

# Overview of fisheries habitat prediction using the Pelagic Habitat Analysis Module (PHAM)

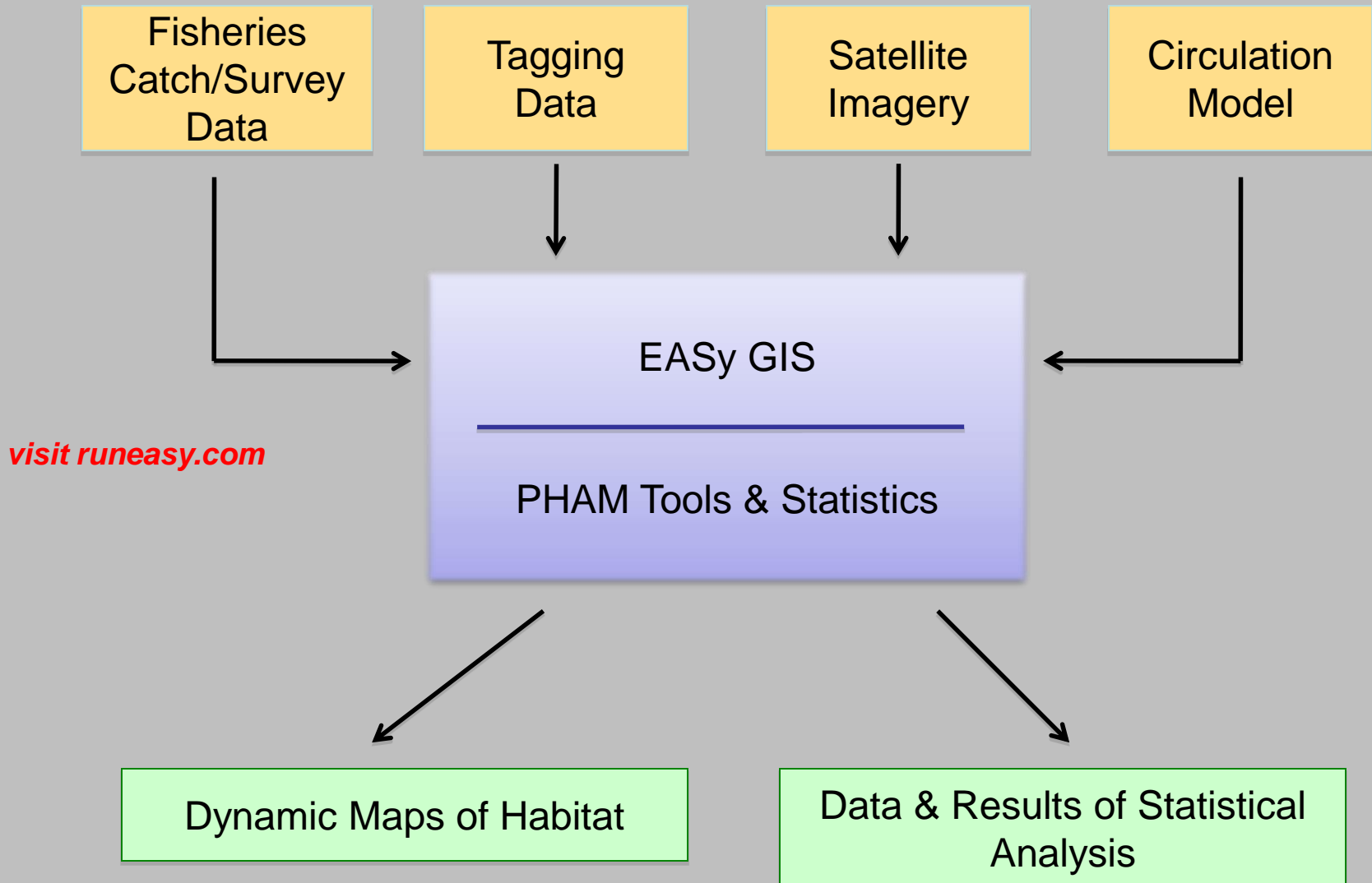


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Government sponsorship acknowledged



# Pelagic Habitat Analysis Module (PHAM)



# Improving Fisheries Management

## Stock Assessment / By-catch

### **Tuna of the EPO**

- Important Commercial Species (\$2-3 B annual revenues Eastern Pacific)
- Stock assessment models only provide a reliable estimate of recruitment several years after the fact
- Very little (if any) environmental data used in stock assessment models

### **Sharks of the California Current**

- Stock assessment model for Thresher Sharks – Input from PHAM GAM
- By-catch Management – Where does habitat overlap commercial fishing?
- Distribution of pregnant females



Mako Shark (*Isurus oxyrinchus*)



Blue Shark (*Prionace glauca*),



Common Thresher Shark (*Alopias vulpinus*)

## Fisheries Data

- Survey Data
- Commercial Catch Data
- Vessel Logbook Data
- Recreational Fishing Data
- Tagging data (not yet)

## Environmental Characteristics

### Satellite Imagery

- Seawifs Chl
- Modis Chl
- Modis SST
- GHRSSST
- AVHRR SST
- AVISO SSH
- Quikscatt Winds
- NOAA Coastwatch Frontal Probability
- NSA JPL Frontal Probability
- EPTO Bathymetry

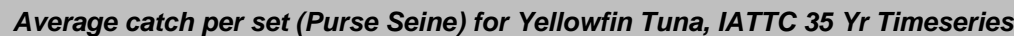


### NASA ECCO 2 Model

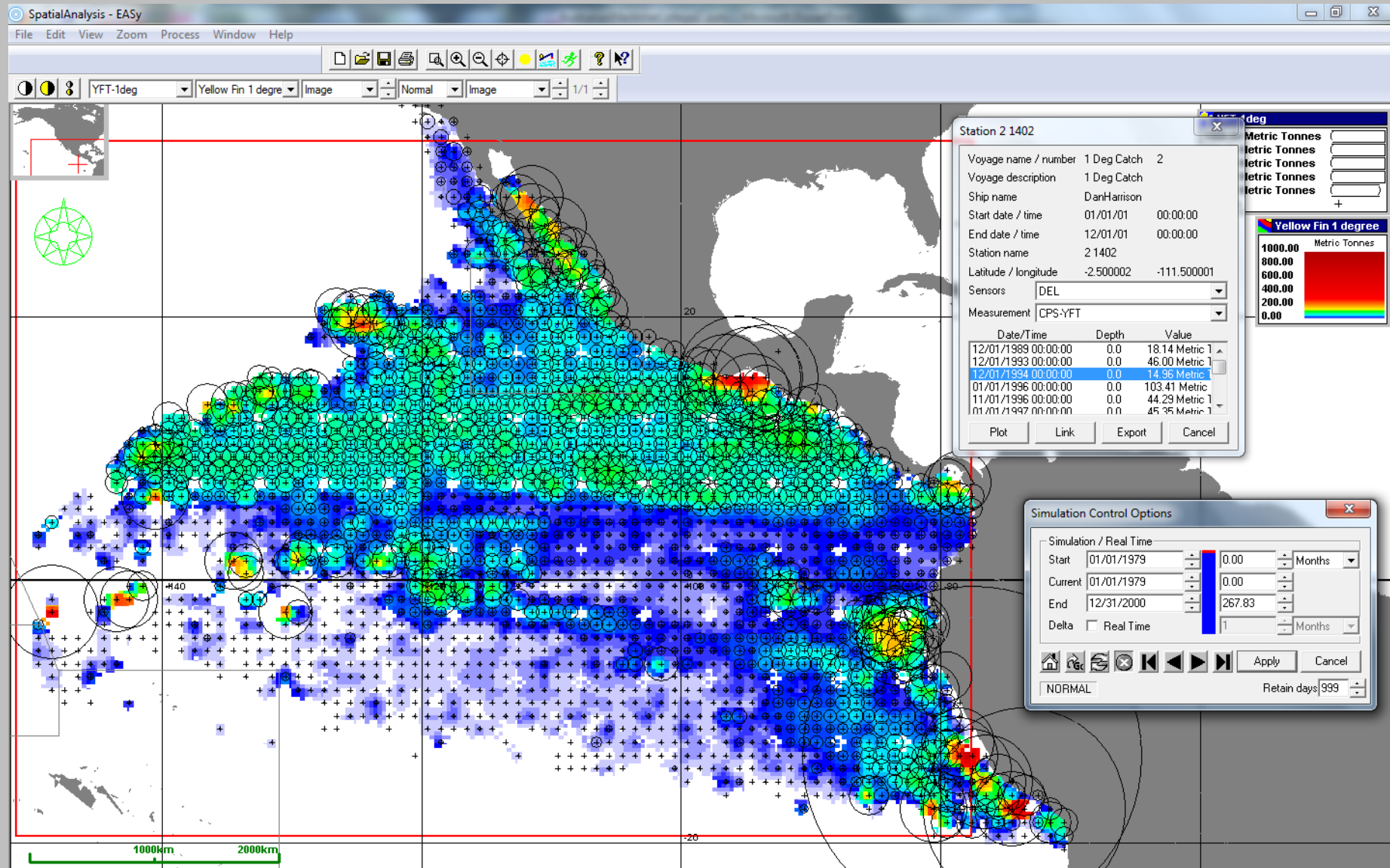
- Mixed Layer Depth
- SST
- Temperature at Depth
- SSH
- Sea Surface Salinity
- Currents

### EASy Built In

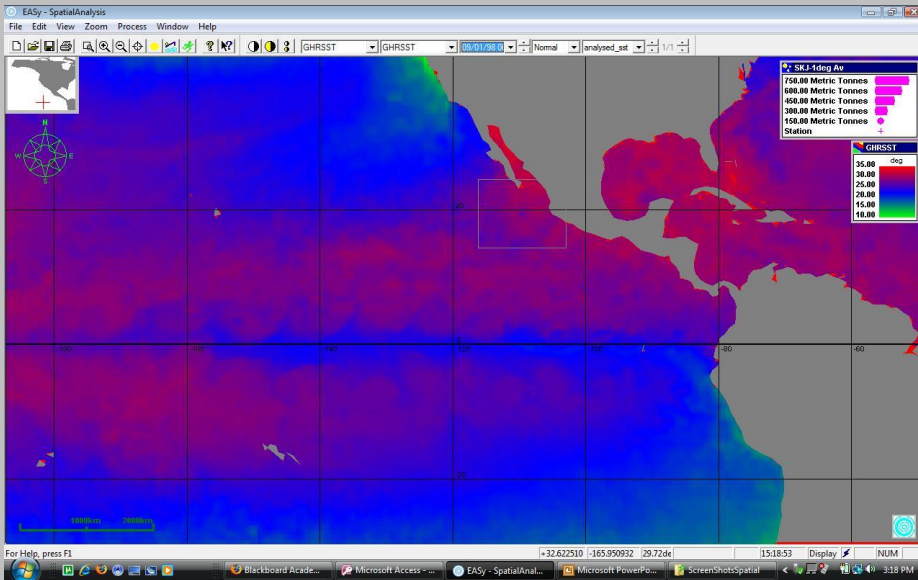
- Earth Magnetic Field
- Longitude
- Latitude
- Month



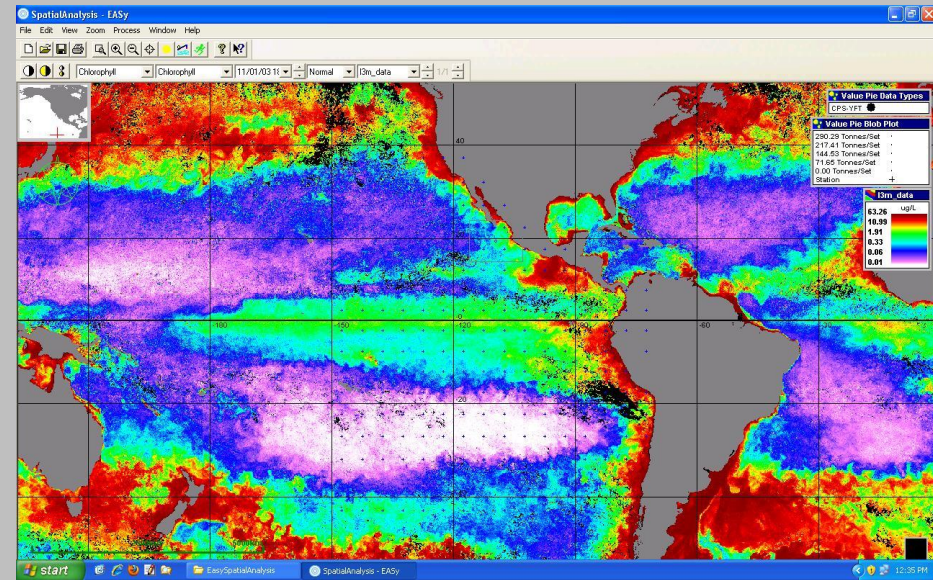
# EASy Screen of Pelagic Habitat Module



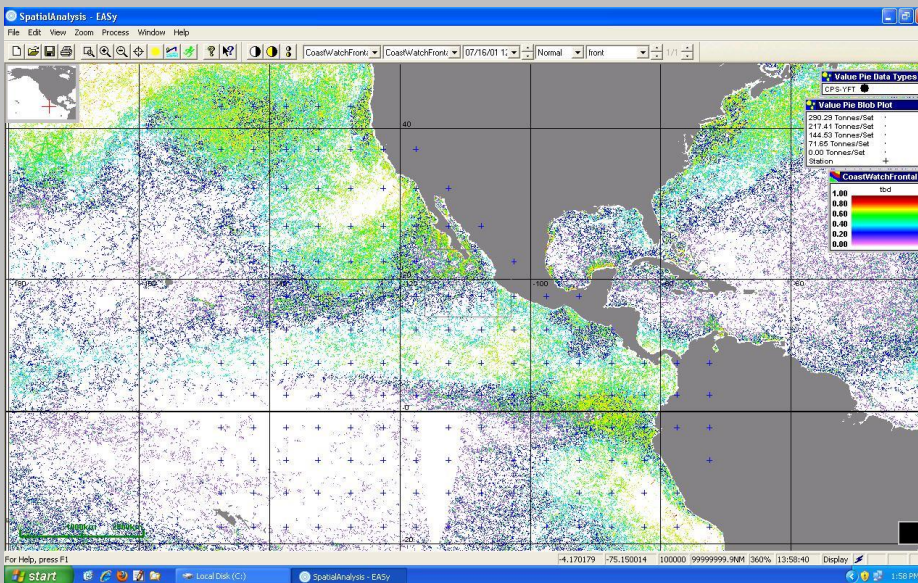
# Environmental Characteristics



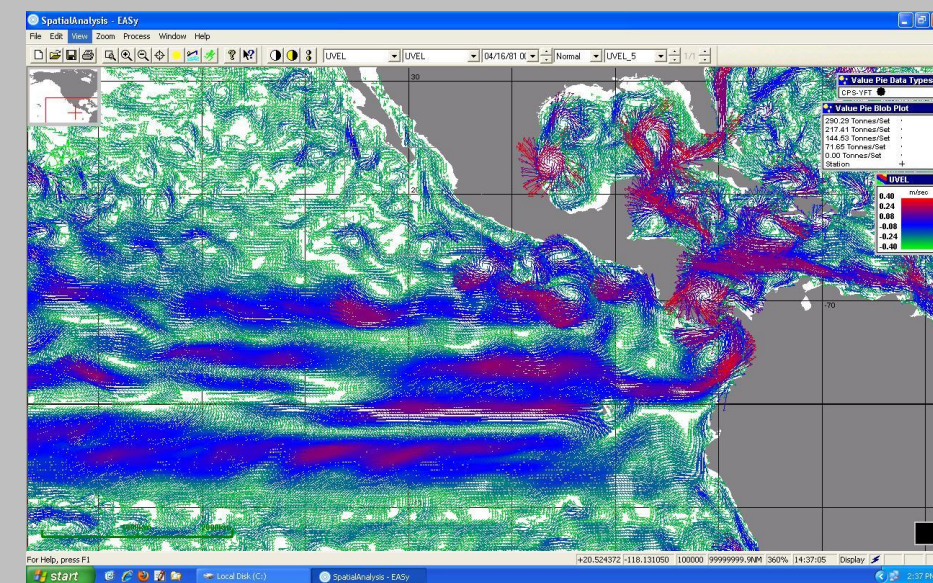
***GHR SST Sea Surface Temperature***



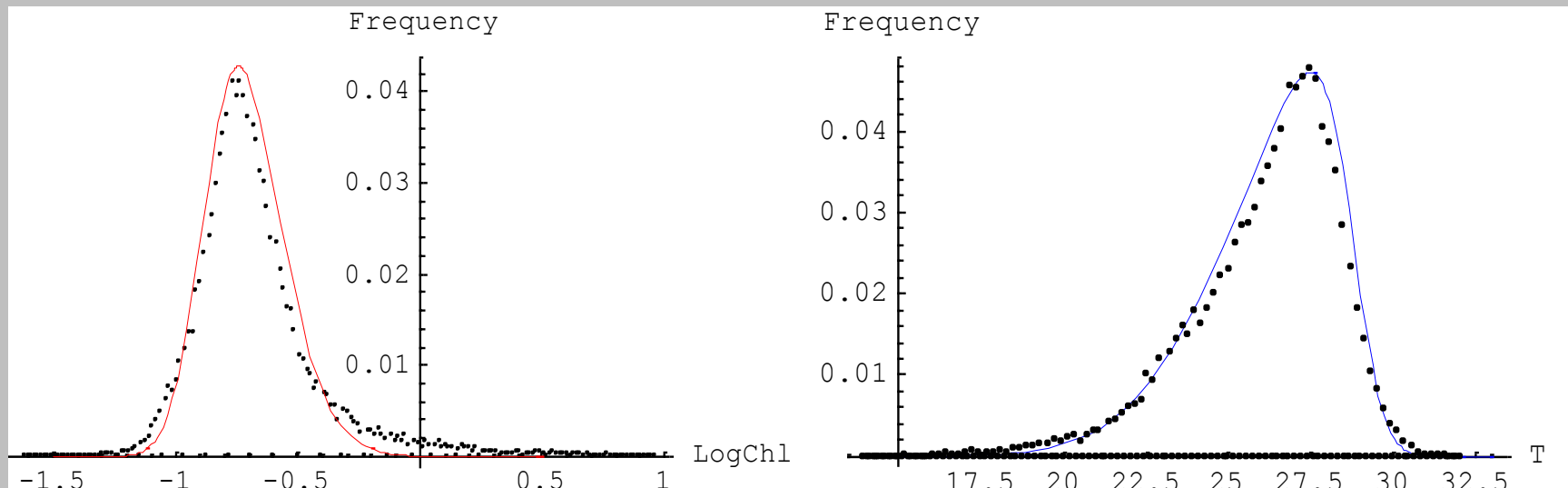
***SeaWiFS Chlorophyll***



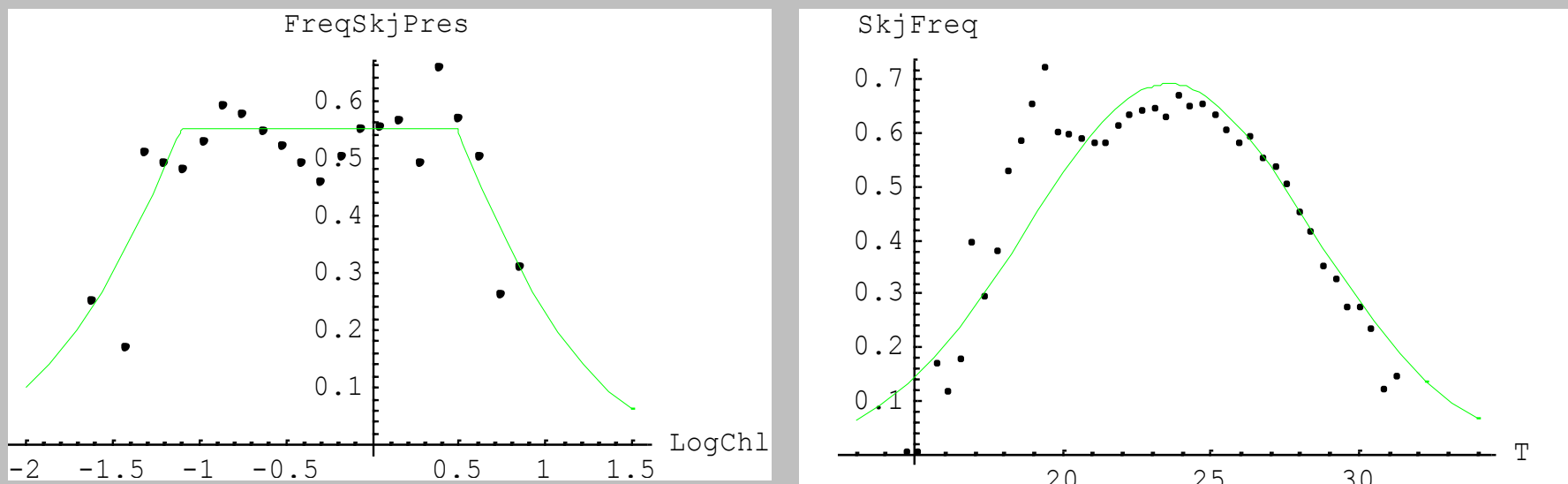
***NOAA Coastwatch Frontal Probability***



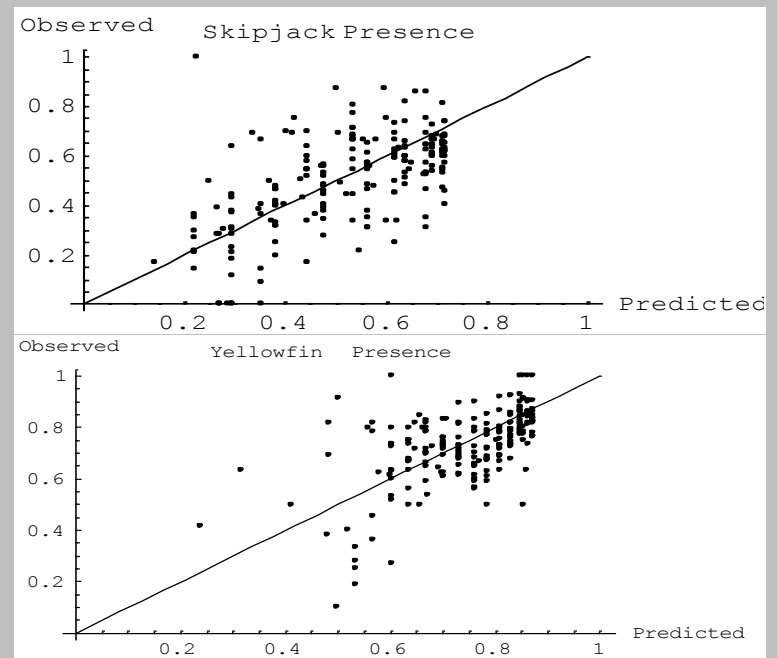
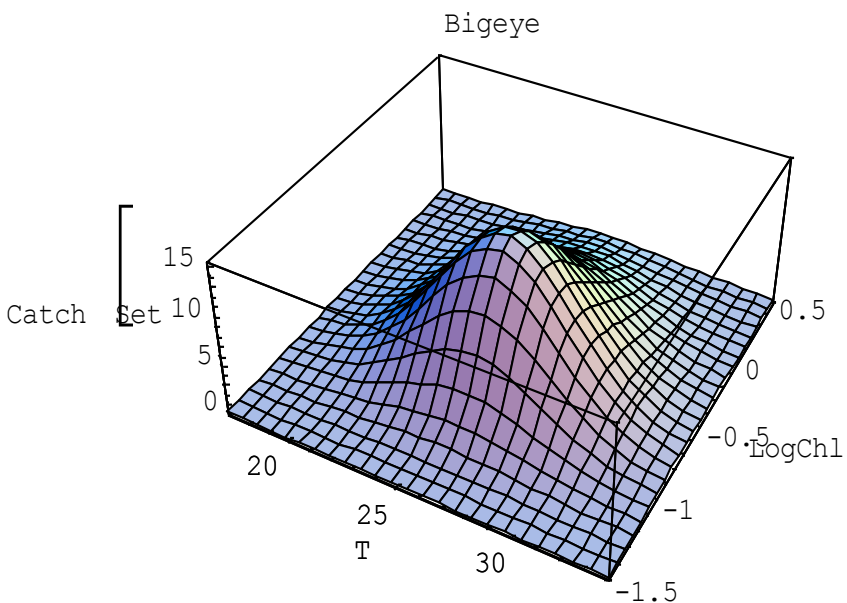
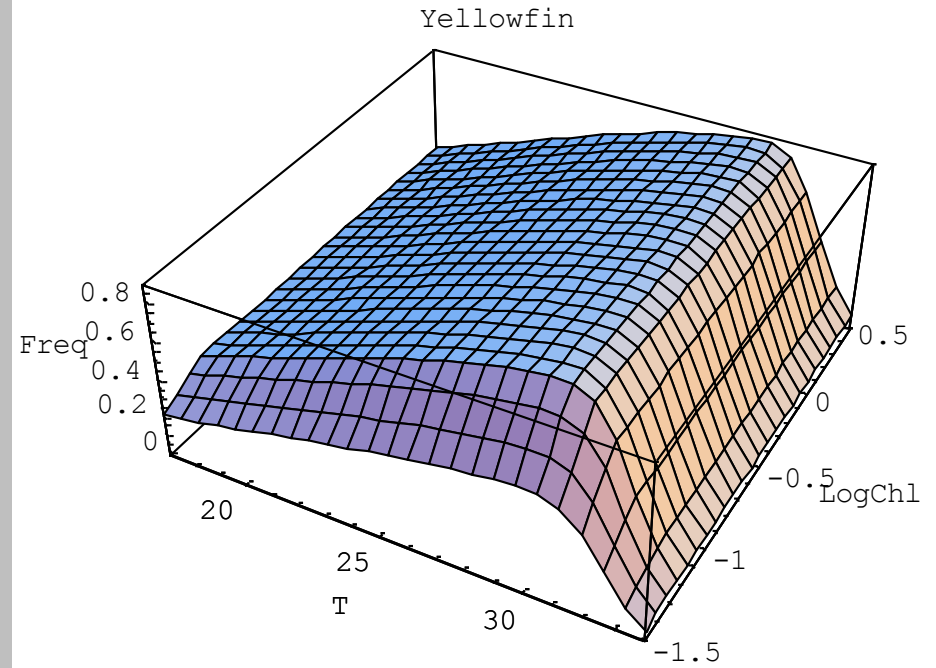
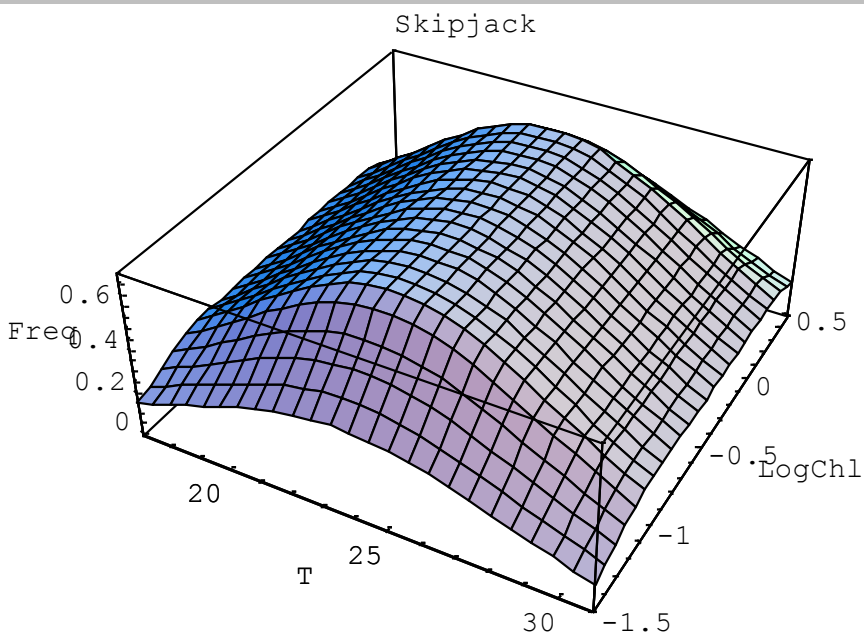
***NASA ECCO2 Ocean Currents***



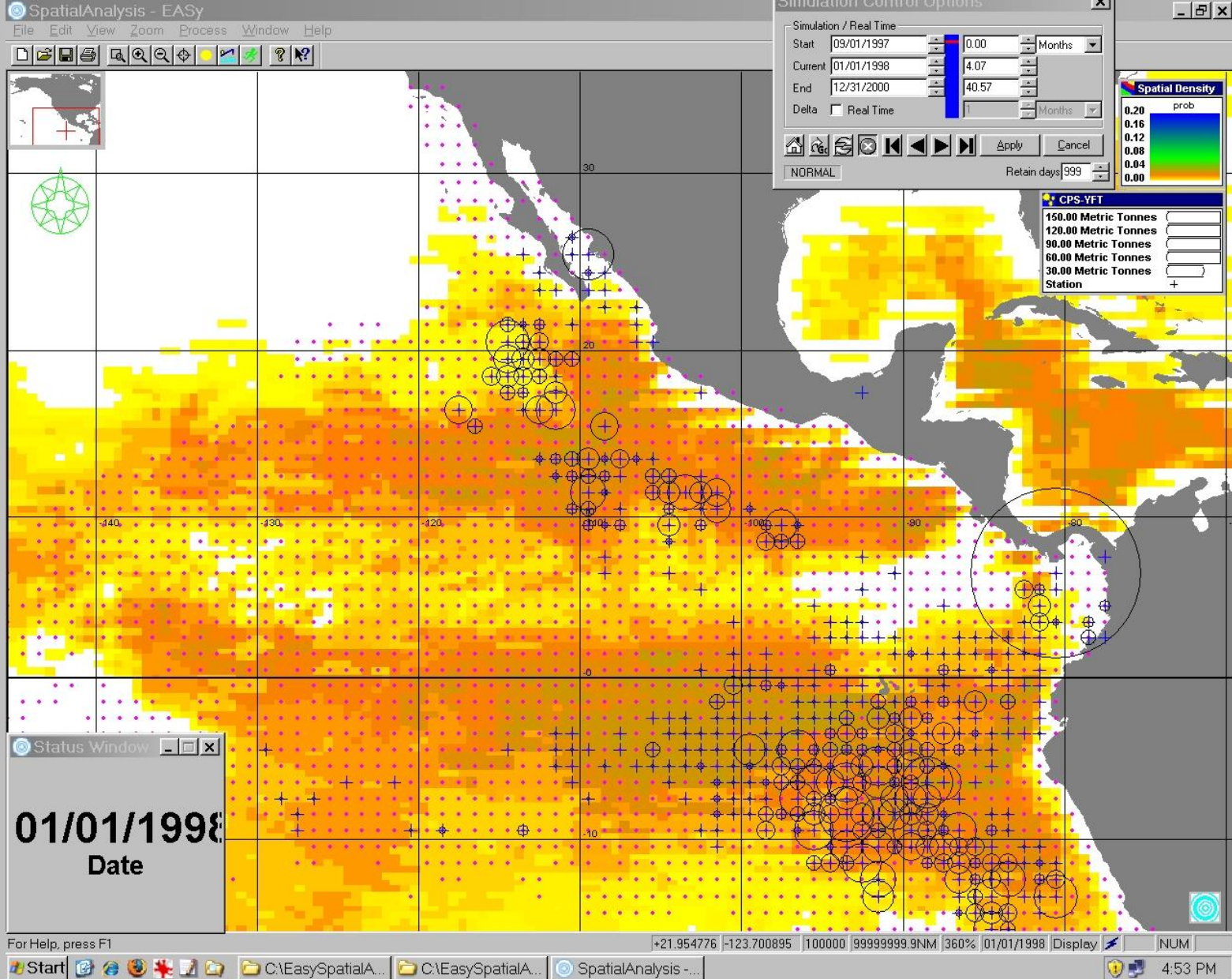
Distribution of sea surface chlorophyll concentrations and water temperatures where purse seine sets were deployed in the IATTC time series for Pacific Tuna.



Distribution of probabilities that a skipjack tuna was caught in a purse seine set in surface water of a given chlorophyll concentration and water temperature.

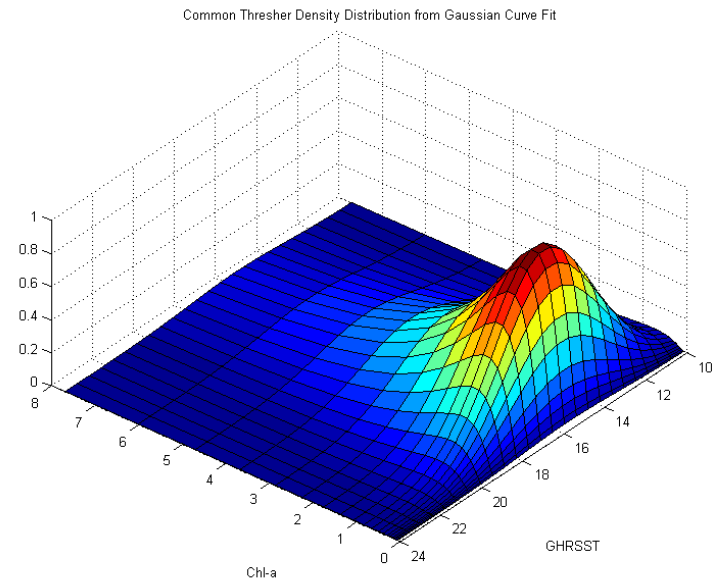
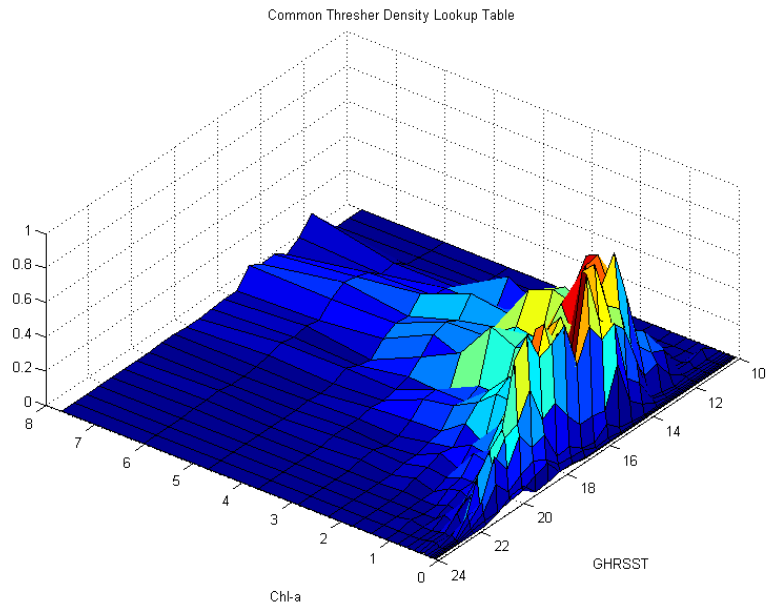
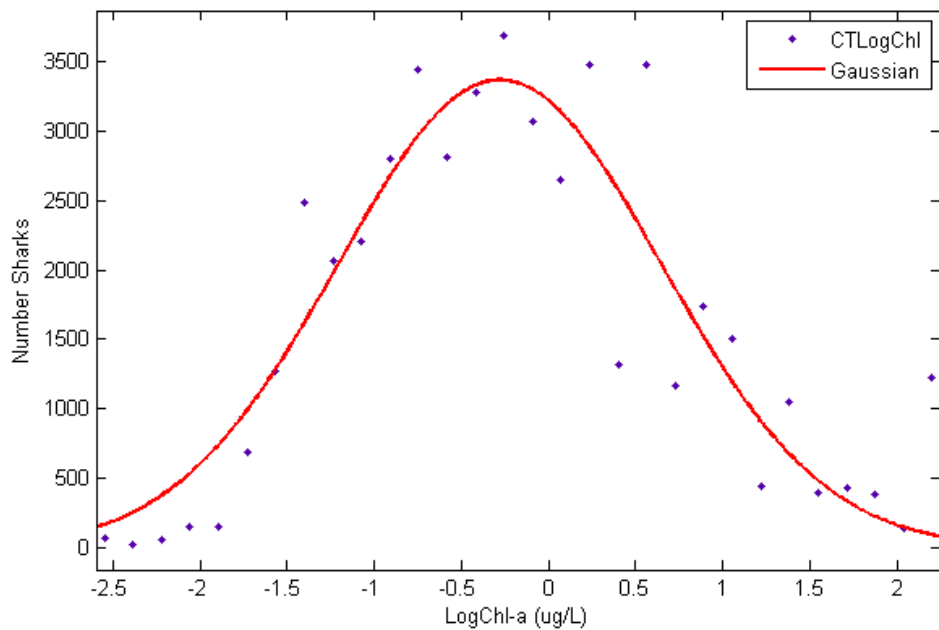
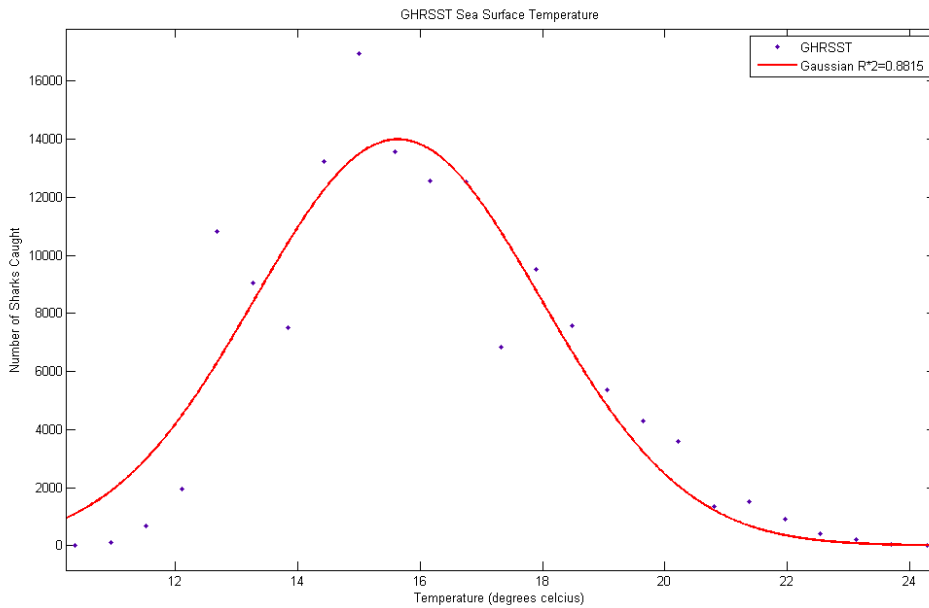


Habitat characterization for 3 tuna species of the Eastern Pacific.



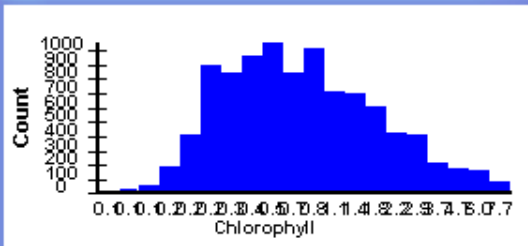
PHAM screen of critical habitat of skipjack tuna as calculated from habitat analysis and current satellite imagery.

# Common Thresher Shark Habitat Mapping

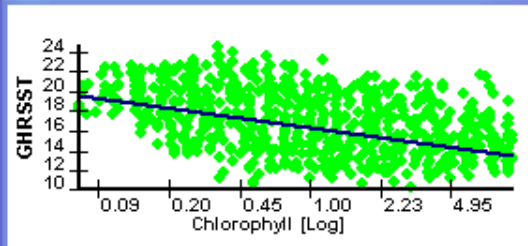




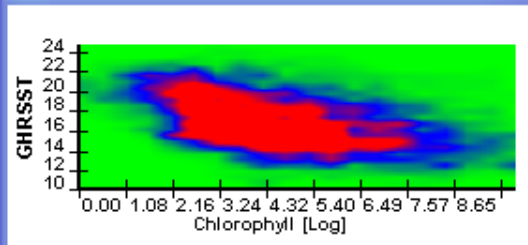
### Chlorophyll Histogram



### Characteristic Correlation ...

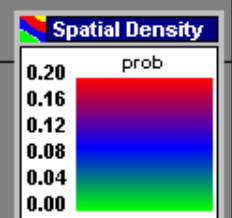
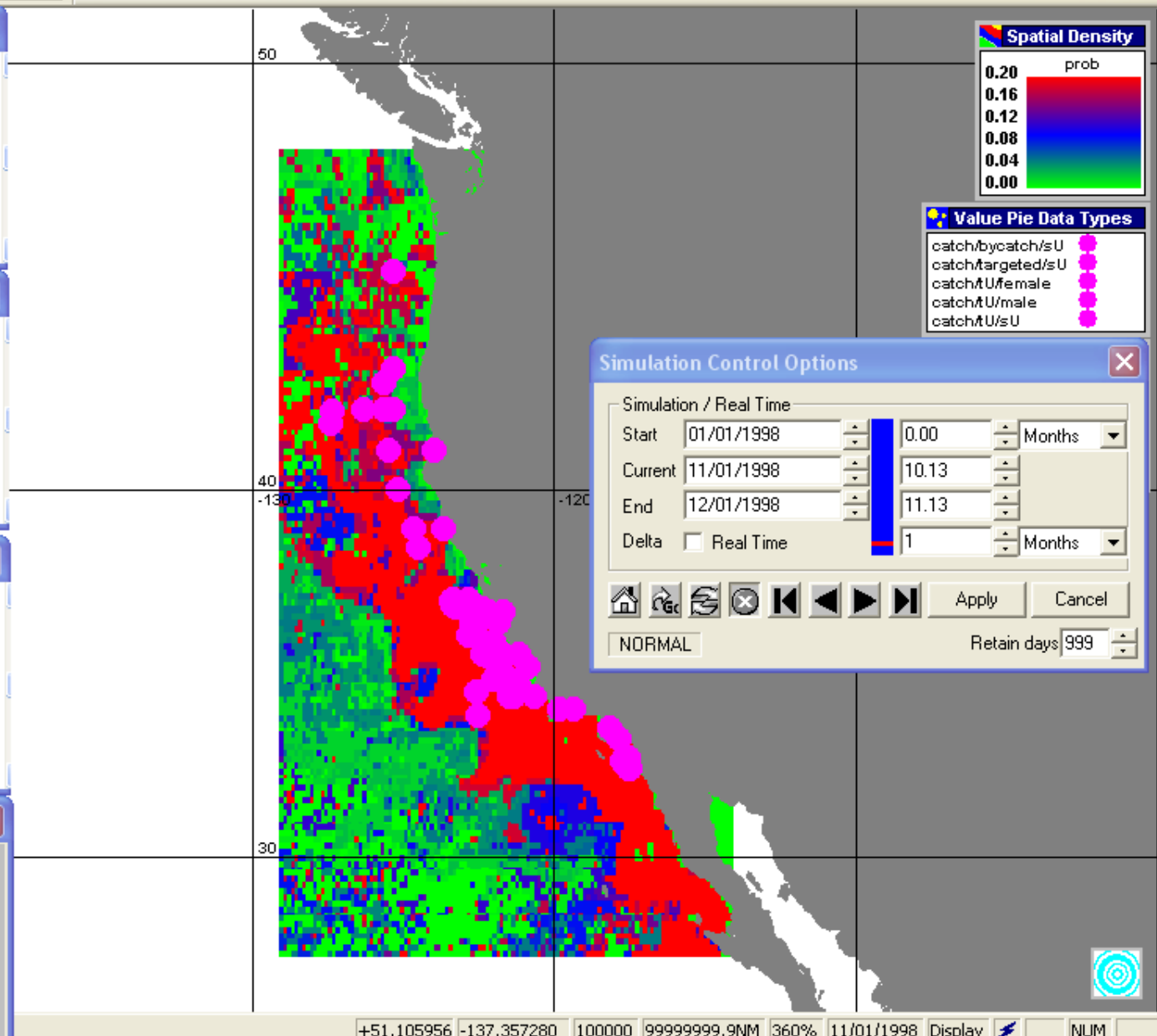


### Sample Density Probability



### Status Window

**11/01/1998**  
Date



- Value Pie Data Types**
- catch/bycatch/sU
  - catch/targeted/sU
  - catch/U/female
  - catch/U/male
  - catch/U/sU

### Simulation Control Options

Simulation / Real Time

Start: 01/01/1998 0.00 Months

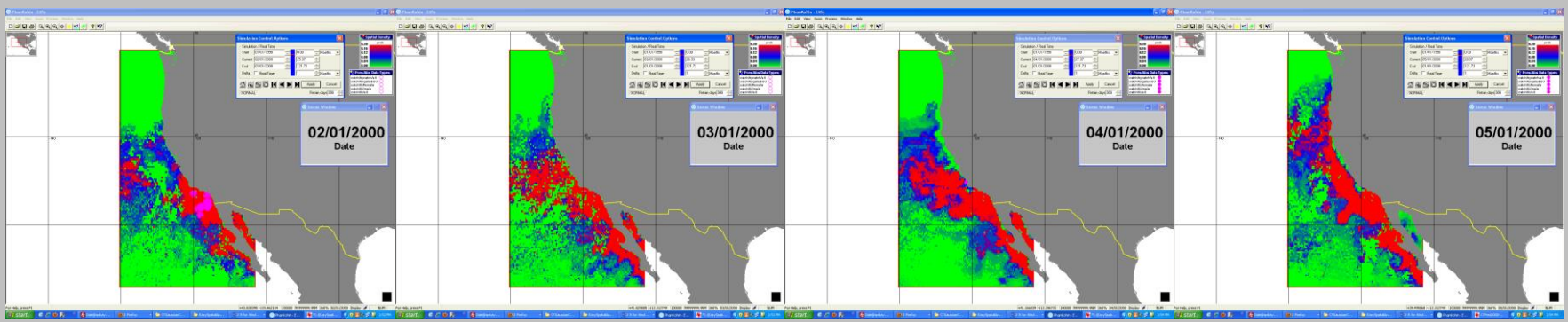
Current: 11/01/1998 10.13

End: 12/01/1998 11.13

Delta: ☐ Real Time 1 Months

Buttons: Home, Refresh, Stop, Play, Previous, Next, Apply, Cancel

NORMAL Retain days: 999

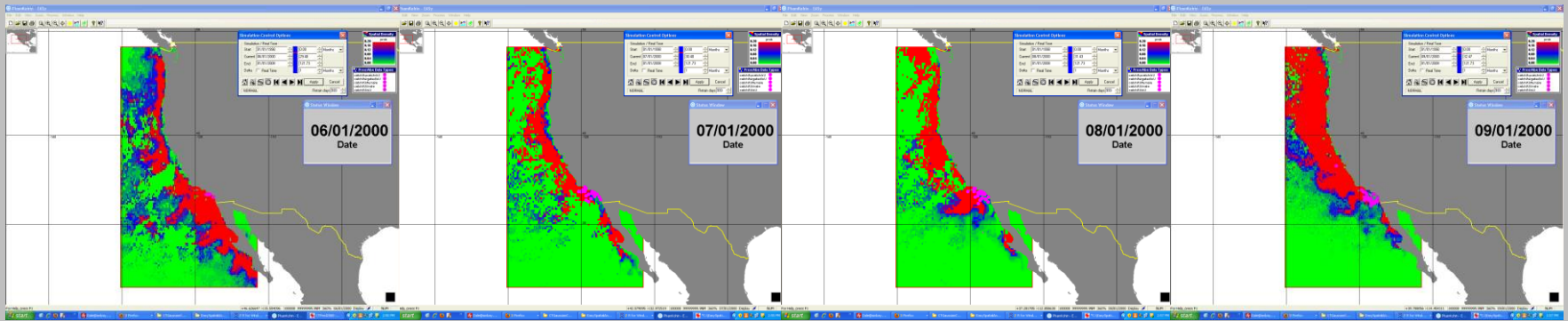


JAN

FEB

MAR

APR

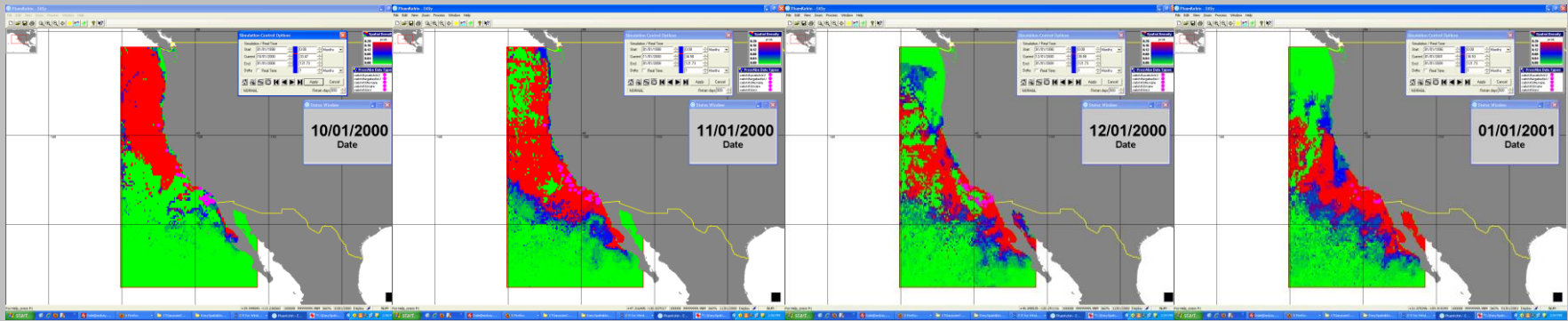


MAY

JUN

JUL

AUG



SEP

OCT

NOV

DEC

PHAM Common Thresher Shark Habitat Prediction for 2000  
based on chlorophyll and SST

## Conclusions

- We have assembled a system that integrates satellite and model output with fisheries data
- We have developed tools that allow analysis of the interaction between species and key environmental variables
- Demonstrated the capacity to accurately map habitat of Thresher Sharks *Alopias vulpinus* & *pelagicus*. Their seasonal migration along the California Current is at least partly driven by the seasonal migration of sardine, key prey of the sharks.
- *If you are interested in using PHAM software (free) please contact [kiefer@usc.edu](mailto:kiefer@usc.edu)*
  - URLs for more information:
    - <http://phamlite.com>
    - <http://runeasy.com>



# The Coastal Marine Discovery Service: Data Discovery, Visualization, and Understanding

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System Science Applications, Inc.

2012 Fall AGU -- 7 Dec 2012

# Operational Gateways

- [http://podaac.jpl.nasa.gov/podaac\\_labs](http://podaac.jpl.nasa.gov/podaac_labs)
  - Main PO.DAAC Labs web site
- <http://cmds.jpl.nasa.gov>
  - Main CMDS web site with the ESGF interface
- <http://cmds-gis.jpl.nasa.gov>
  - Direct link to NetViewer visualization

# CMDS web site



[Home](#) [Search](#) [Tools](#) [Login](#)



## Coastal Marine Discovery Service

Jet Propulsion Laboratory

Welcome to the NASA Marine Discovery Service

NASA's Coastal Marine Discovery Service, an ACCESS 2009 funded proposal to leverage open source technology for unifying coastal



### Quick Search

Keyword:

Advanced Search (Category, Geospatial, Temporal, and more)...



### Resources

- [EASy GIS NetViewer](#)

(supported browsers)



### ESGF Peer Nodes

- [PCMDI Node](#)
- [ORNL Node](#)
- [NASA-JPL Node](#)
- [PNNL Node](#)
- [ANL Node](#)

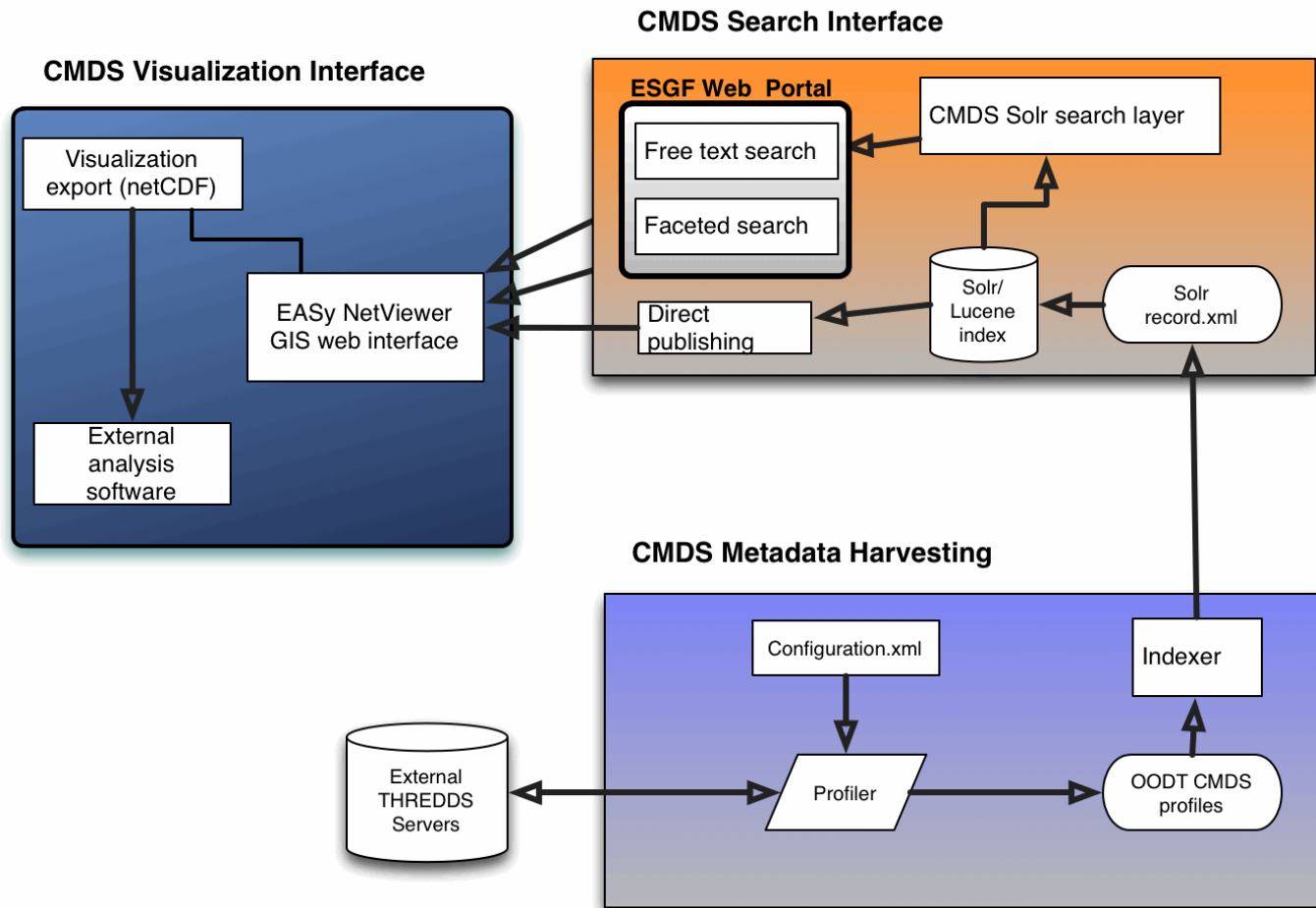
Guest User  
ESGF P2P Version 1.4.0-brighton\_beach-release-18-g3141bda-devel [fe-2.2.5]

[Privacy Policy & Legal Notice](#) | [Contact ESGF](#)

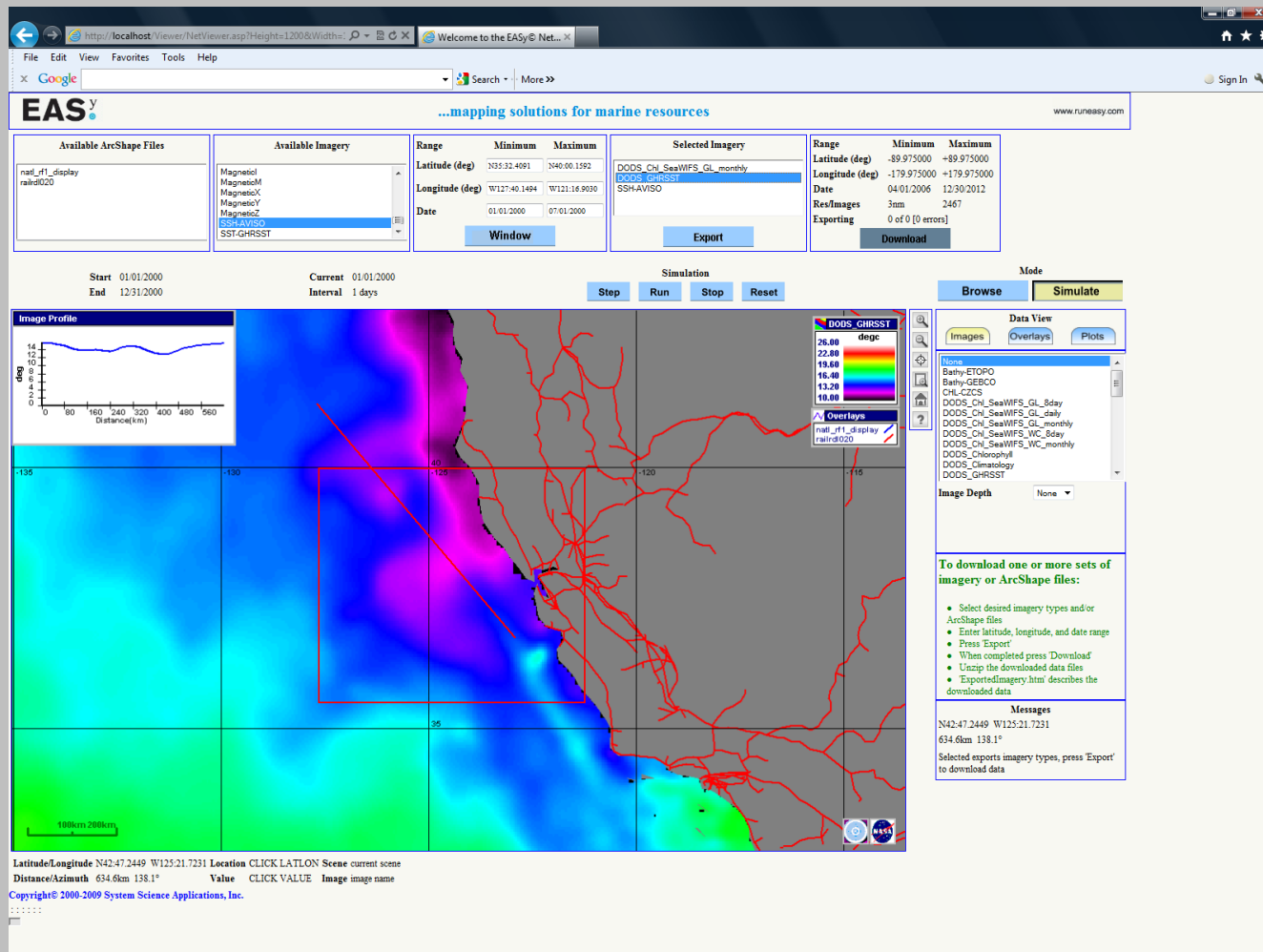
# CMDS datasets exposed

- Focused on global and coastal datasets from CoastWatch, NOAA ERDDAP, NOAA NODC, US NAVY on THREDDS (OPeNDAP) servers
  - Over 200 datasets indexed. More to come.
- Organized as faceted search on provider, measurement (CF standard name), spatial coverage and sensor. This list is extensible and easily changed.
- Free text search on keywords harvested from metadata exposed from THREDDS servers

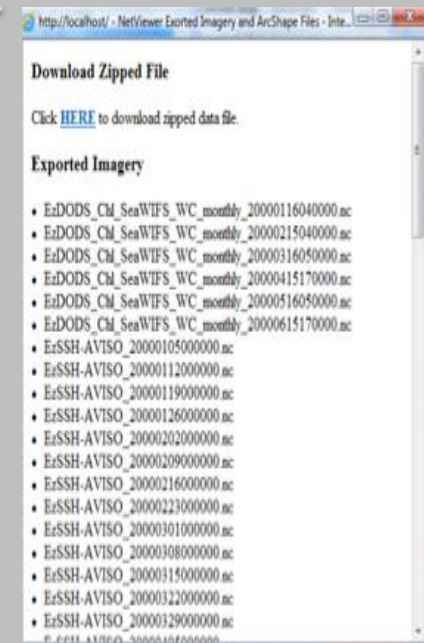
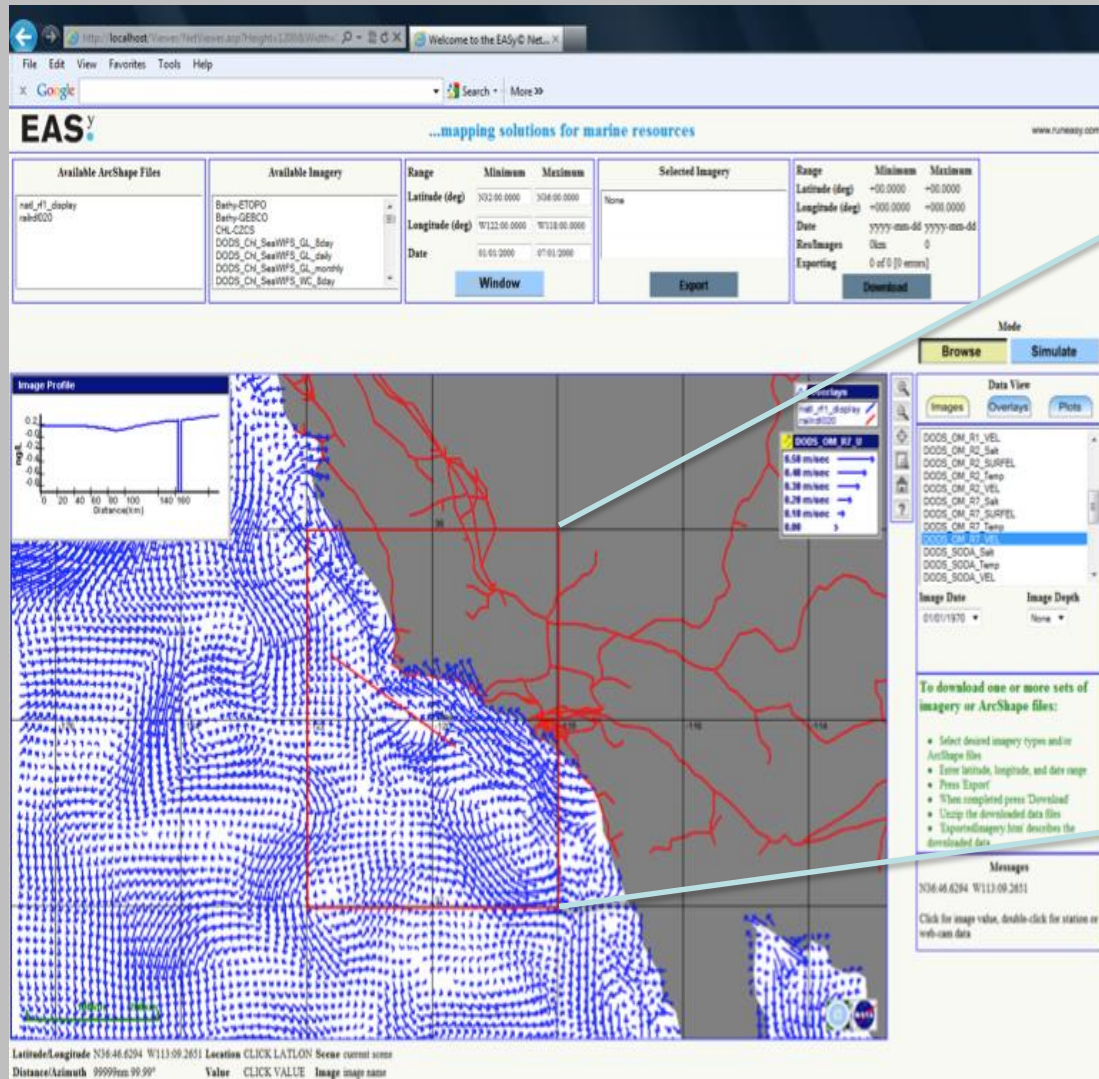
# Current architecture



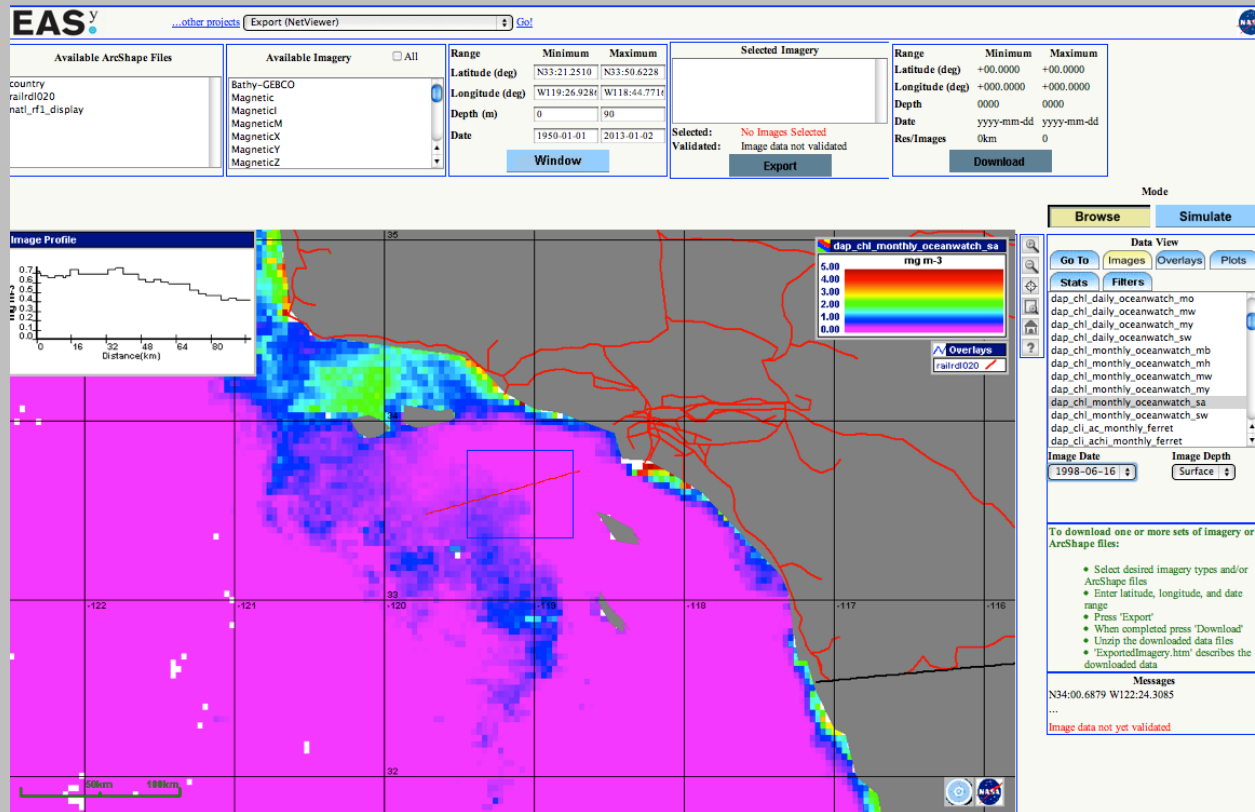
# Example of SST “on the fly”



# Example: Export ocean model data



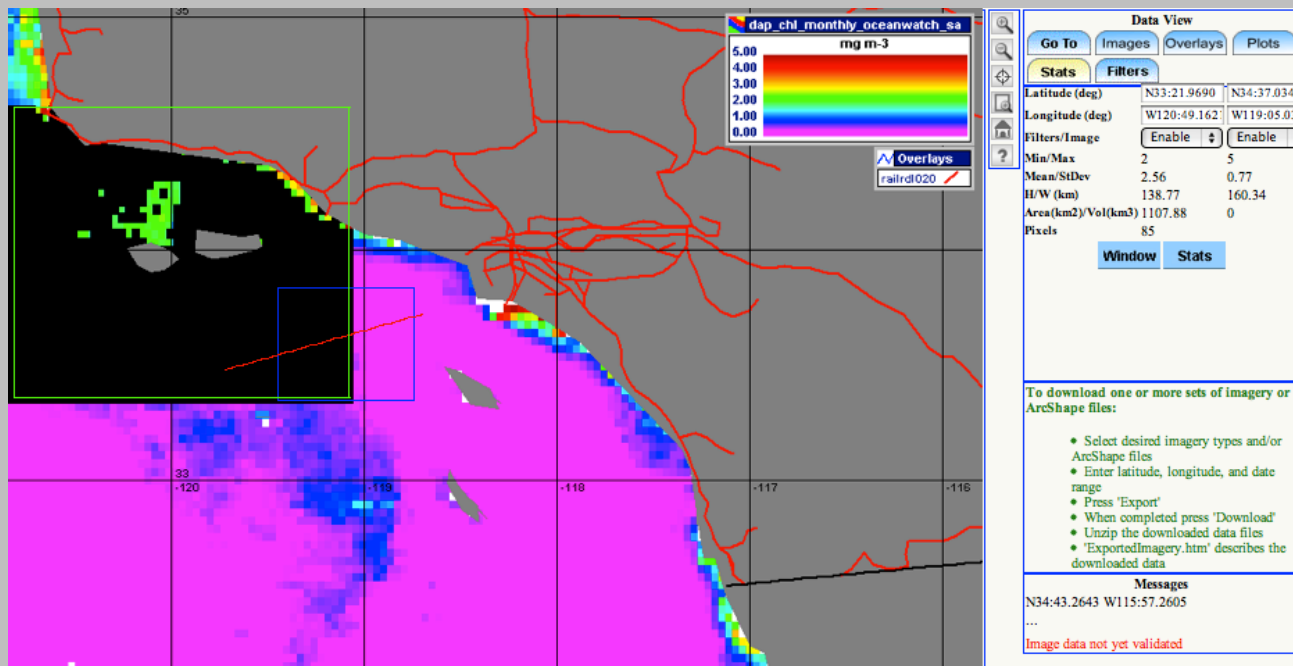
# NetViewer visualization: Chl\_A



- Implementation of the visualization capability has been completed
  - Stand alone software running on a Windows server
  - Accessed via web browser
  - Reads and displays any OPeNDAP URL from CMDs either from a populated list or from the results of a search
  - Can package custom subsets of data

# Query and statistics capability added

- Use case: Where are the high chlorophyll values and what is their distribution in the Santa Barbara Channel ?
- Can be combined with up to 3 other layers for multi dimensional query; e.g., Where the high chlorophyll values with a temperature range of 10-15 degC in shallow to shelf depth water.



# Comparison of popular tools

Tool/ Interface	Data Discovery	Visualization	Data interrogation	ROI Statistics	Export	Shapefile support
CMDS/ NetViewer	"quasi- Federated"	✓	✓	✓	✓	✓
IDV	Specific THREDDS	✓	✓	No	No	No
Live Access Server	Specific LAS	✓	No	No	✓	No
Godiva2	Specific THREDDS	✓	No	No	No	No
Panoply	None	✓	Table format	No	✓	No
netCDF- JavaToolUI	Specific THREDDS	✓	✓	No	No	No