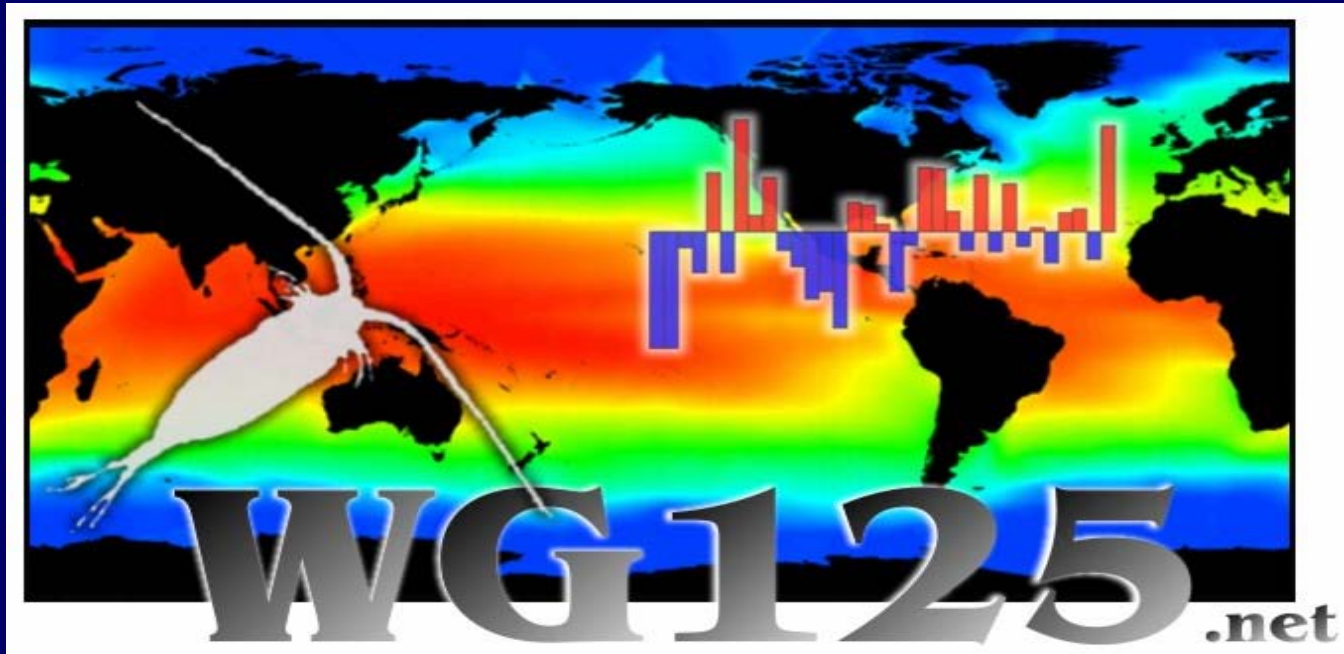


The SCOR WG125 toolkit: *Issues and methods for analyzing zooplankton time series.*



**Todd D. O'Brien**, Dave Mackas, Mark D. Ohman,  
Ángel López-Urrutia, *and SCOR WG125 contributors*

# *SCOR WG125 contributors*

*“With data contributions and participation from 12 countries, over twenty long-term regional zooplankton time series have been identified ...”*

# SCOR WG125 contributors

*“With data contributions and participation from 12 countries, over twenty long-term regional zooplankton time series have been identified ...”*

*“With data contributions and participation from **23** countries, up to one hundred long-term\* regional zooplankton time series have been identified ...”*

# The definition of “long term” ?

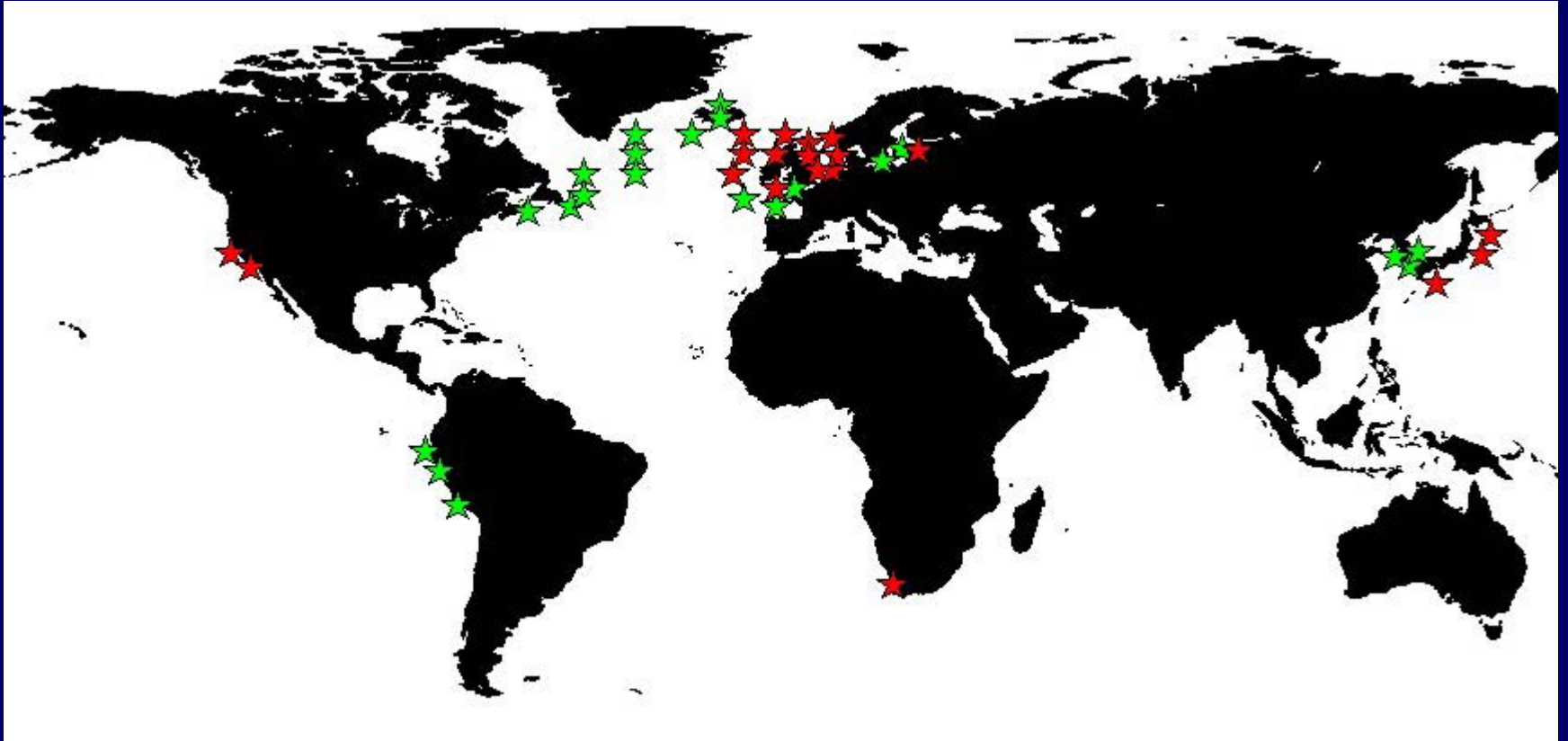


# The definition of “long term” ?



> 50 years (21 ts)

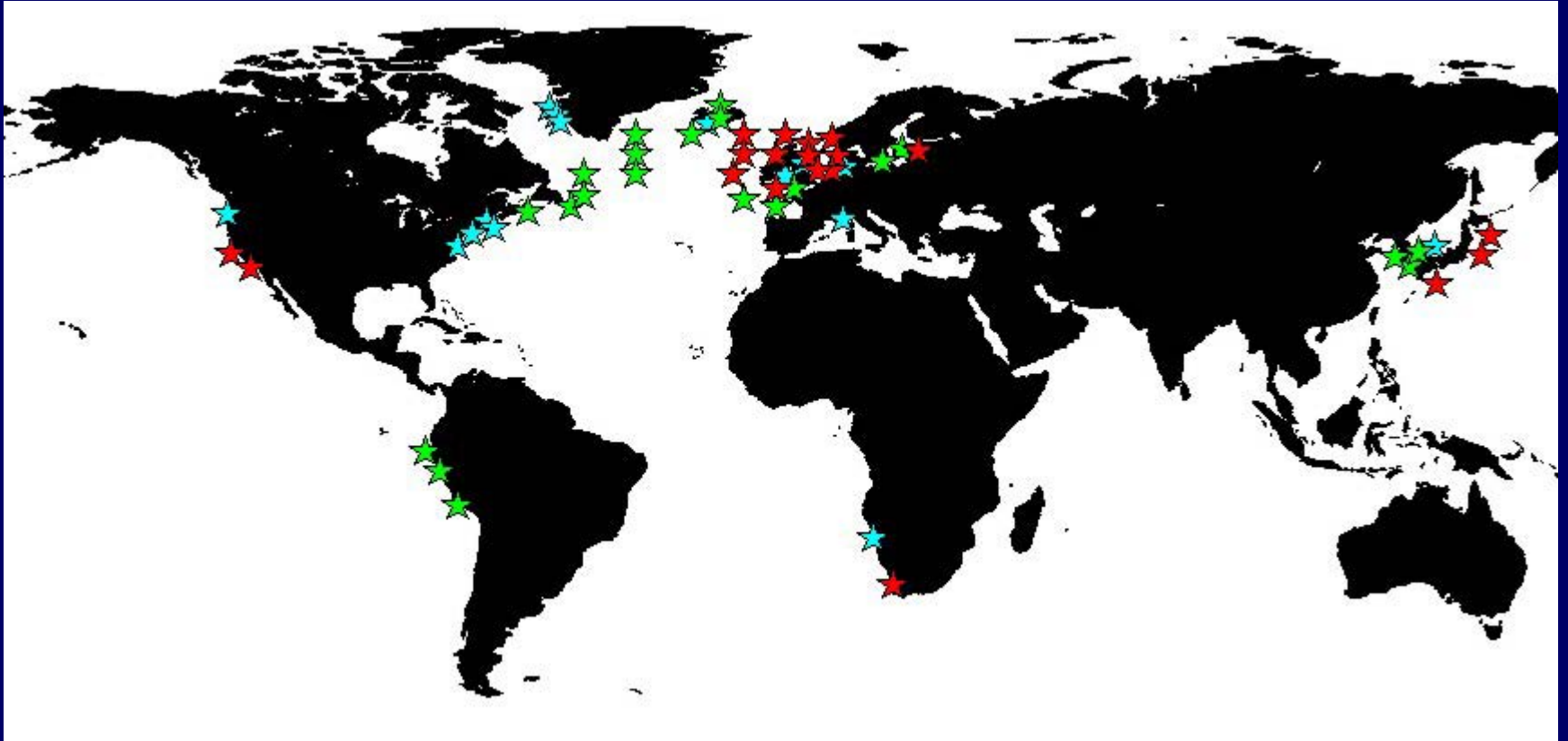
# The definition of “long term” ?



> 50 years (21 *ts*)

> 40 years (39 *ts*)

# The definition of “long term” ?

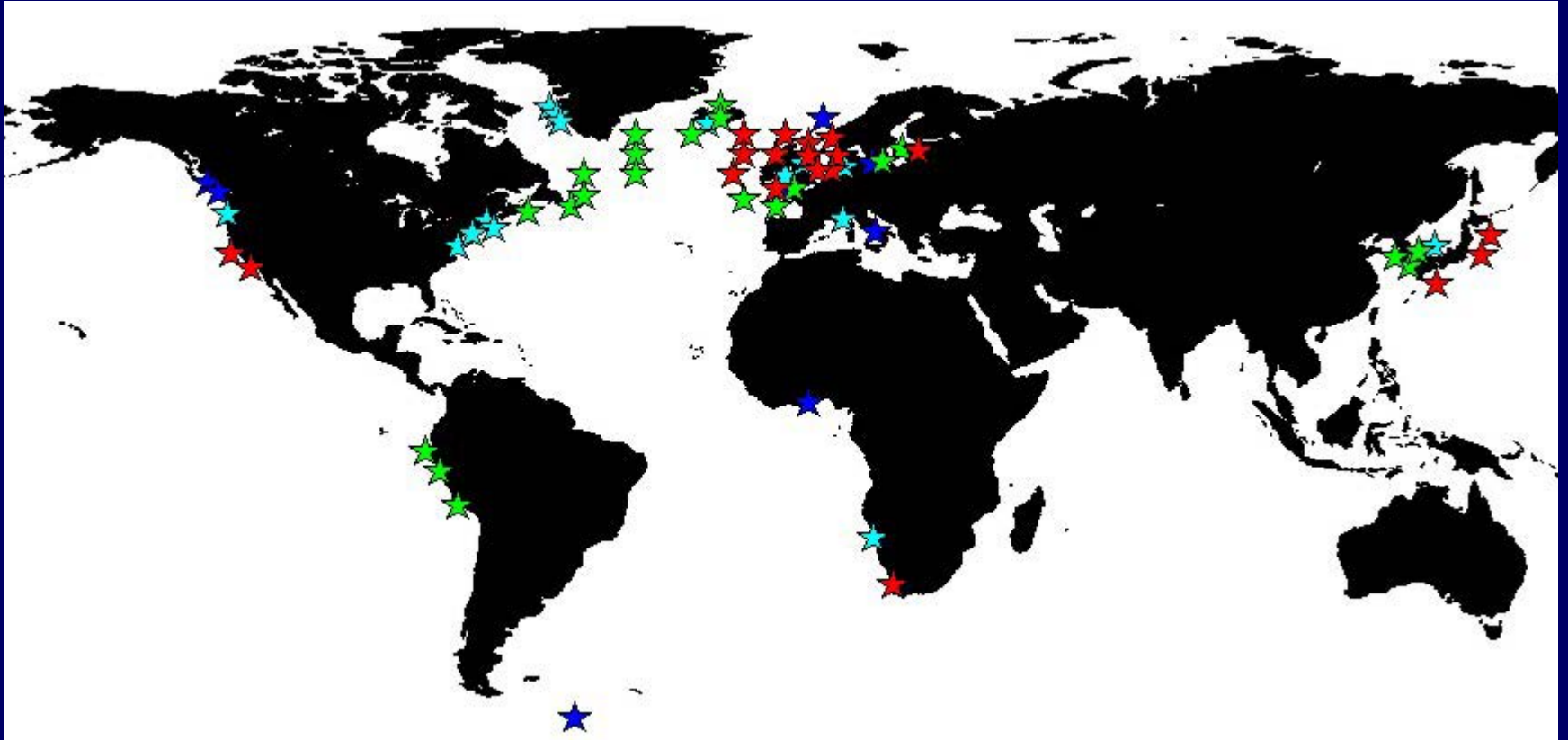


> 50 years (21 ts)

> 40 years (39 ts)

> 30 years (50 ts)

# The definition of “long term” ?



> 50 years (21 ts)

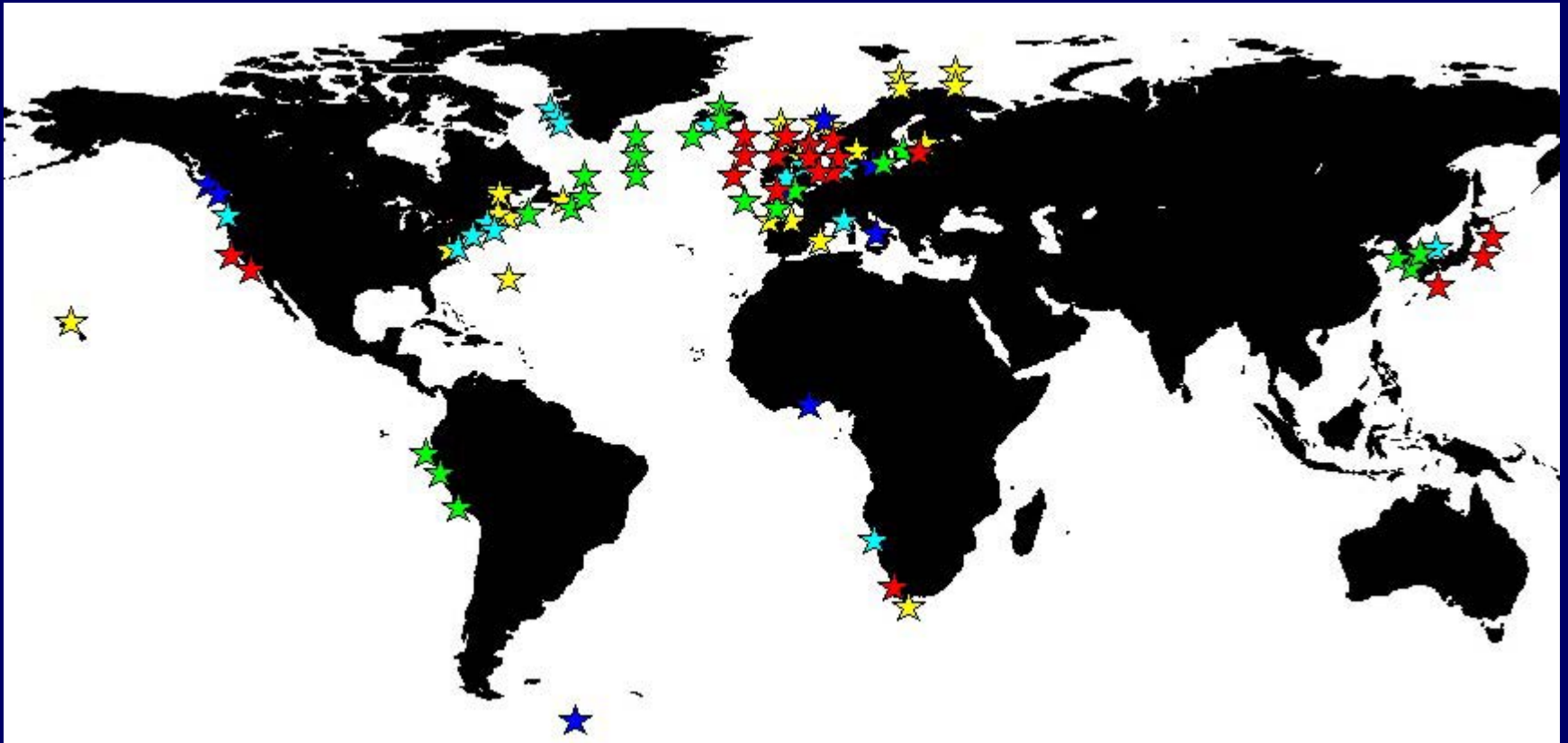
> 30 years (50 ts)

> 40 years (39 ts)

> 20 years (62 ts)



# The definition of “long term” ?



> 50 years (21 ts)

> 40 years (39 ts)

> 30 years (50 ts)

> 20 years (62 ts)

>10 years (100+ ts)

# WG125 Methodology

This methodology was selected after conducting spurious and repeat evil *transformations* and various other *mean* experiments on helpless time series data.

# WG125 Methodology

This methodology was selected after conducting spurious and repeat evil *transformations* and various other *mean* experiments on helpless time series data.

For example, what happens if you ...

- shoot a time series full of holes?
- randomly cut out entire years?
- add gross disfigurations (*outliers*) to the data?

# WG125 Methodology

While no one method was best for every situation, we found our method fairly robust to outliers, noise, and data scarcity.

*( This is important if one intends to examine and compare over one hundred time series of different measurement methods and sampling frequencies. )*

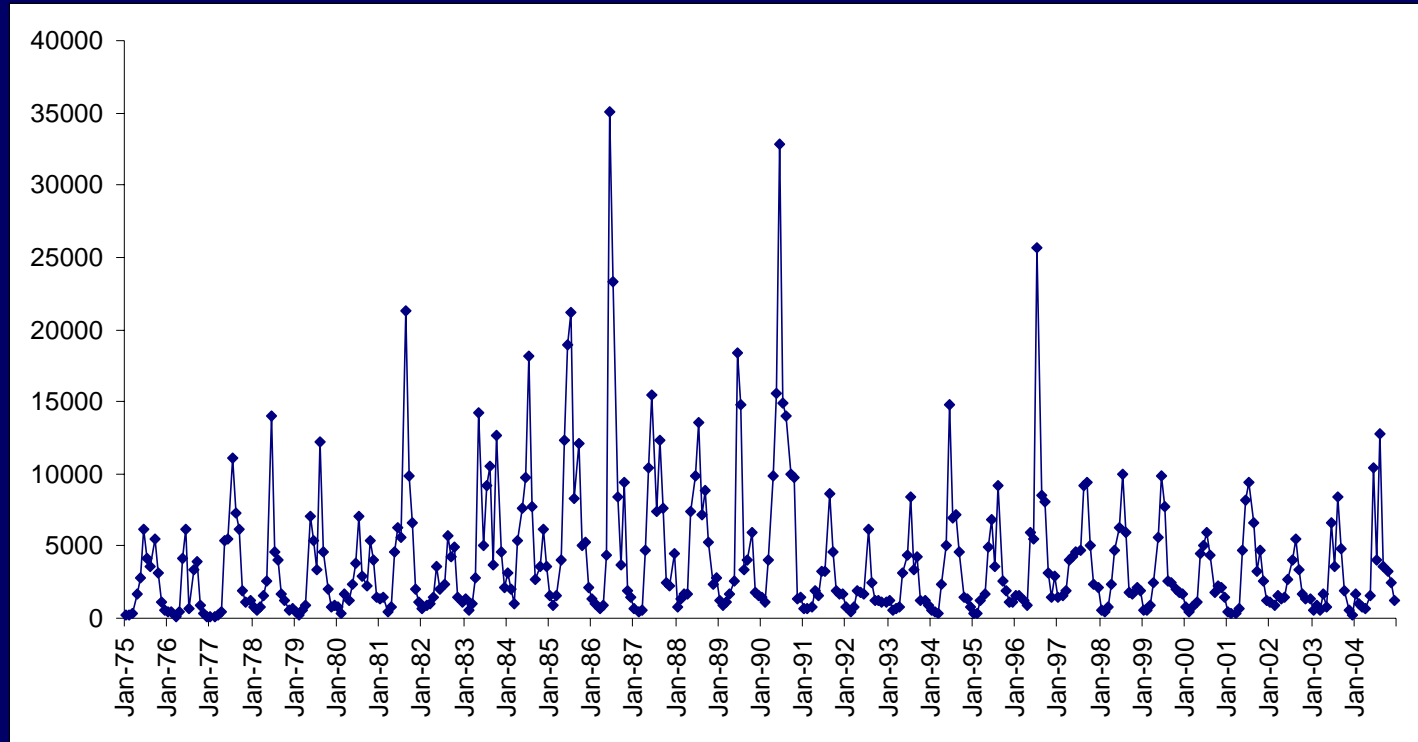
# The WG125 Methodology

- Log transform the data and calculate monthly means (*if data avail.*) for each year of data;
- For each calendar month, calculate a monthly climatology (*mean of all the monthly means*);
- For each month in each year, calculate a monthly anomaly;

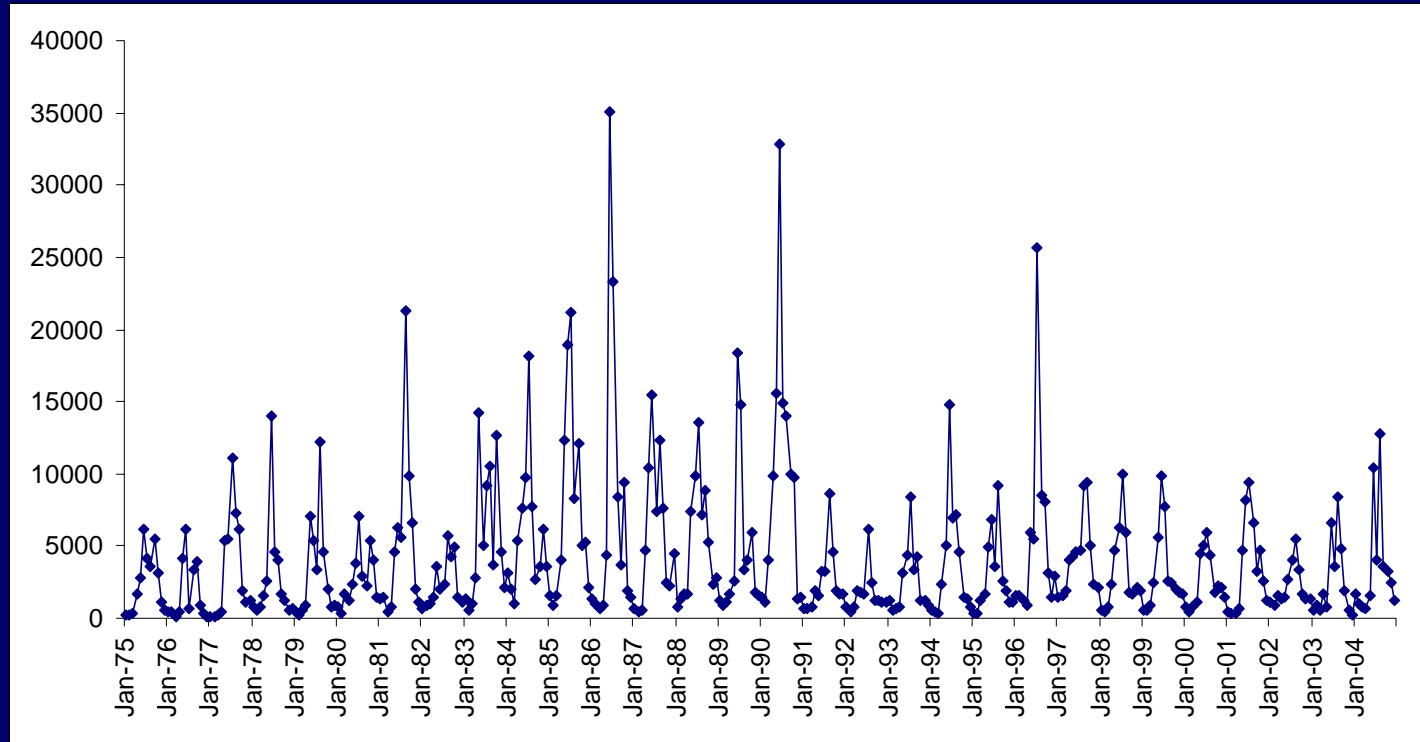
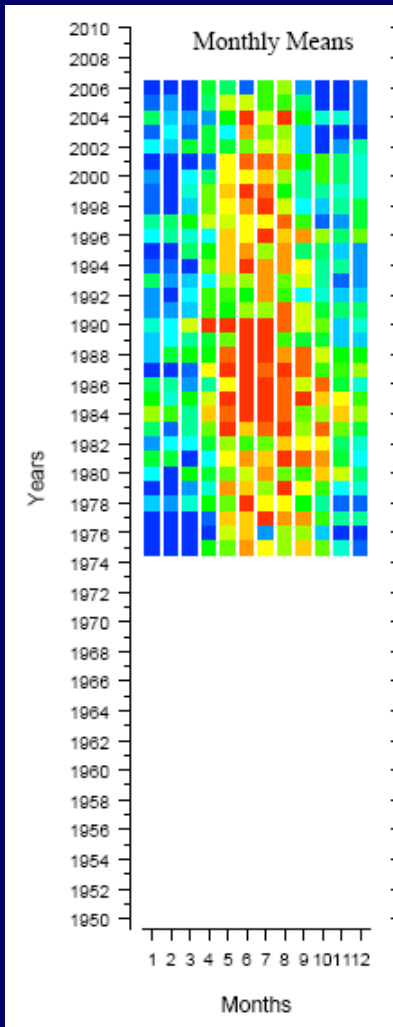
$$A_t = \log (B_t / \bar{B})$$

- For each year, calculate an annual anomaly as an average of all the monthly anomalies.

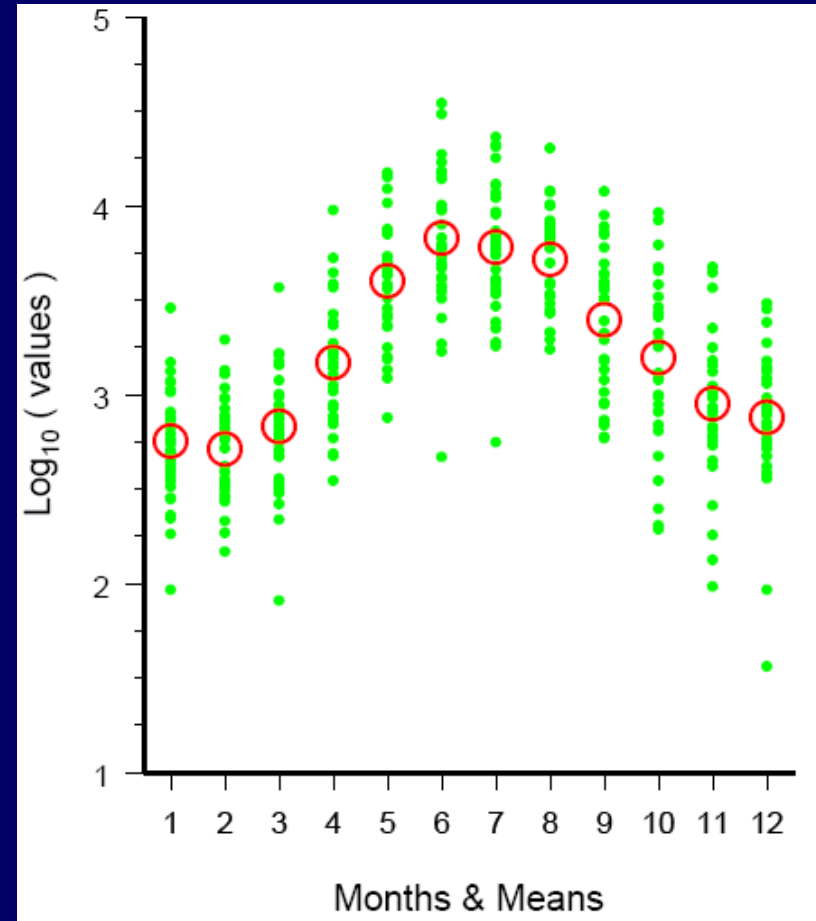
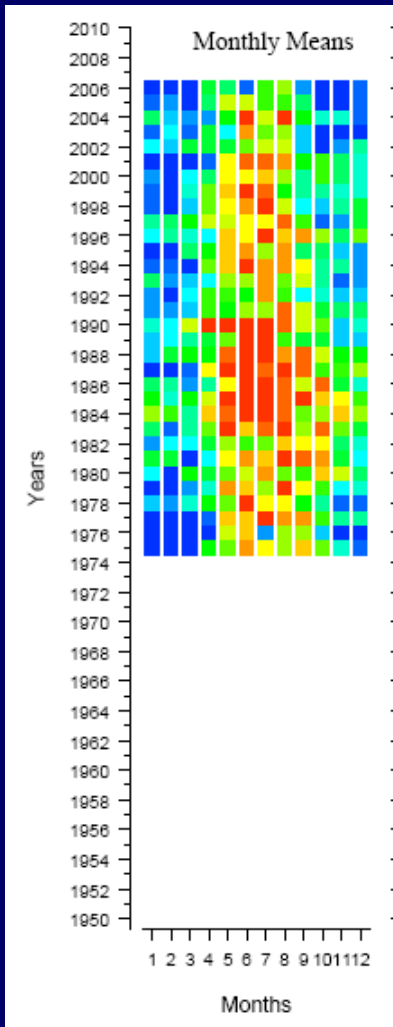
# The WG125 Methodology



# The WG125 Methodology

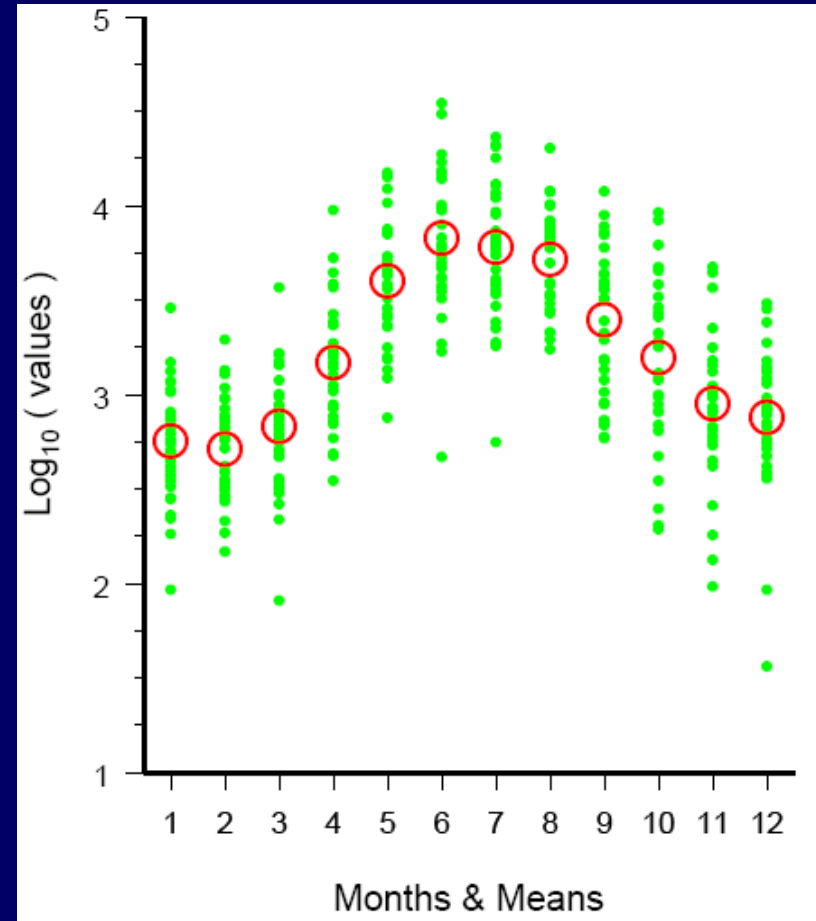
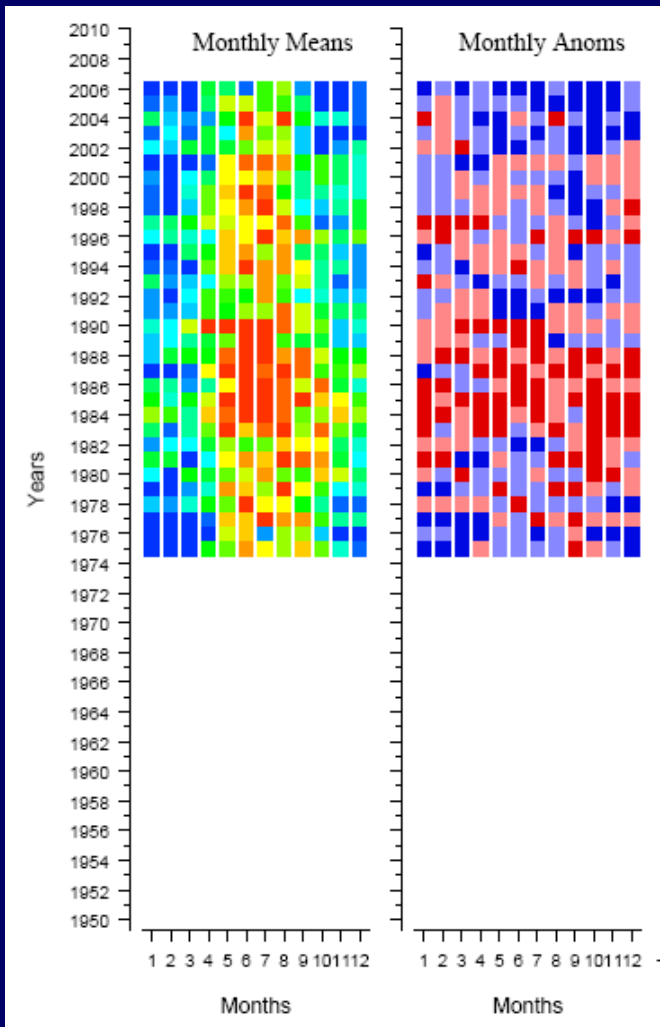


# The WG125 Methodology

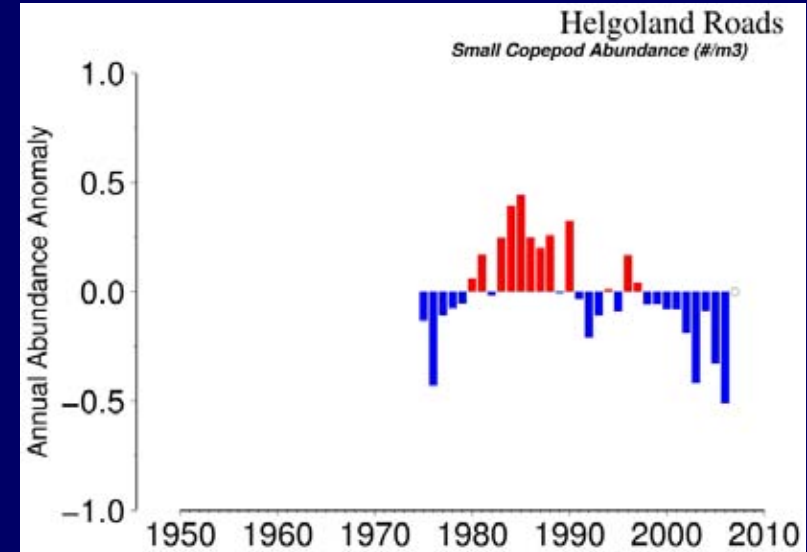
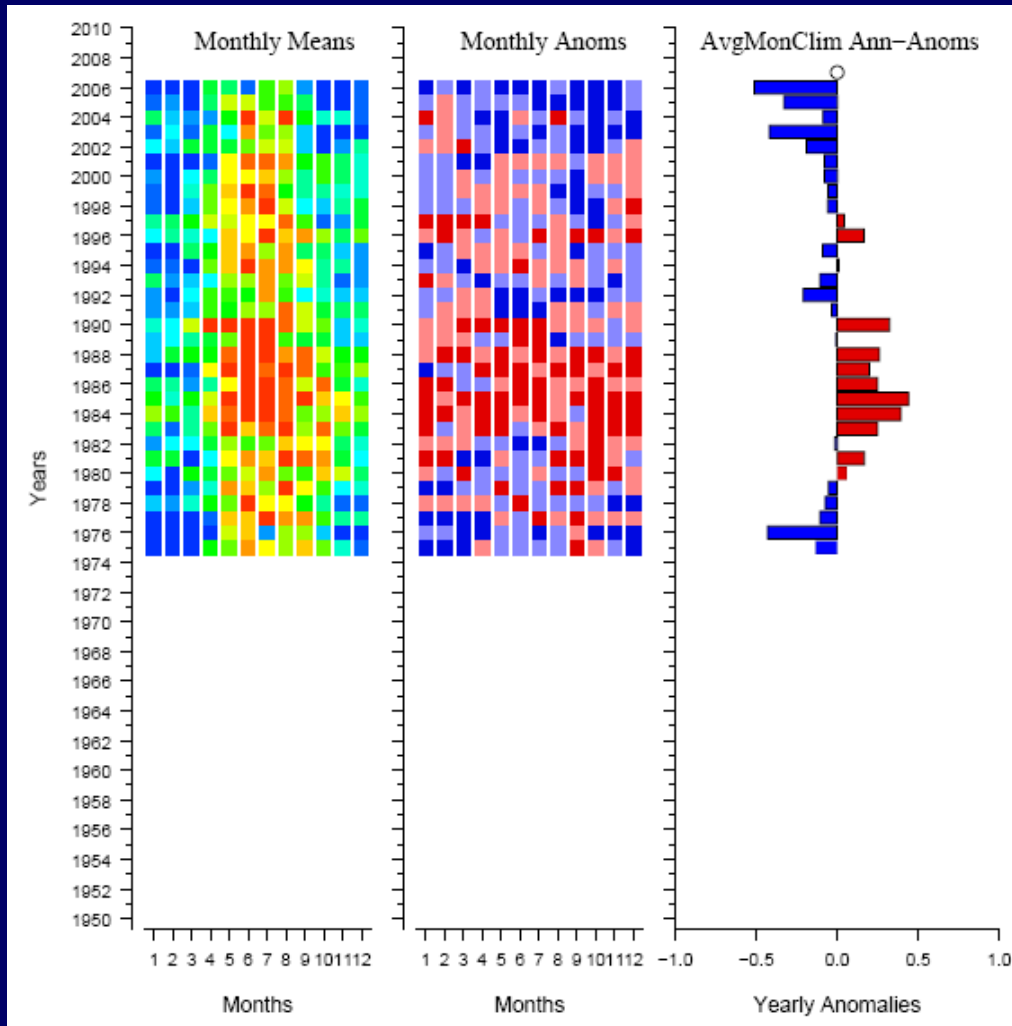




# The WG125 Methodology



# The WG125 Methodology



# The WG125 Methodology

This annual anomaly is a dimensionless ratio of relative change (*3x more, 2x less*) within a time series over time.

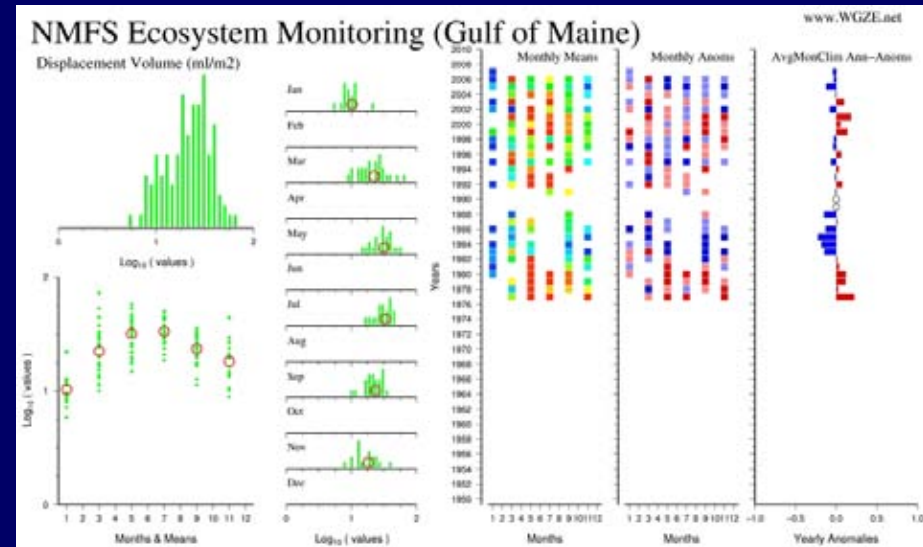
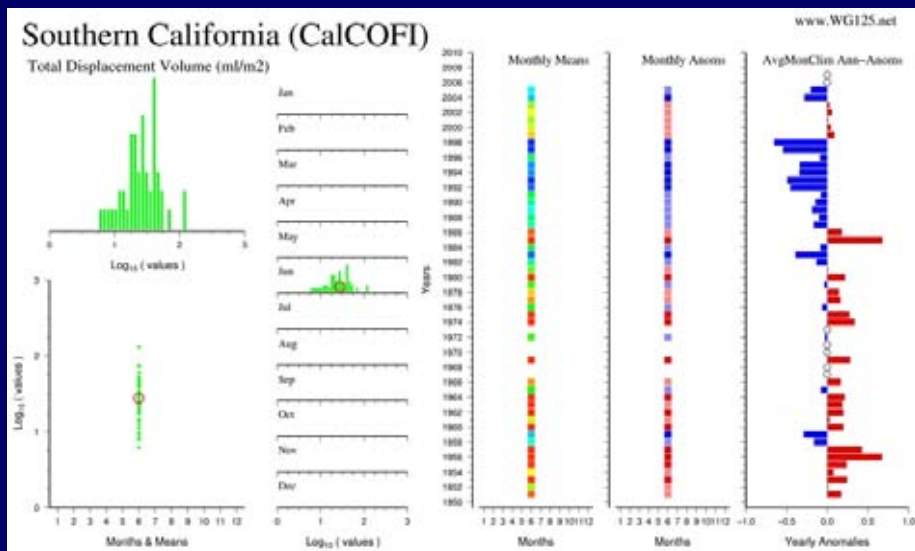
... and provides a basis for quantitative comparison between two different time series (*regardless of original unit or type\**).



This is the fine print that you should not be reading. If you can see this, PowerPoint is being incompatible between versions. This is the fine print that you should not be reading. If you can see this, PowerPoint is being incompatible between versions. This is the fine print that you should not be reading. If you can see this, PowerPoint is being incompatible between versions. This is the fine print that you should not be reading. If you can see this, PowerPoint is being incompatible between versions.

# The WG125 Methodology

This method also works with once-per-year, seasonal, and/or sporadic sampling.



# The WG125 Toolkit

# The WG125 Toolkit (*concept*)

- Use *free* software to provide *basic* visualization and comparison functions to curious users.
- More advanced kit analyses *unlikely*
  - others are already providing it (*and better?*)
  - requires careful consideration of the data being used
  - requires understanding of the statistical methods being applied\*

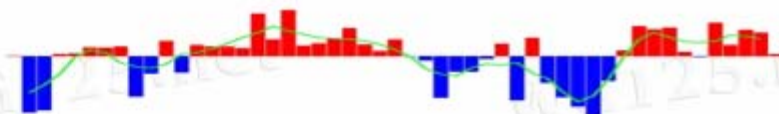
( \* At which point you probably own an \$800 program that does what you need anyway ... )

# Tools of the WG125 Toolkit

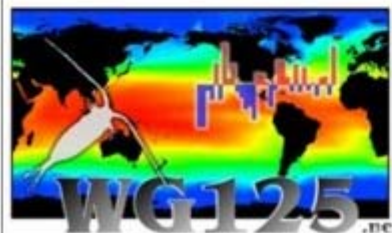
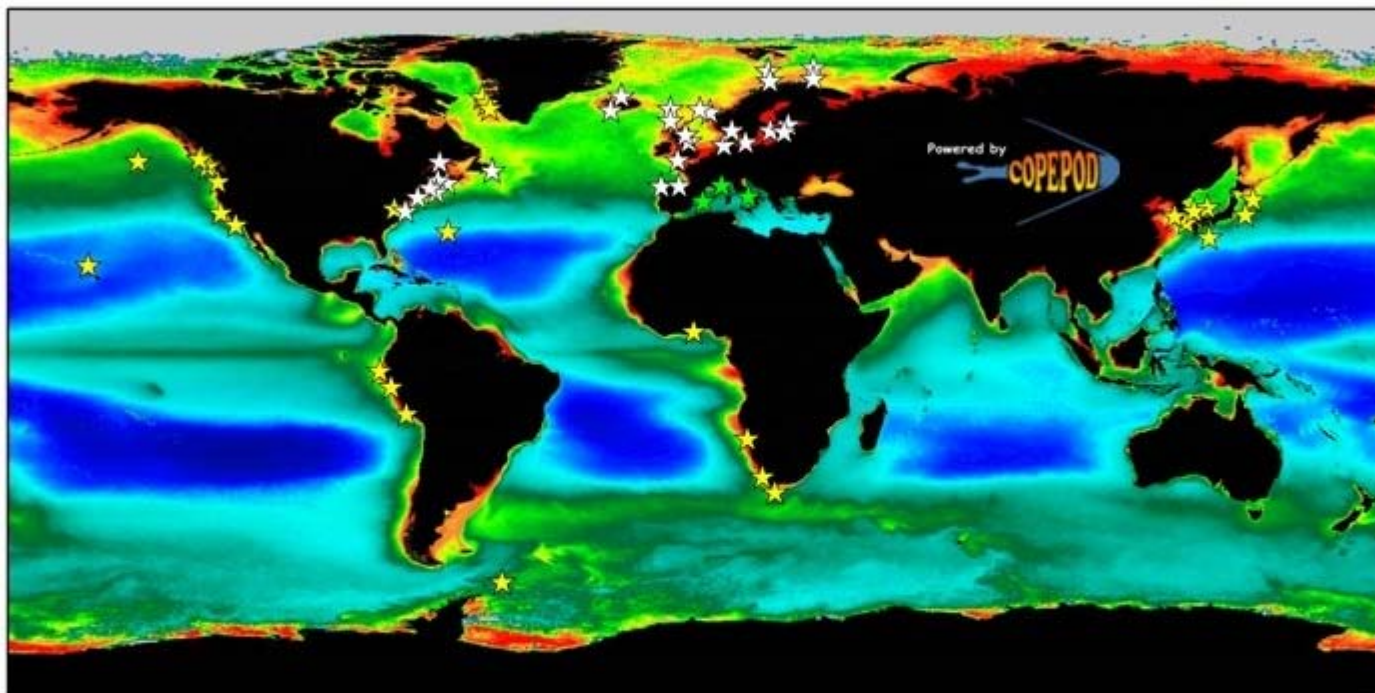
- Online Time Series Map & Information System
  - geographic “point and click” interface for all sites
  - each site has standard graphic and text summaries of the data
  - each site has contact information for requesting the data
- Data Preparation Tool
- One-site Visualization Tool
- Cross Comparison Tool
  - compare with other variables at same site
  - compare with other sites and/or variables

# SCOR WG125

"Global Comparisons of Zooplankton Time Series"



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The locations presented in this global map indicate zooplankton time series that are being used in the WG125 global comparison work. If you have or know of additional time series that could be included in this map, please contact us. The white stars in this map indicate time series associated with the separate ICES-WGZE ("Working Group on Zooplankton Ecology") North Atlantic zooplankton monitoring efforts, some of whose data are also included in this global study.

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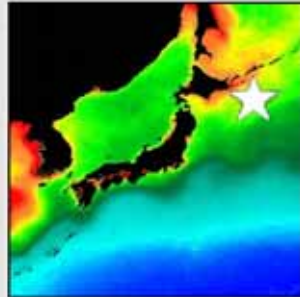


## SCOR WG125: Global Comparisons of Zooplankton Time-Series

### North Pacific

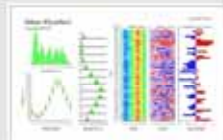
#### Japan (Oyashio Current)

About 20,000 zooplankton samples taken by various Japanese research institutions since 1949 were reassembled and the biomass was measured by Dr. K. Odate. The data and samples are known as the Odate Collection and maintained at the *Tohoku National Fisheries Research Institute (TNFRI)*. Sampling area covers Oyashio, Kuroshio and Transition zone, of which Oyashio is known for extensive spring bloom and high zooplankton biomass (Figure 2). The long-term climate-ecosystem change study, the Odate Project started in 2003 (project leader: Dr. Hiroya Sugisaki, TNFRI) based on this zooplankton collection. One of our major finding is a clear influence of the Pacific Decadal Oscillation on zooplankton biomass both in the Oyashio (Figure 3) and the Transition zone (Figure 4). We have especially focused on the functional and taxonomic breakdown of zooplankton community. Microscopic analysis has been done for the selected thousand samples by the end of 2005, and new study results will come out soon.



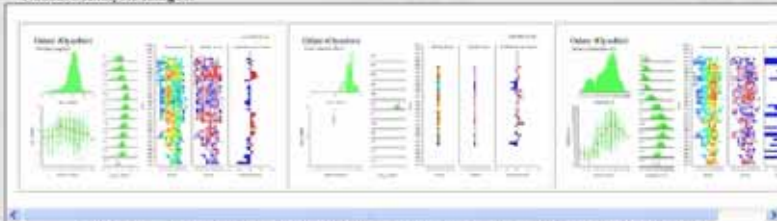
Contact-point: Sanae Chiba  
([chiba@jamstec.go.jp](mailto:chiba@jamstec.go.jp))  
Related-website:

[www.jamstec.go.jp/frcgc/eng/index.html](http://www.jamstec.go.jp/frcgc/eng/index.html)



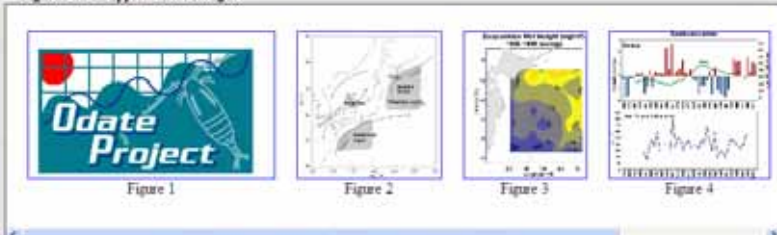
Reynolds-SST for this region (click image to zoom)

#### Standard Analysis Images:



Click on a thumbnail (above) for a full view of that image. A horizontal scrollbar indicates more images to the right.

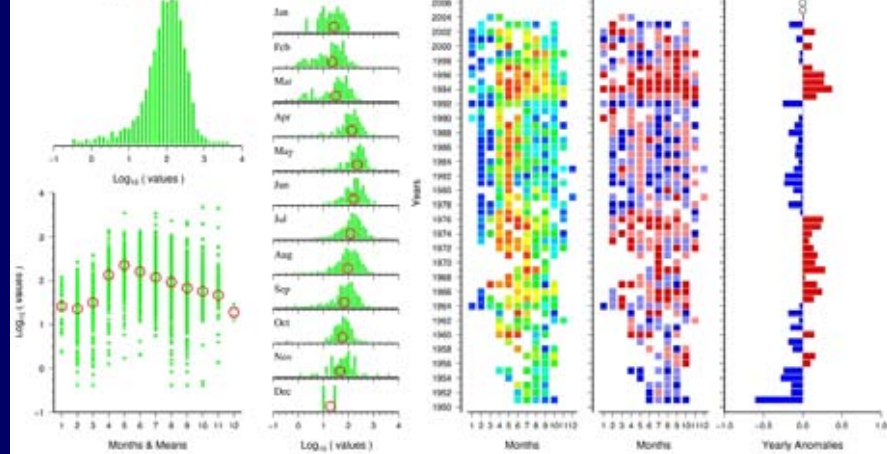
#### Figures and Supplemental Images:



Click on a thumbnail (above) for a full view of that image. A horizontal scrollbar indicates more images to the right.

#### Odate (Oyashio)

Wet Mass (mg/m<sup>3</sup>)

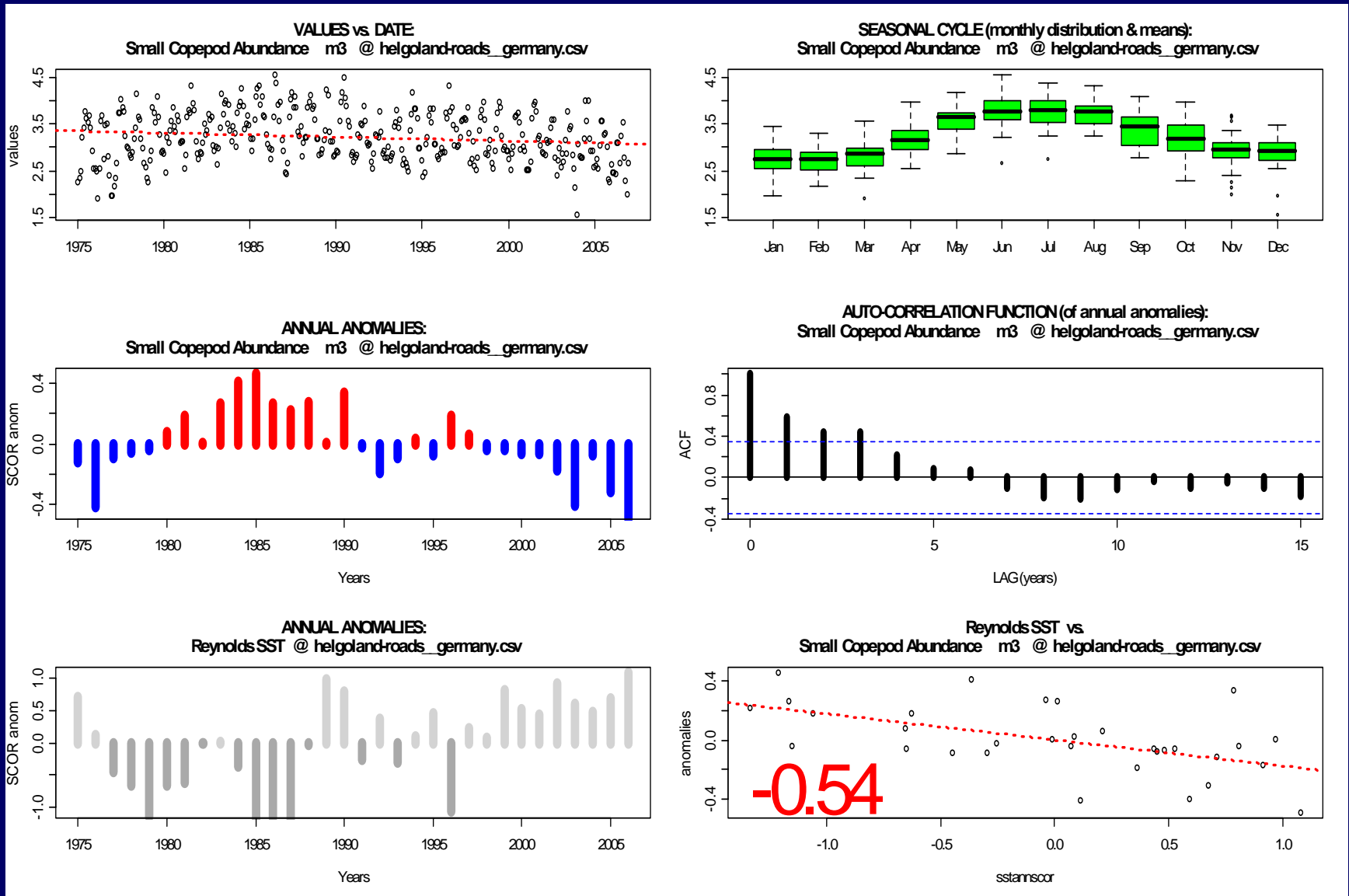


<http://wg125.net>

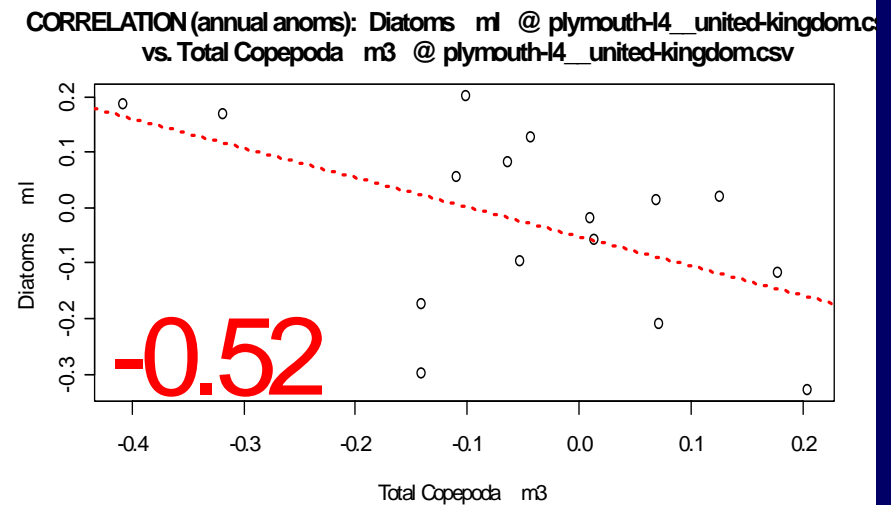
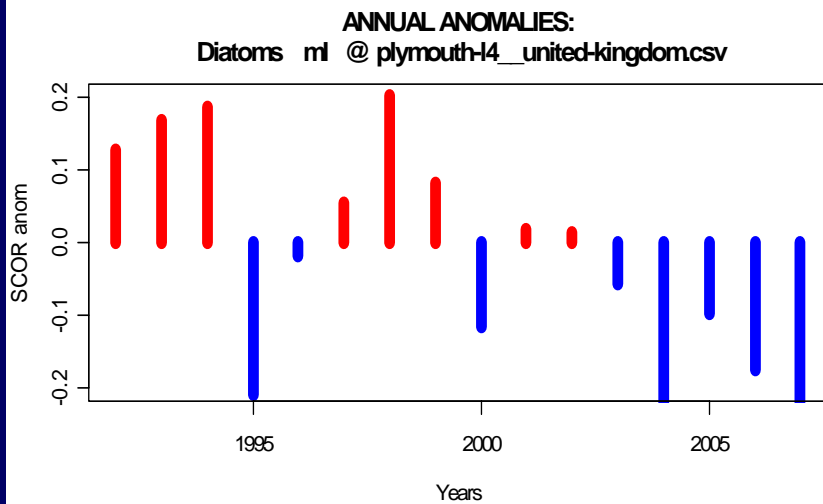
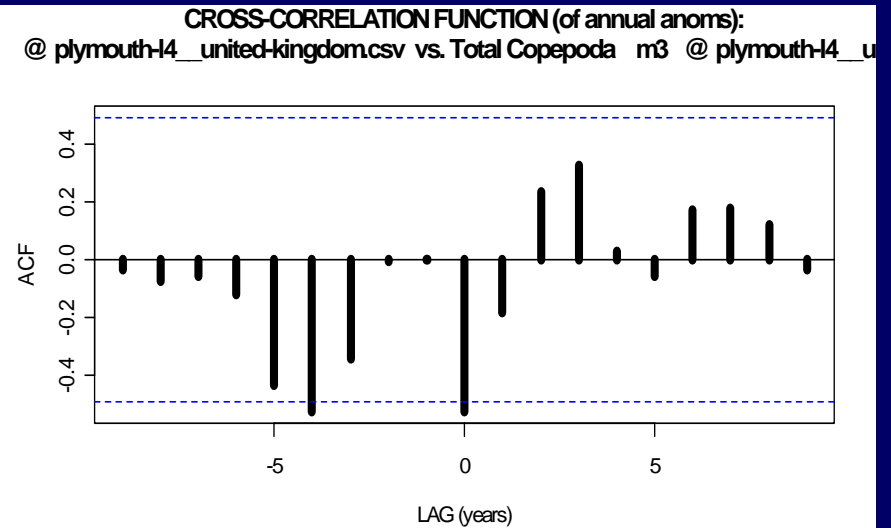
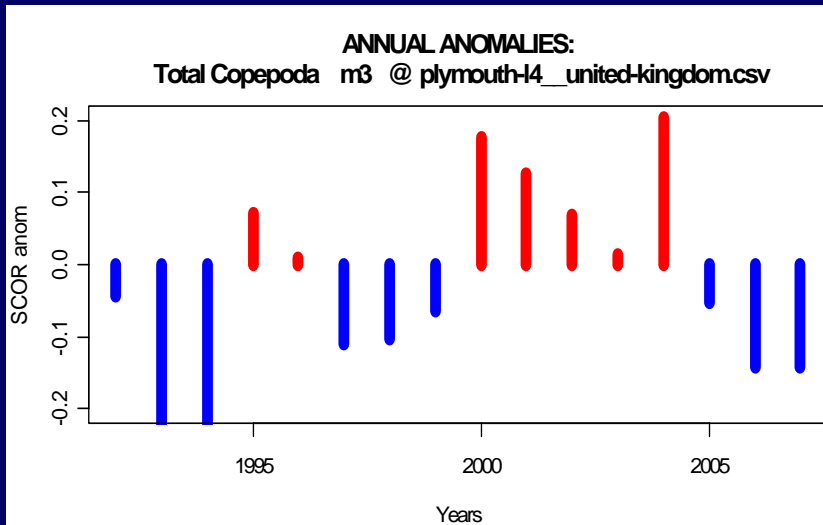
# Data Preparation Tool

- reformats date and data into a standard format
- calculates monthly means and anomalies
- time-synchronizes multiple variables within a time series (*to months*)
- month-by-month blank spacing for missing data

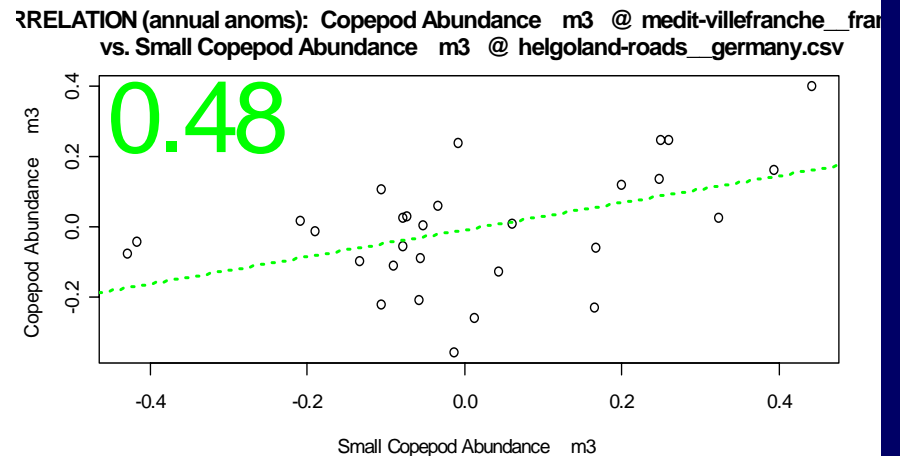
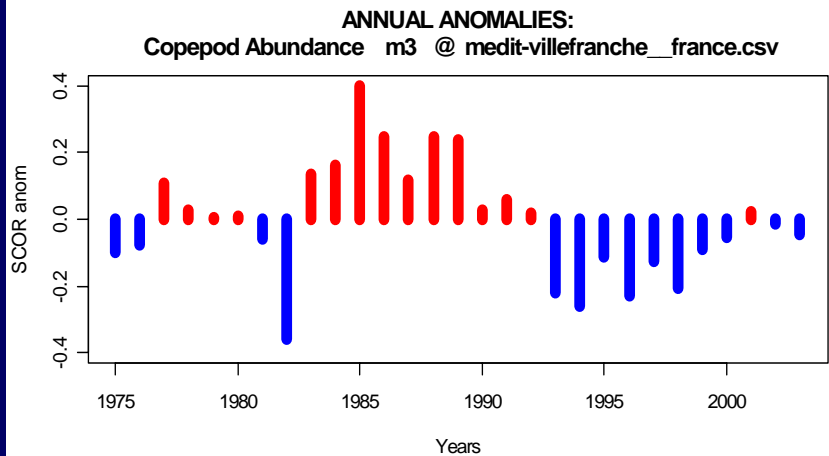
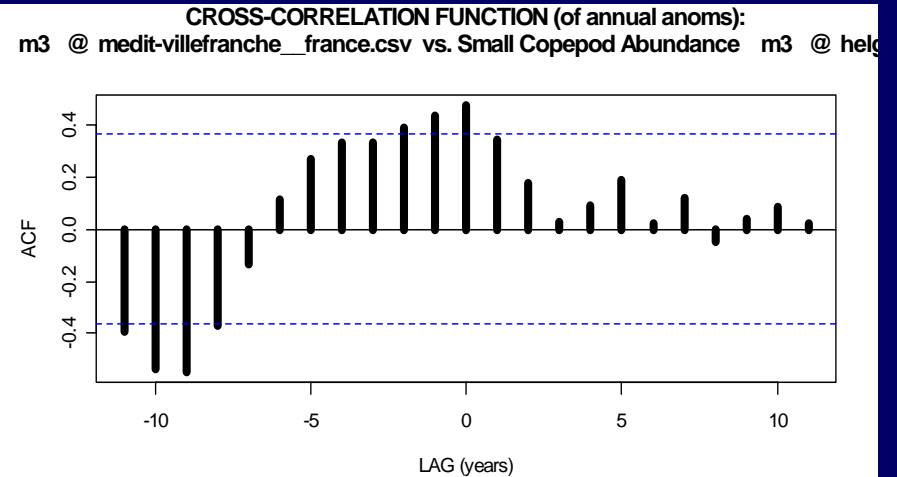
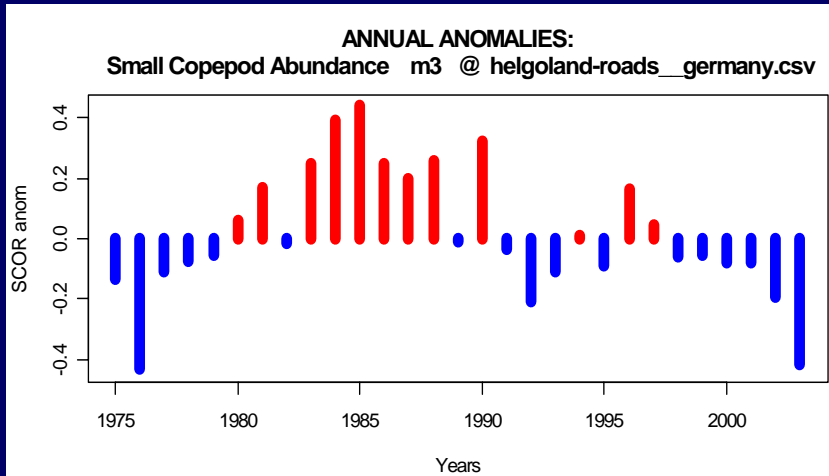
# One-Site Visualization Tool



# Cross Comparison Tool (*same site*)



# Cross Comparison tool (*two sites*)



And more toolkit features are  
coming soon ...

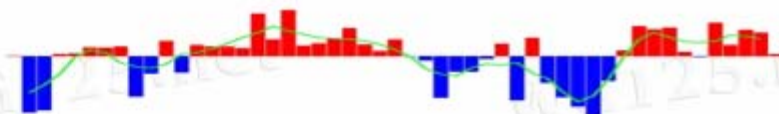
*A special thank you to all of the time series  
data contributors ...*

*... and an invitation to potential new data  
contributors for this global analysis.*

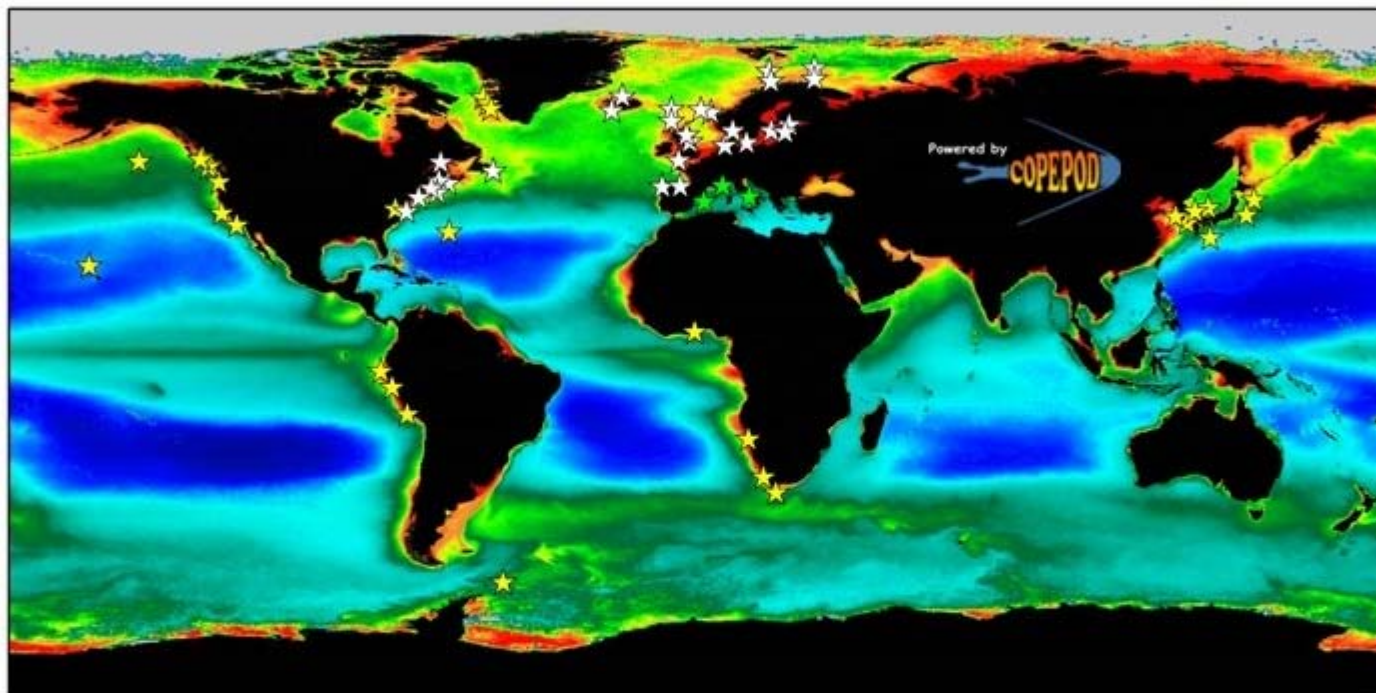
<http://wg125.net>

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