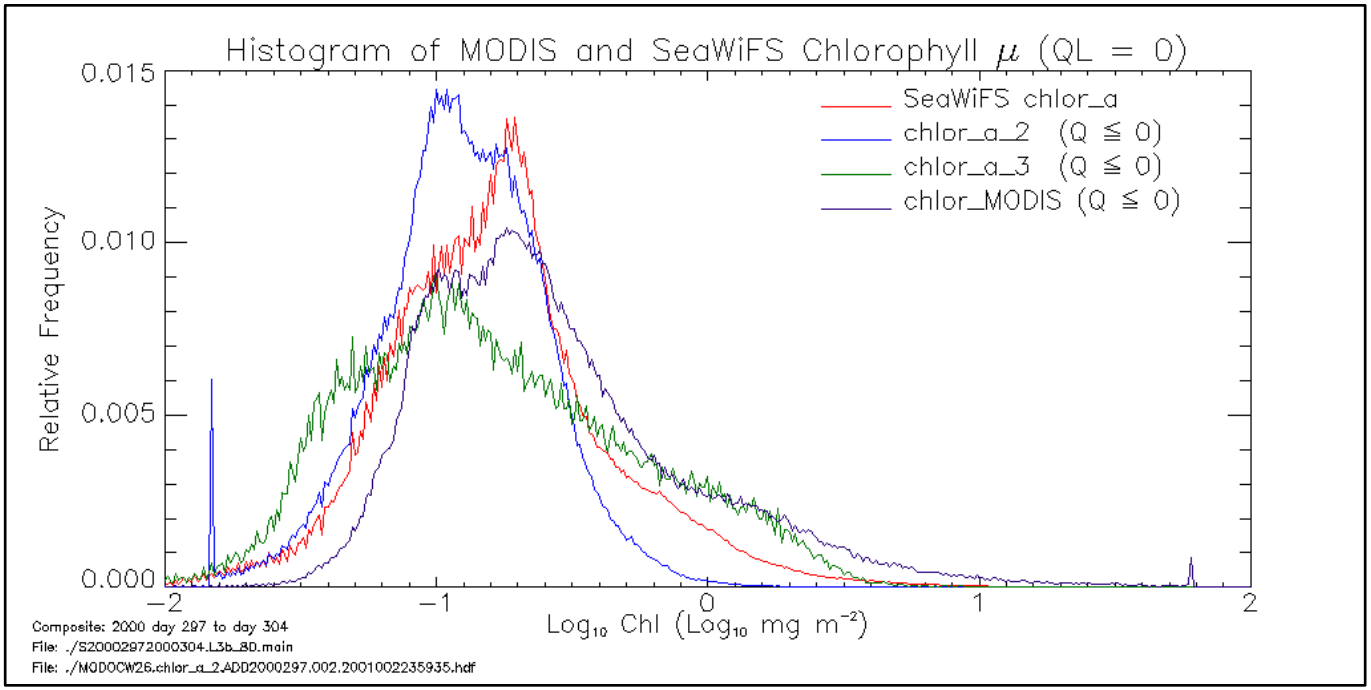
- Reprocessing (for 1 year of data).
- Annual production estimate code deferred.
- ESDT and DAAC insert problems.
- Effect of chlorophyll quality and model choice (currently use chl_a_3).
- Choice and usage of PAR data product (currently use DAO's ENG RadSWG).
- Use of Reynold's SST as back−up.

MODEL / DATA ISSUES

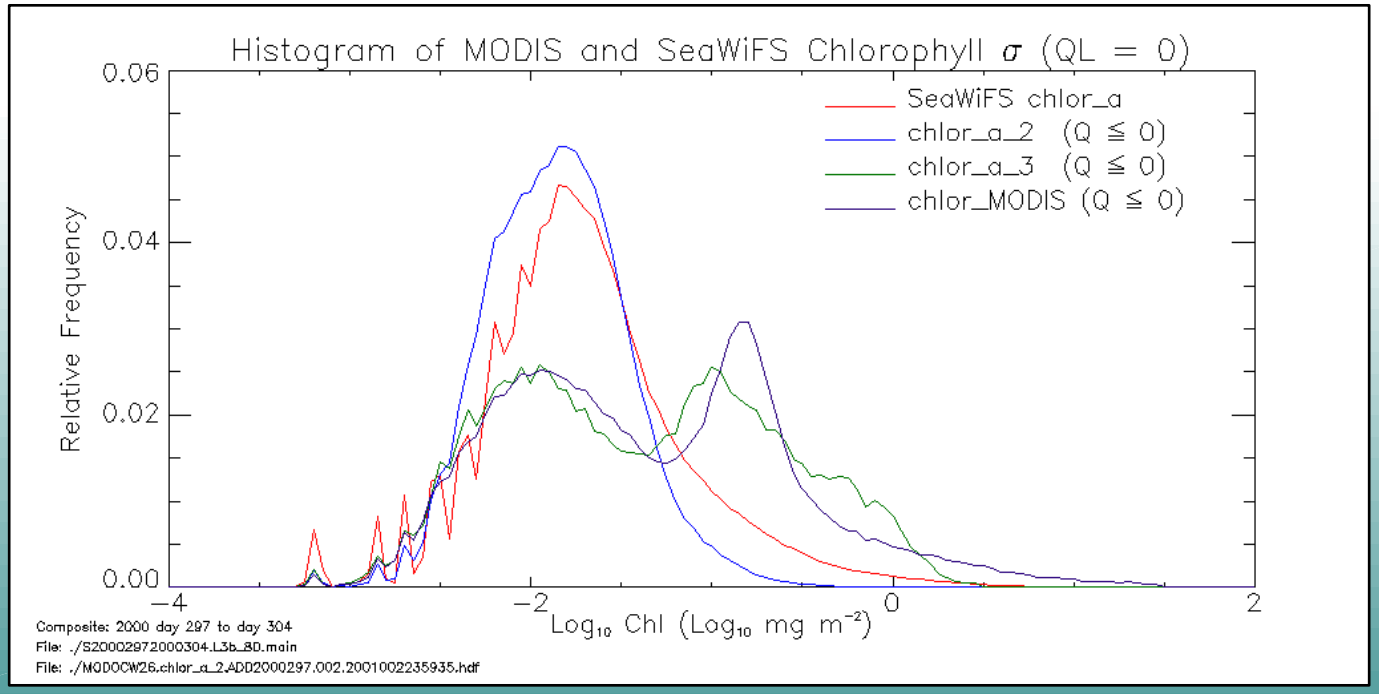
- Usage and aggregation of flags.
- Usage of quality levels and coverage.
- Model Accuracy, Effect of Input Uncertainty, and Aggregation Biases (scaling issues).
- Filling in missing input data.
- Quantitative sensitivity studies of OPP models.
- Further studies of classification techniques.
- Use of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

Chl Product Distribution

L3 Bin Mean

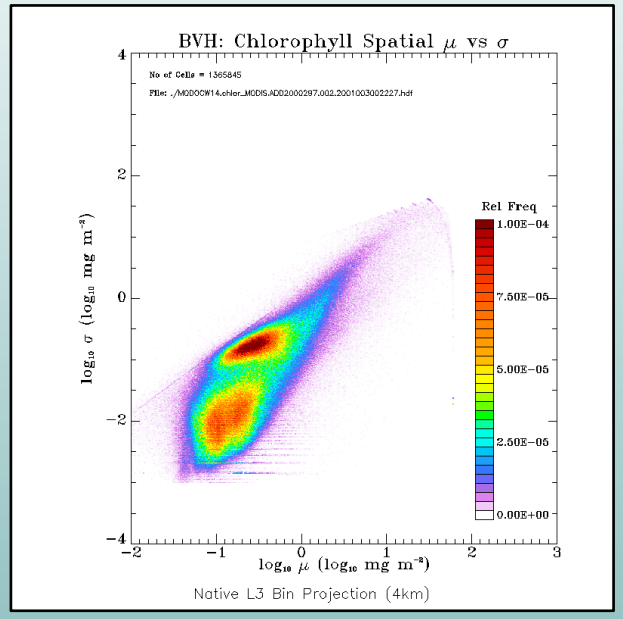


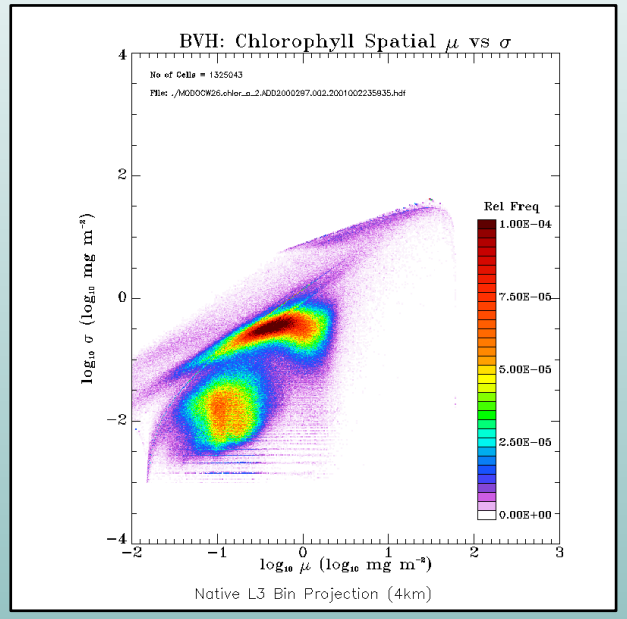
L3 Bin Std Dev

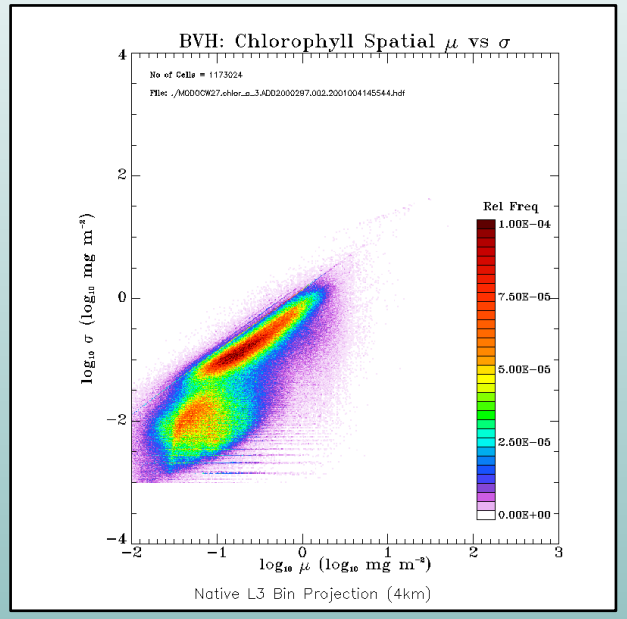


Bivariate Histograms of Chl Product σ and μ

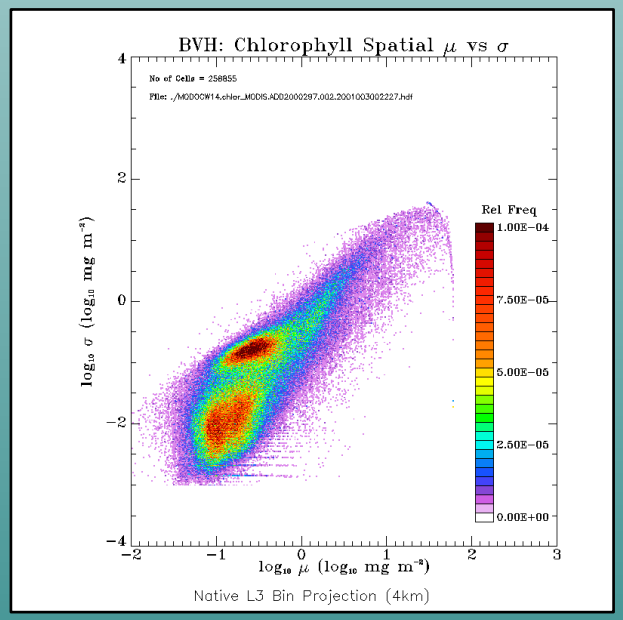
L2 QL = 0,1,2,3

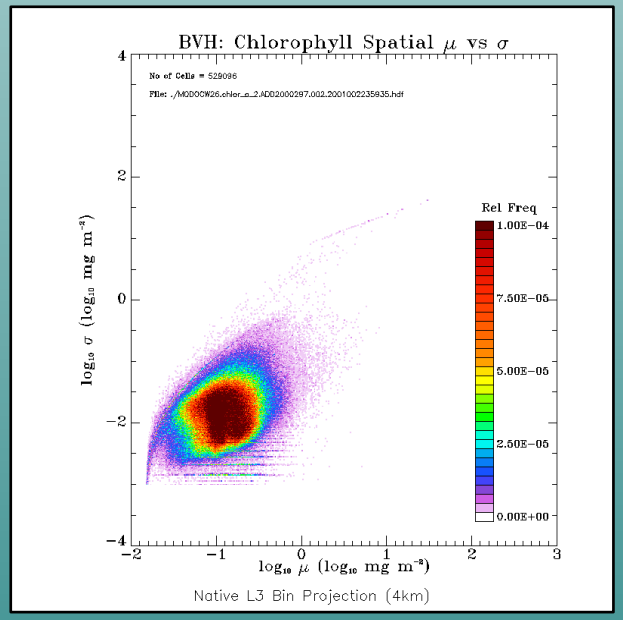


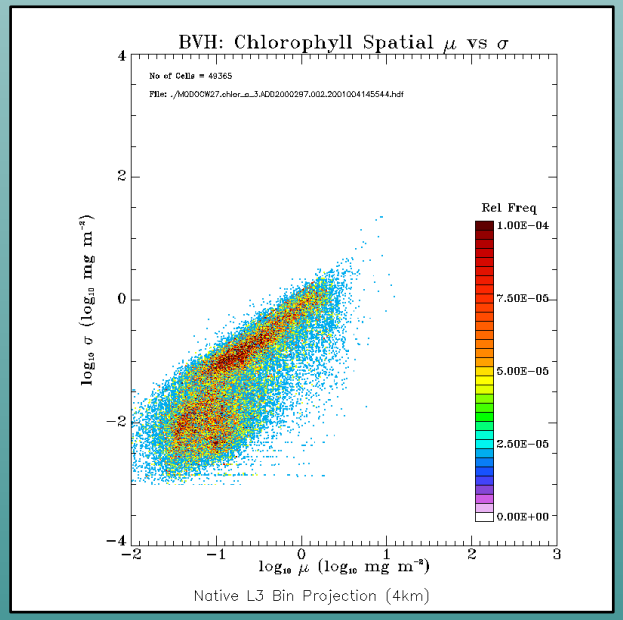




L2 QL = 0







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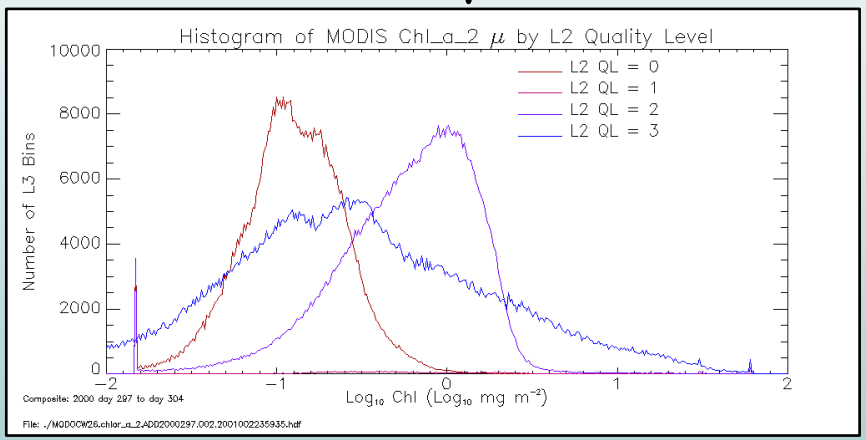
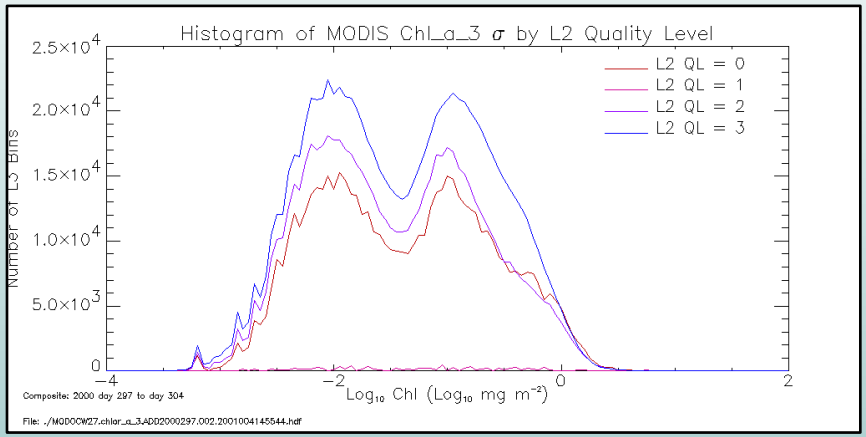
Chl Product Distribution by L2 Quality Level

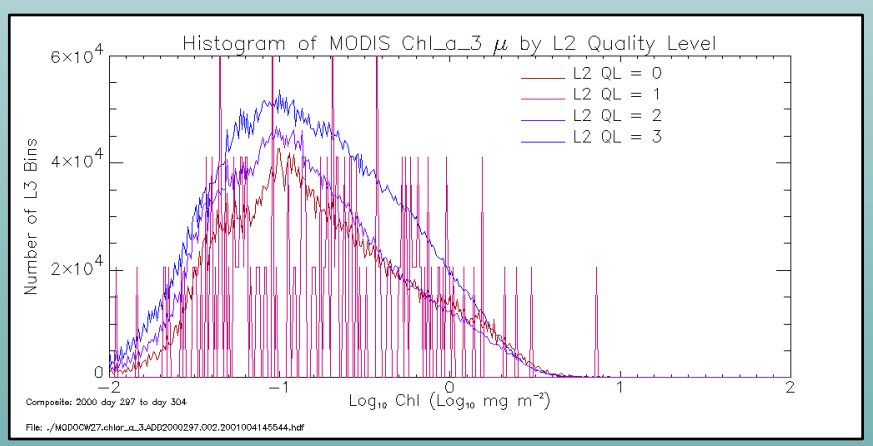
Bin μ | Bin σ

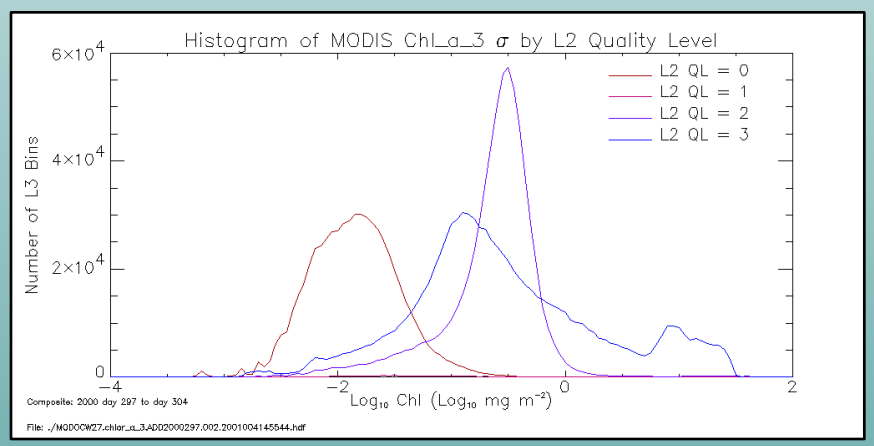
chl_a_2



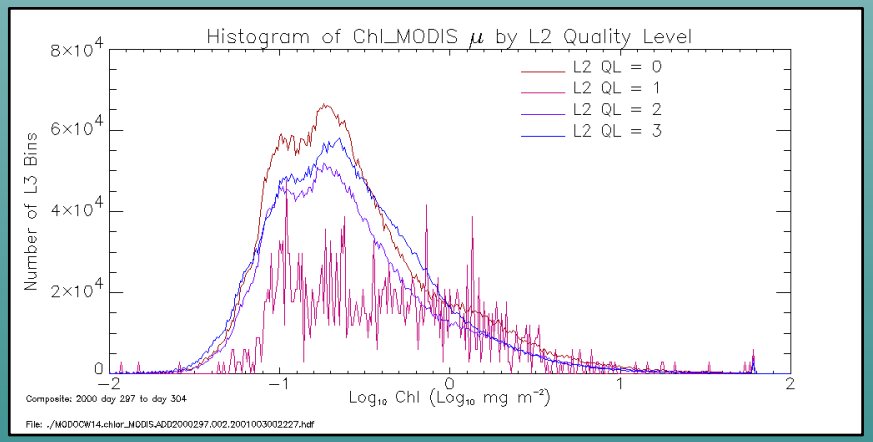


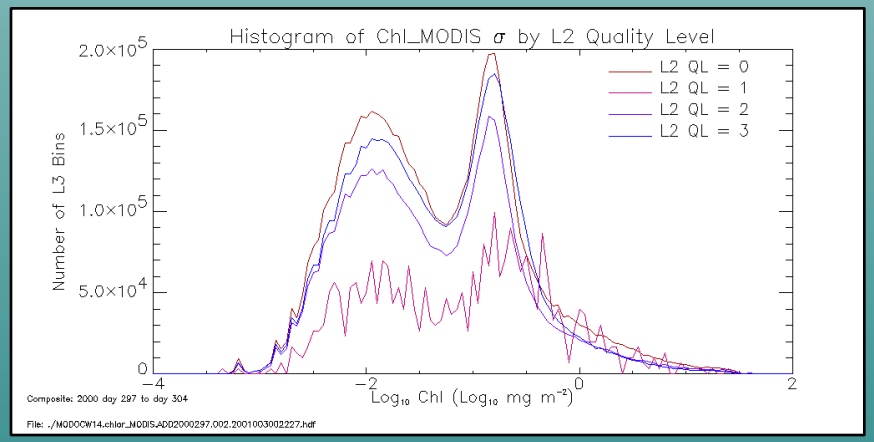
chl_a_3





chl_MODIS





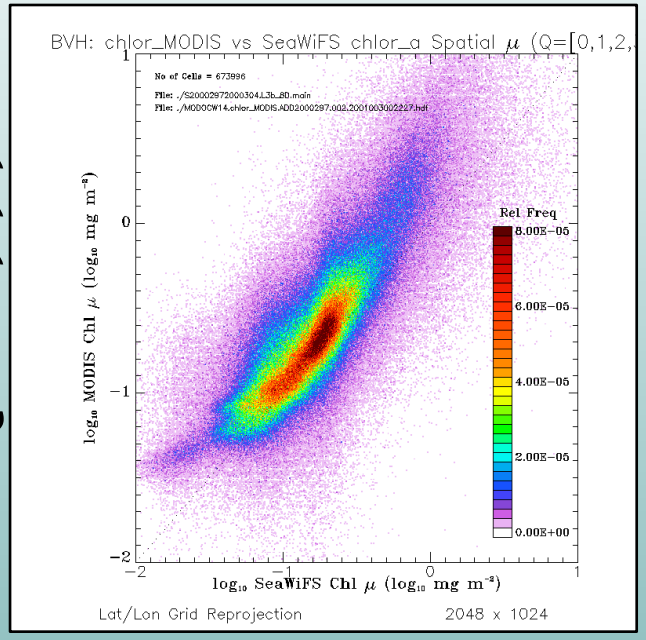
MODIS Chl Products vs SeaWiFS chlor_a

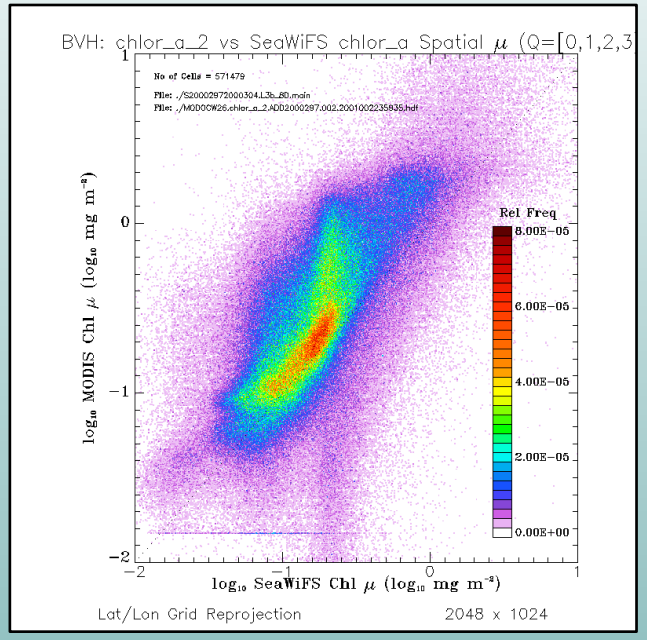
chl_MODIS

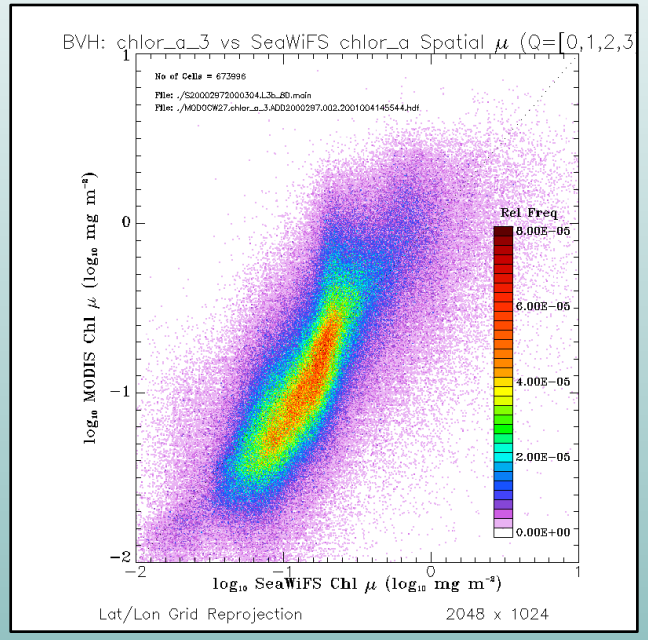
chl_a_2

chl_a_3

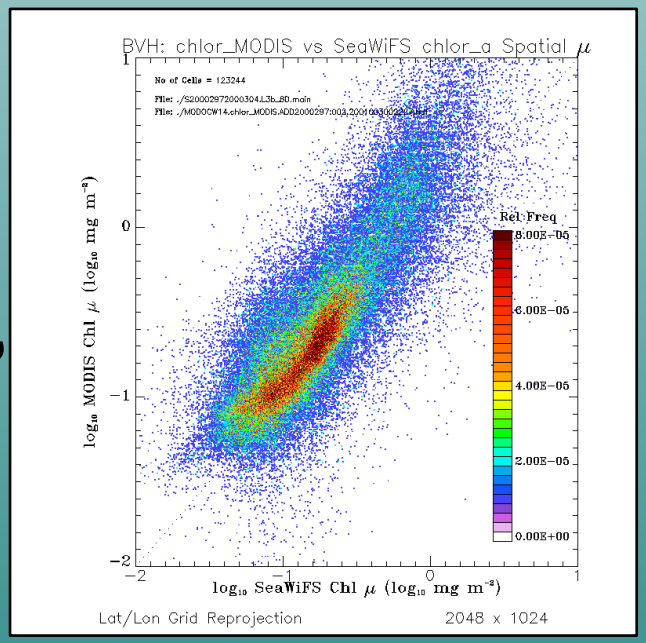
L2 QL = 0,1,2,3

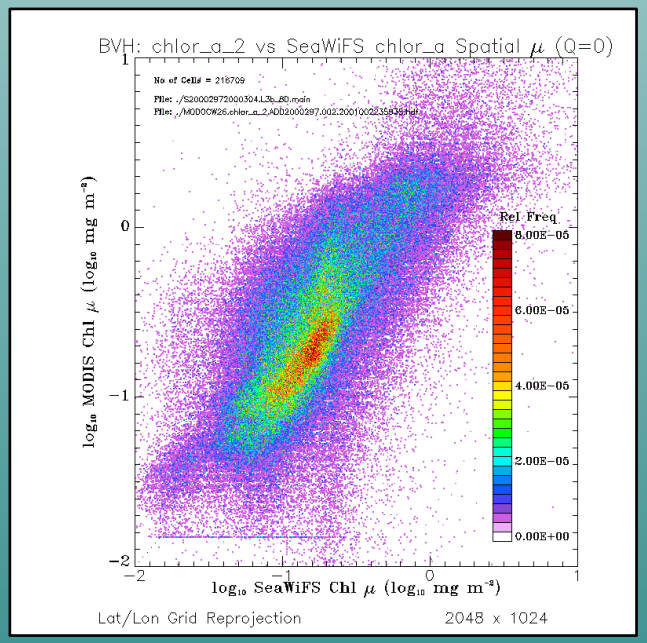


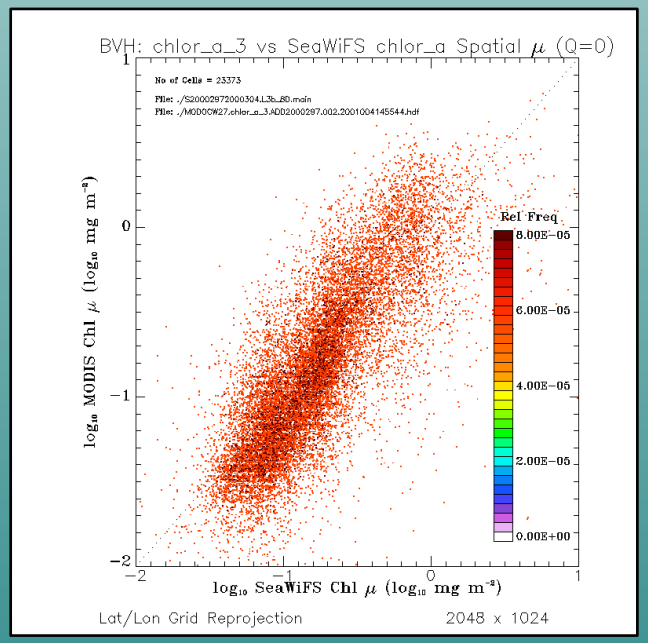




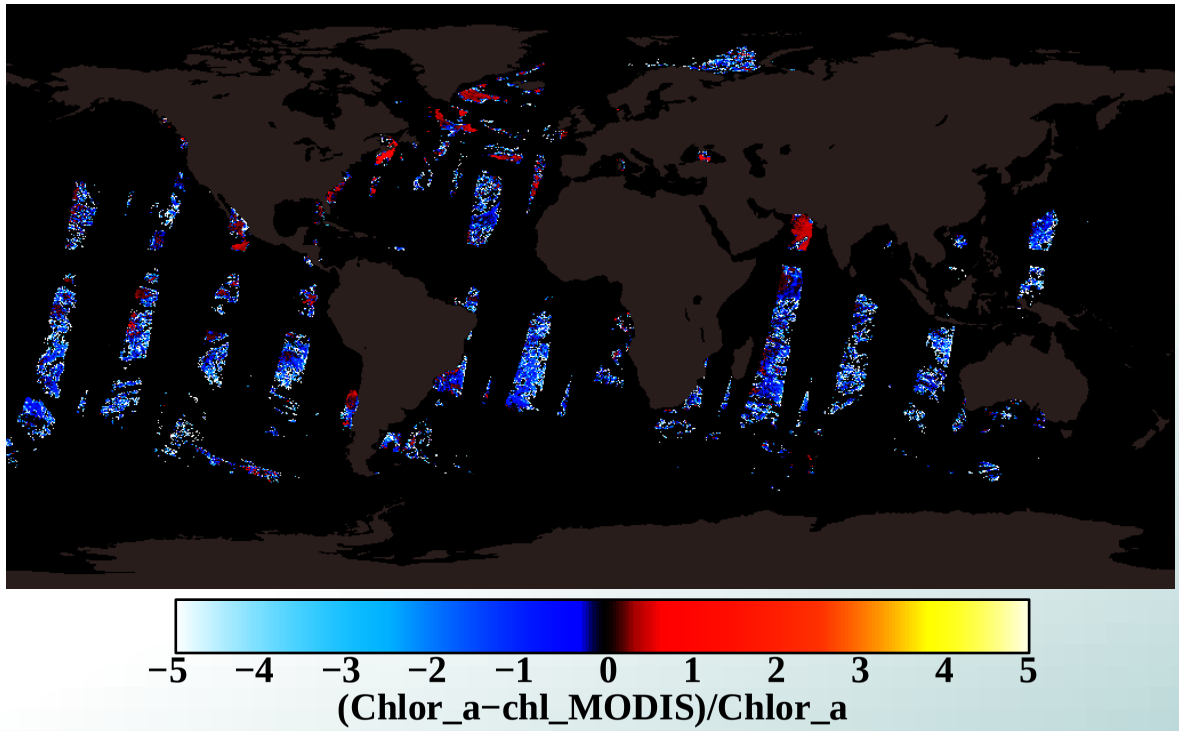
L2 QL = 0

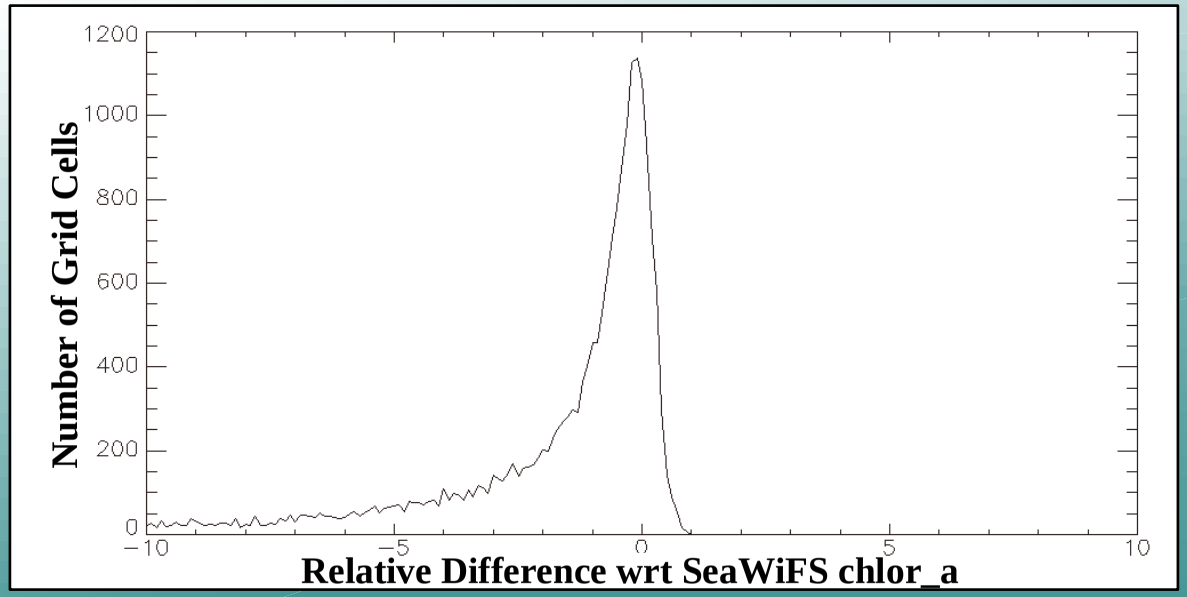


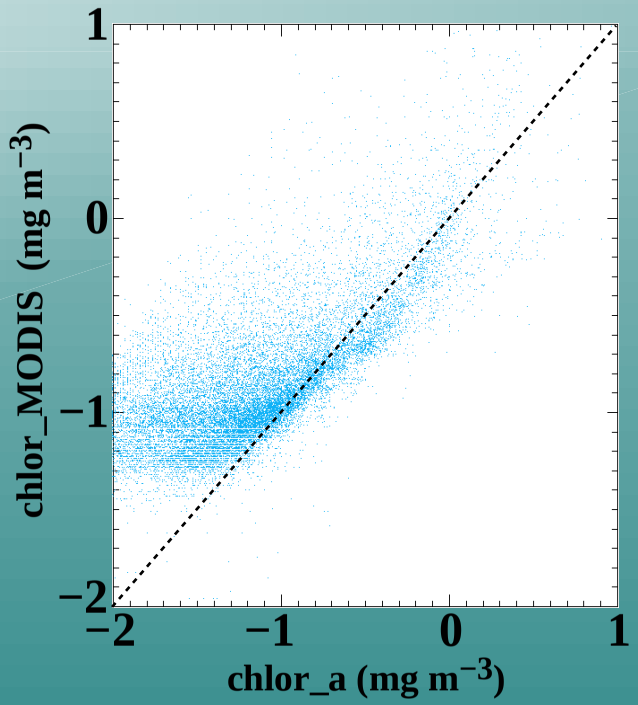




Chl_MODIS vs SeaWiFS chlor_a (Apr 11, 2000)







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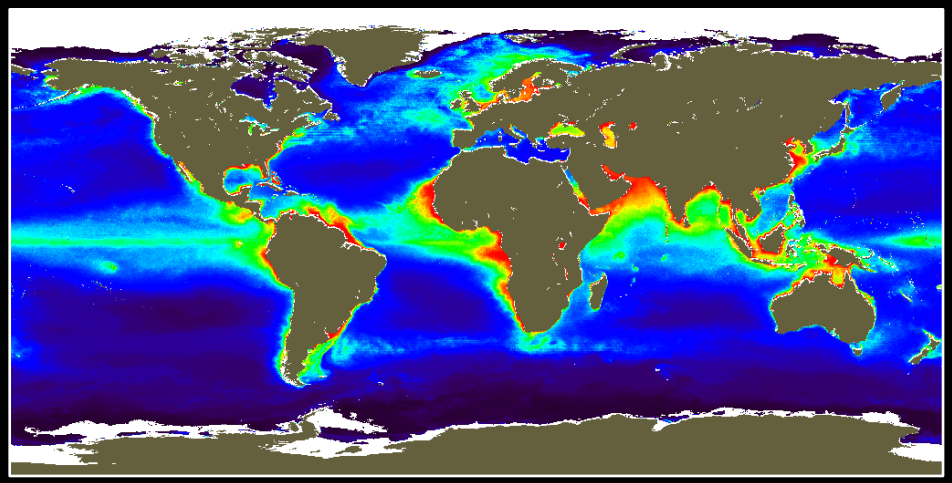
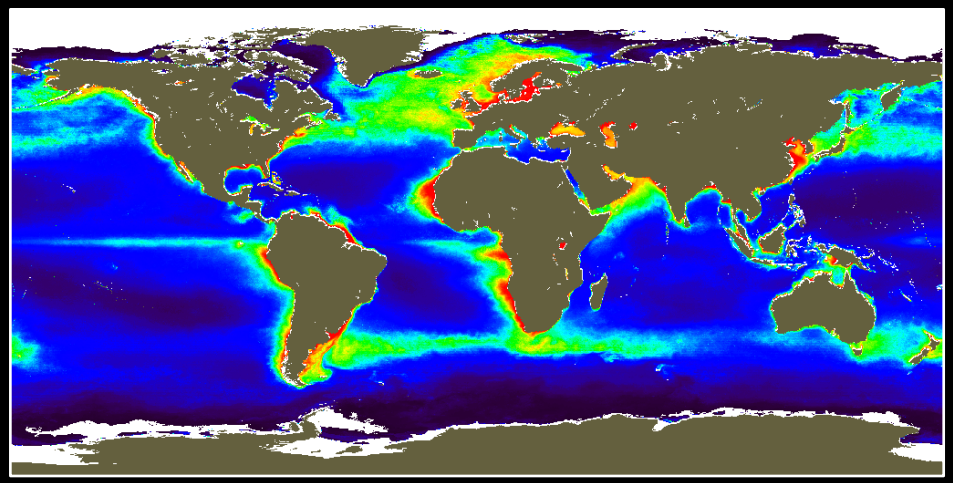
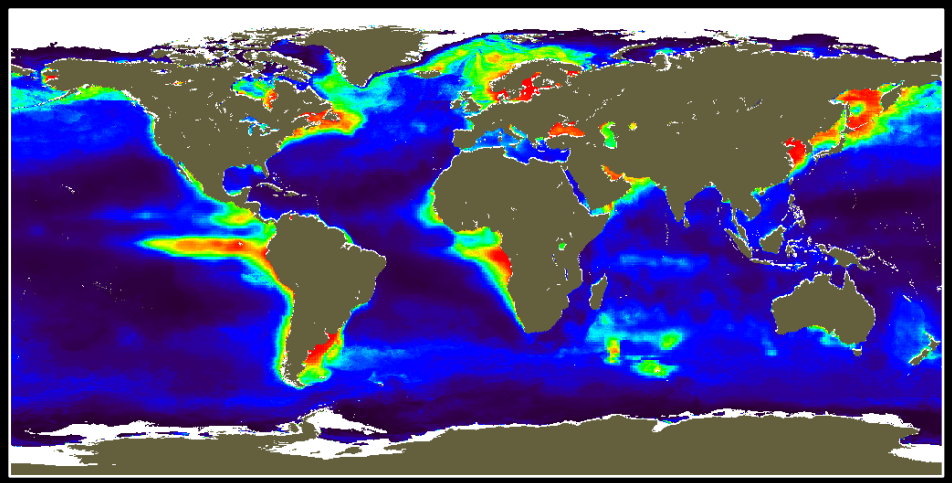
OPP Model Runs with SeaWiFS Data (09/1997−10/2000)



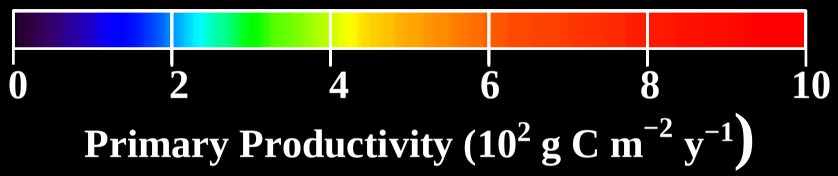
P1 (Behernfeld−Falkowski)



P2 (Howard−Yoder−Ryan)



PhotoAcc



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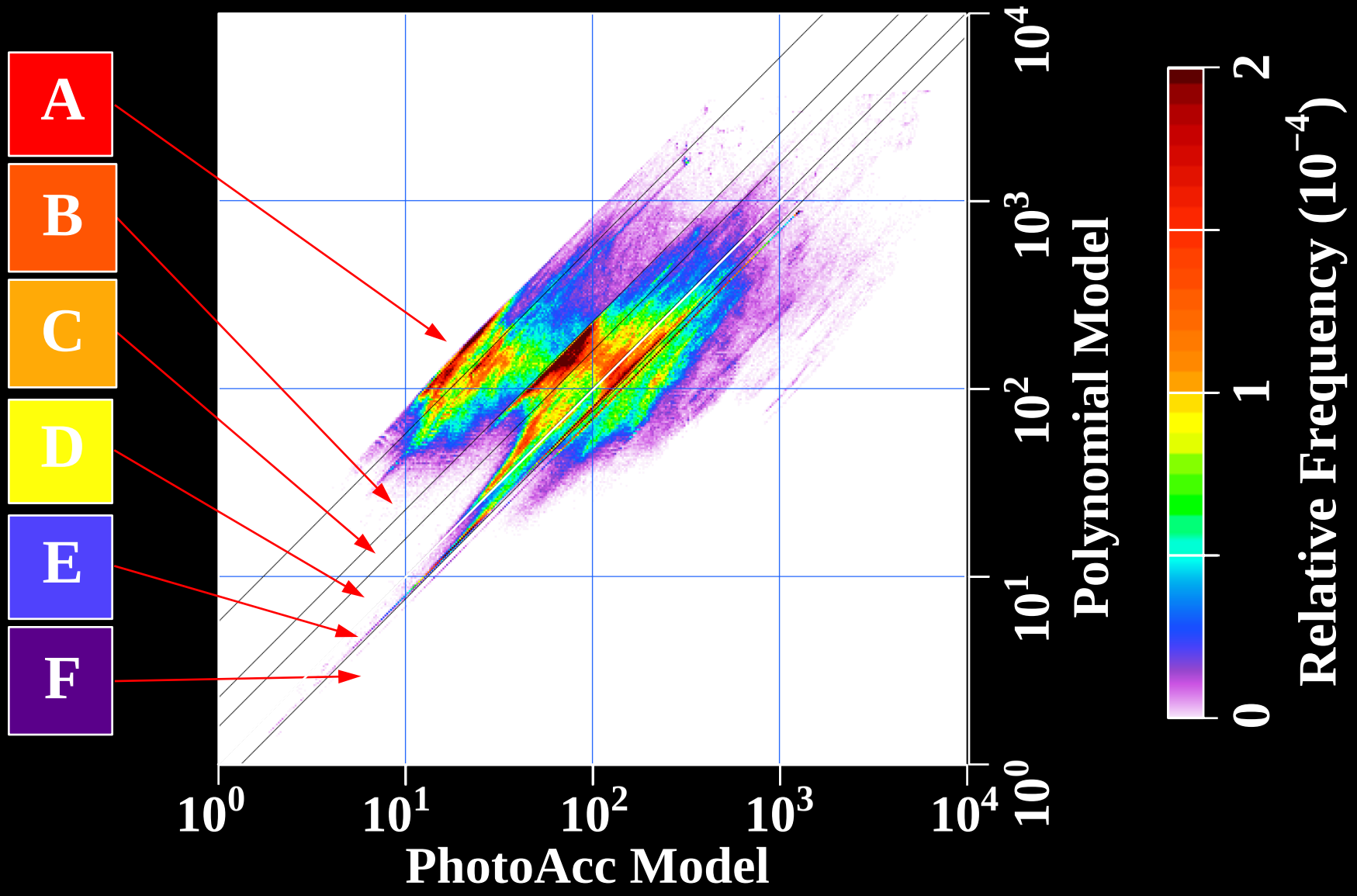
Classification Analysis of PhotoAcc Model



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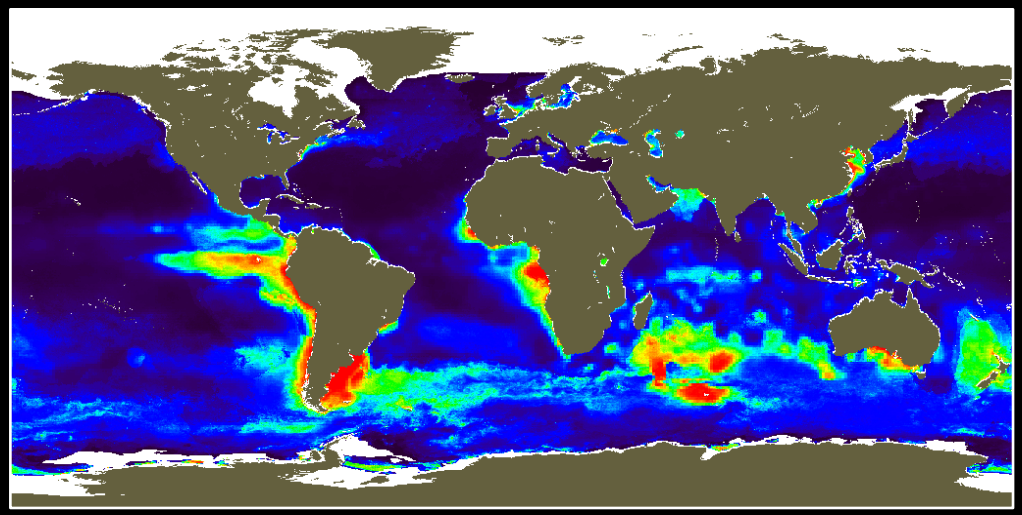
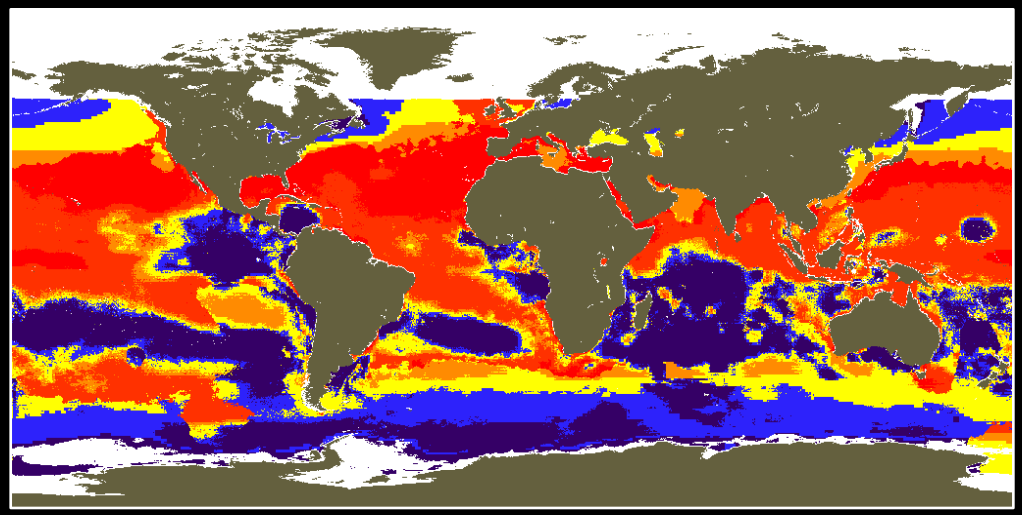
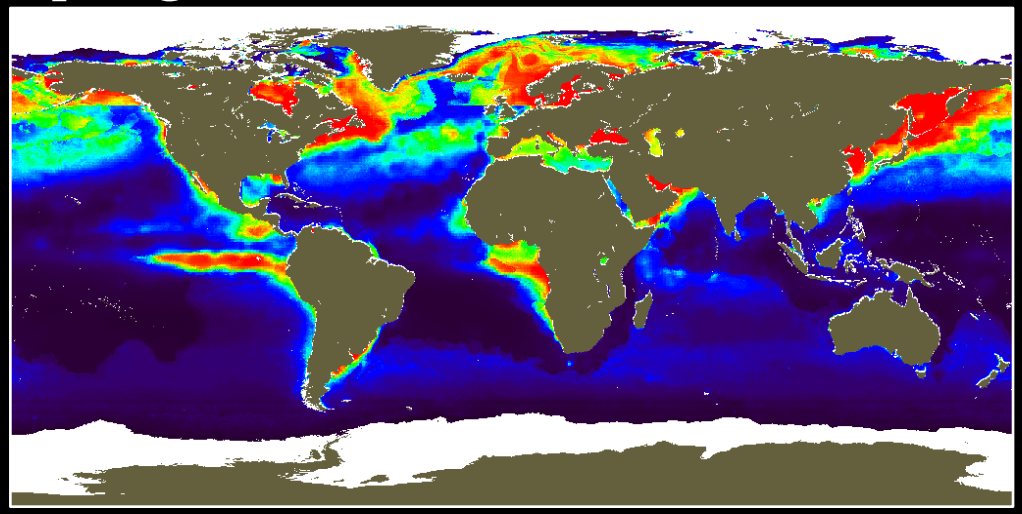
Classification Analysis of PhotoAcc Model

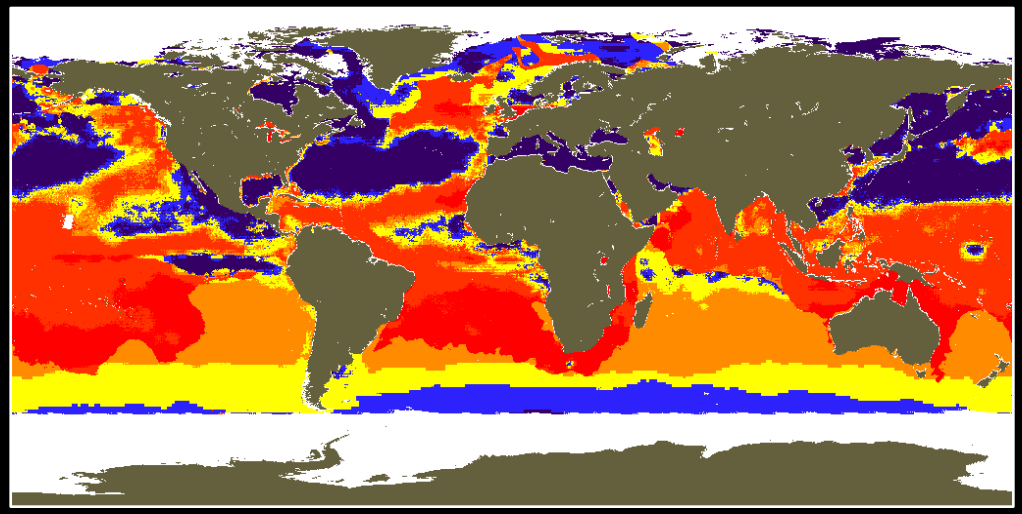
Winter

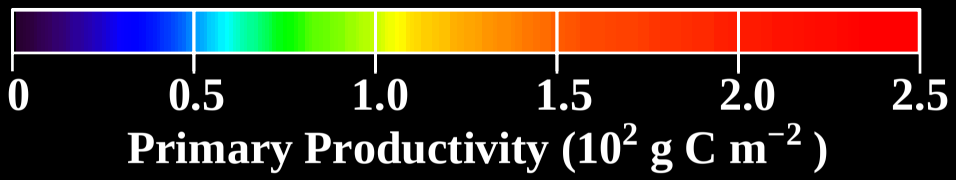




Spring







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