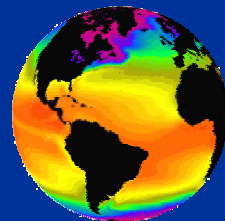


# SST Analysis By Temperature Class

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Jan 29-Feb 1, 2002  
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# Introduction

- 🌍 **Interests in annual-decadal SST trends and climatology development**
- 🌍 **New method of binning anomalies**
- 🌍 **Temperature classes based on mean SST**
- 🌍 **Comparisons to traditional binning schemes**



## Key Results

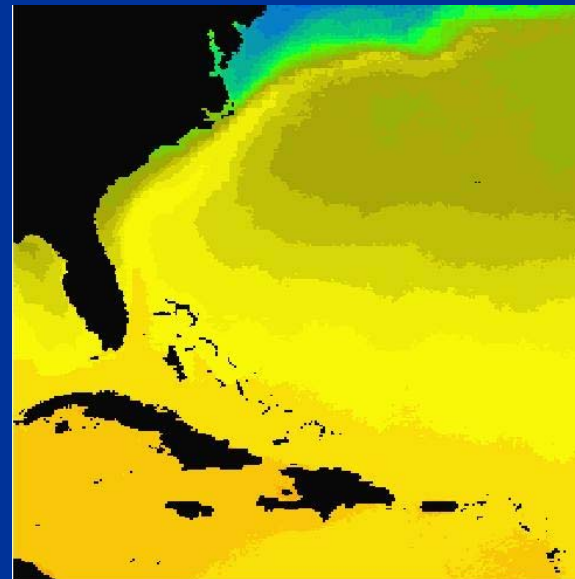
### **SST analysis by temperature class...**

- Provides new perspective for climatology testing and trend estimation
- Finds similar trends in recent years
- Extends trends further back in time
- Lowers error in data-sparse years

# Technique

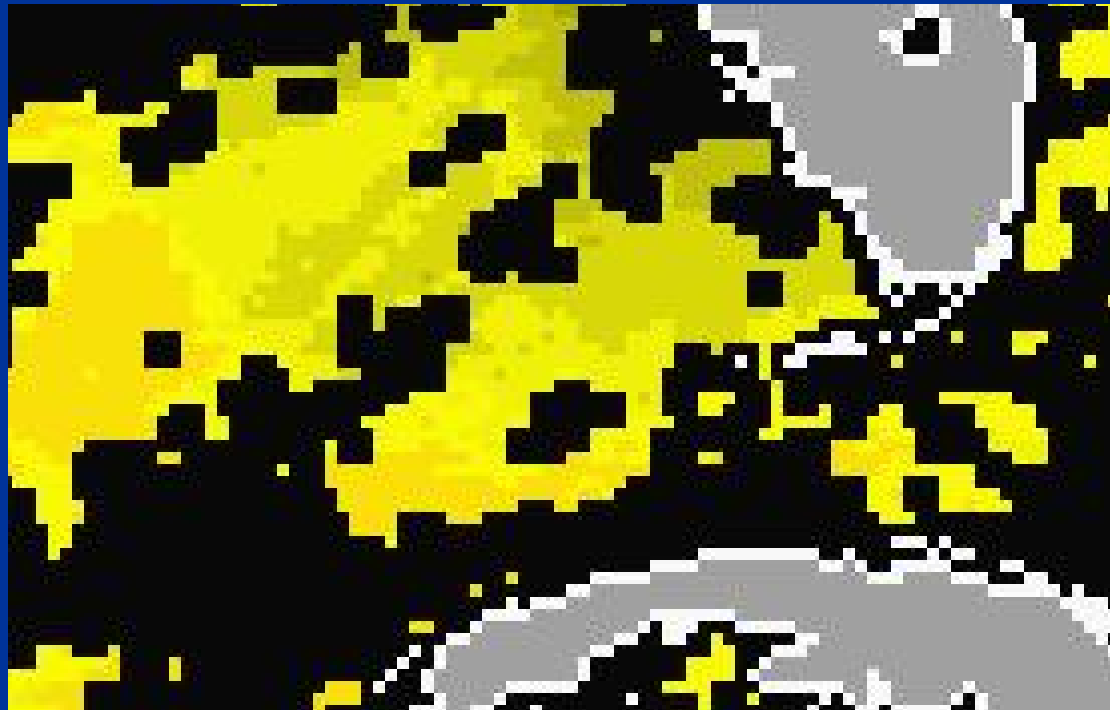
## Develop satellite-only climatology from AVHRR Pathfinder

- ✓ 9 km resolution
- ✓ Twice-daily fields from 1985
- ✓ Erosion filter



# Technique

## Erosion Filter:






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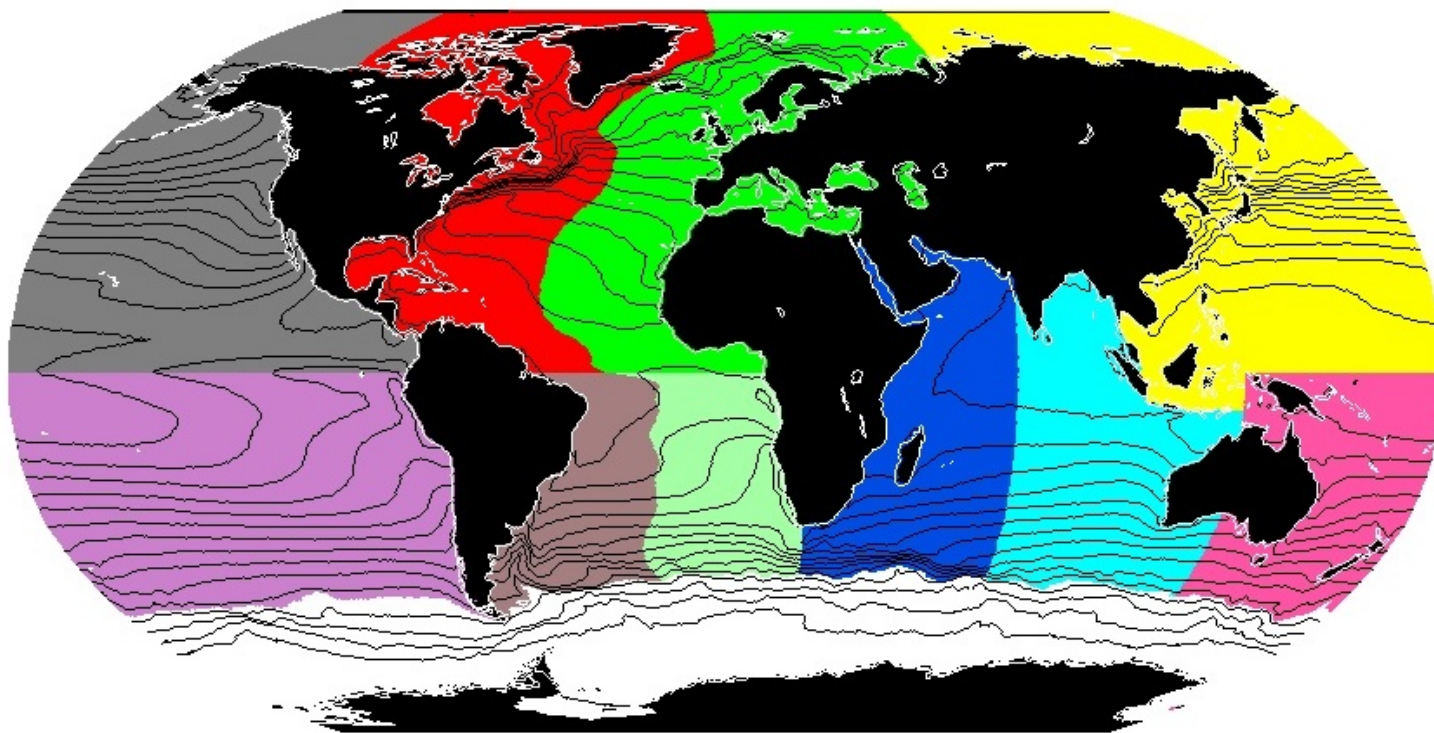
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# Technique

-  **Compute individual SST anomalies:**
  - COADS (~ 88 million, 1942-)
  - WOA94 (~ 4 million, 1900-)
  - Use Reynolds, GOSTA, GISST, WOA94, and Pathfinder climatologies
-  **Average into temperature class bins and 5-degree latitude-longitude bins**
-  **Apply to climatology testing and trends**

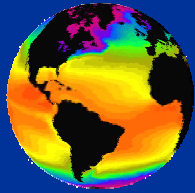
# Temperature Classes



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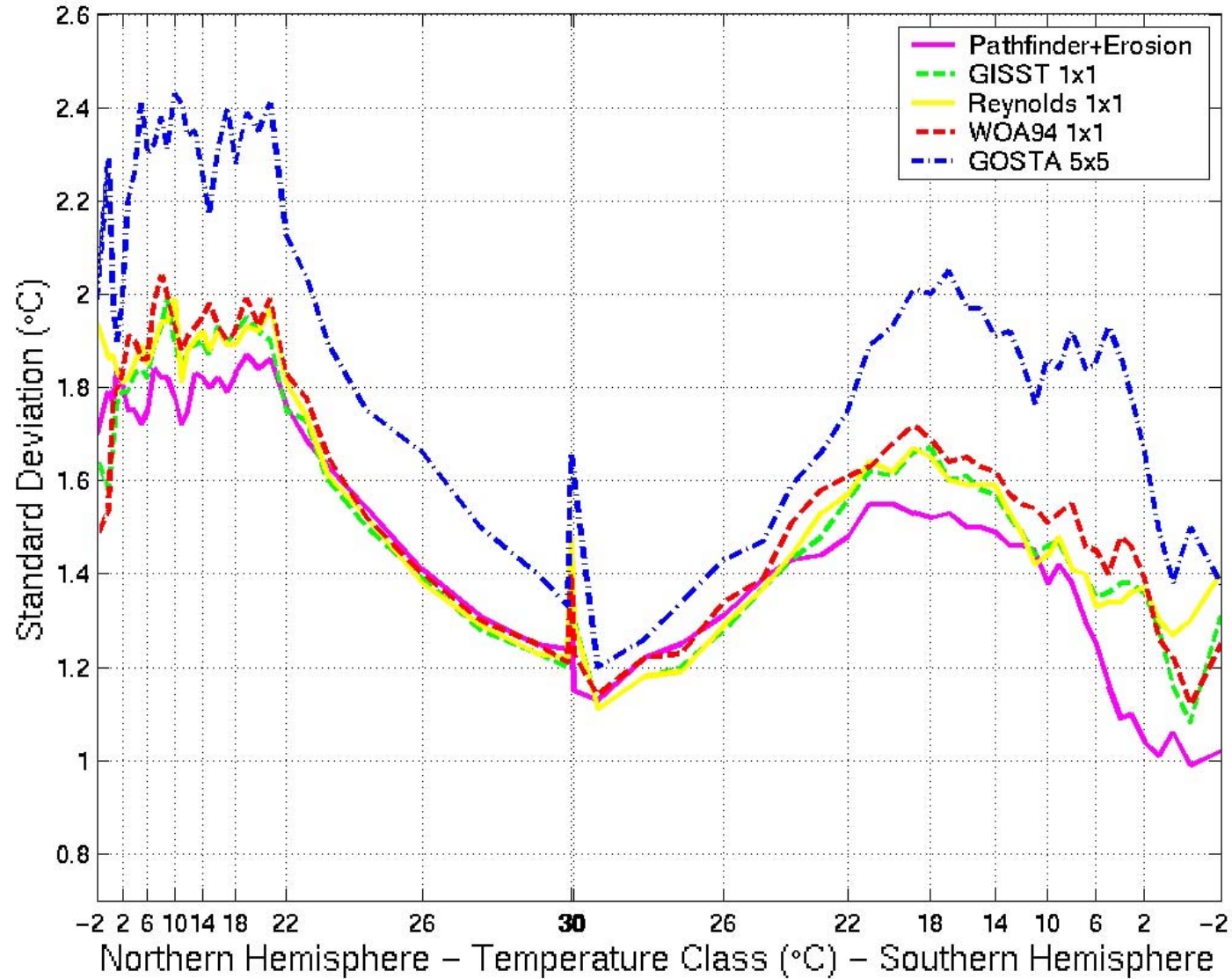
# Climatology Testing

- Create WOA94 and COADS anomalies from several different climatologies
- Bin by latitude band or temperature class
- Find climatology with lowest standard deviation of anomalies...

(Casey and Cornillon, 1999)



## COADS

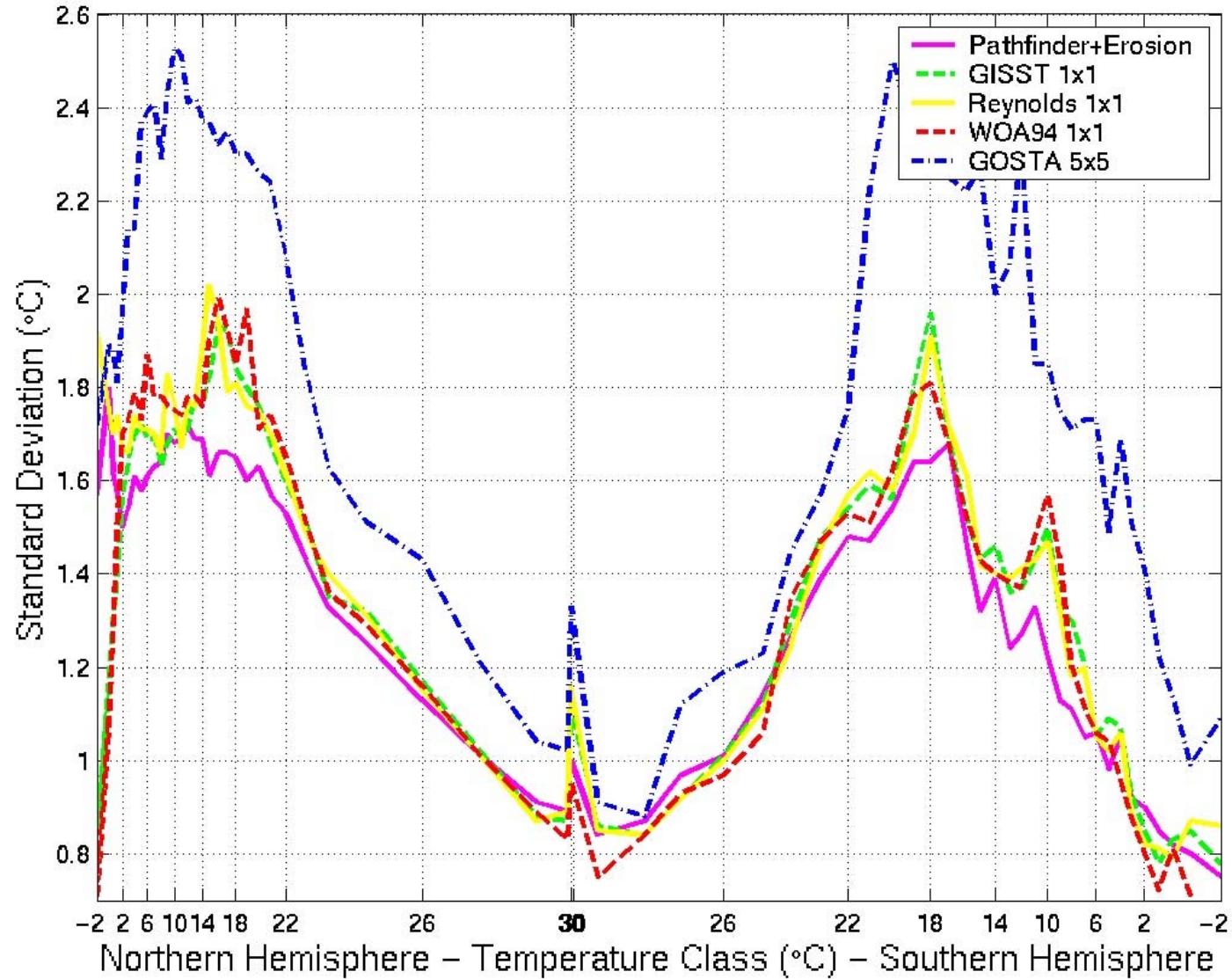


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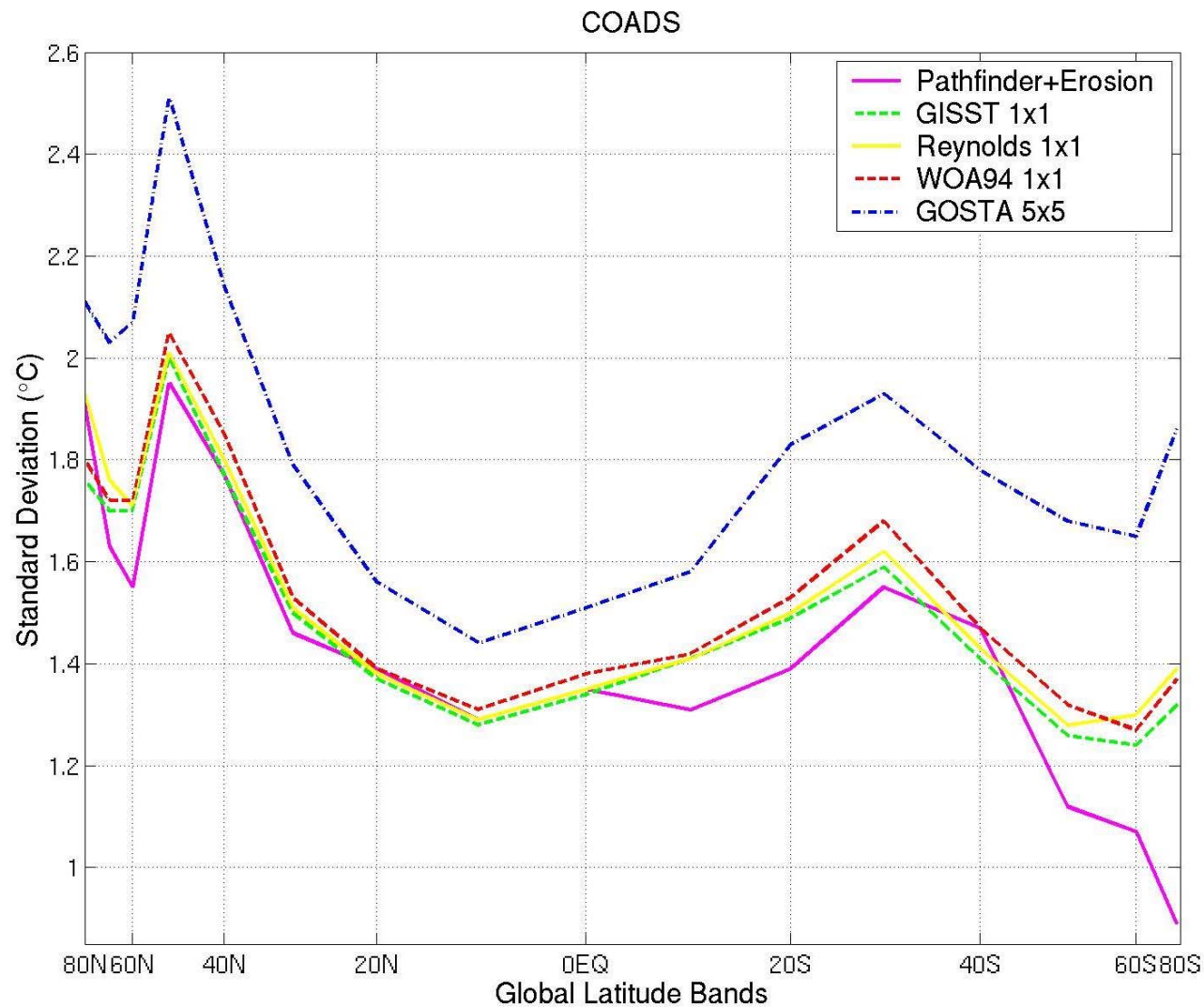
## WOA94



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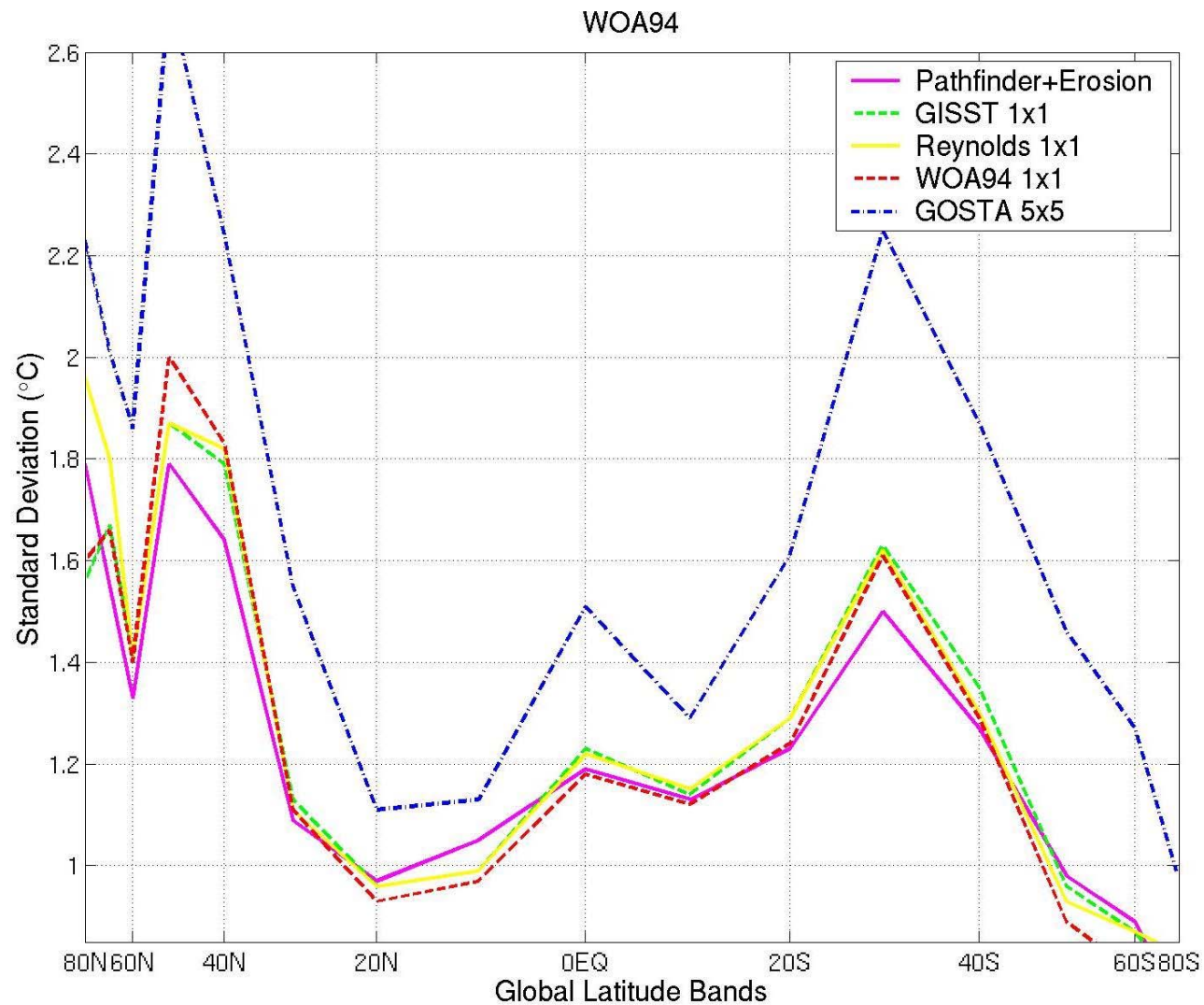




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# Trend Estimation

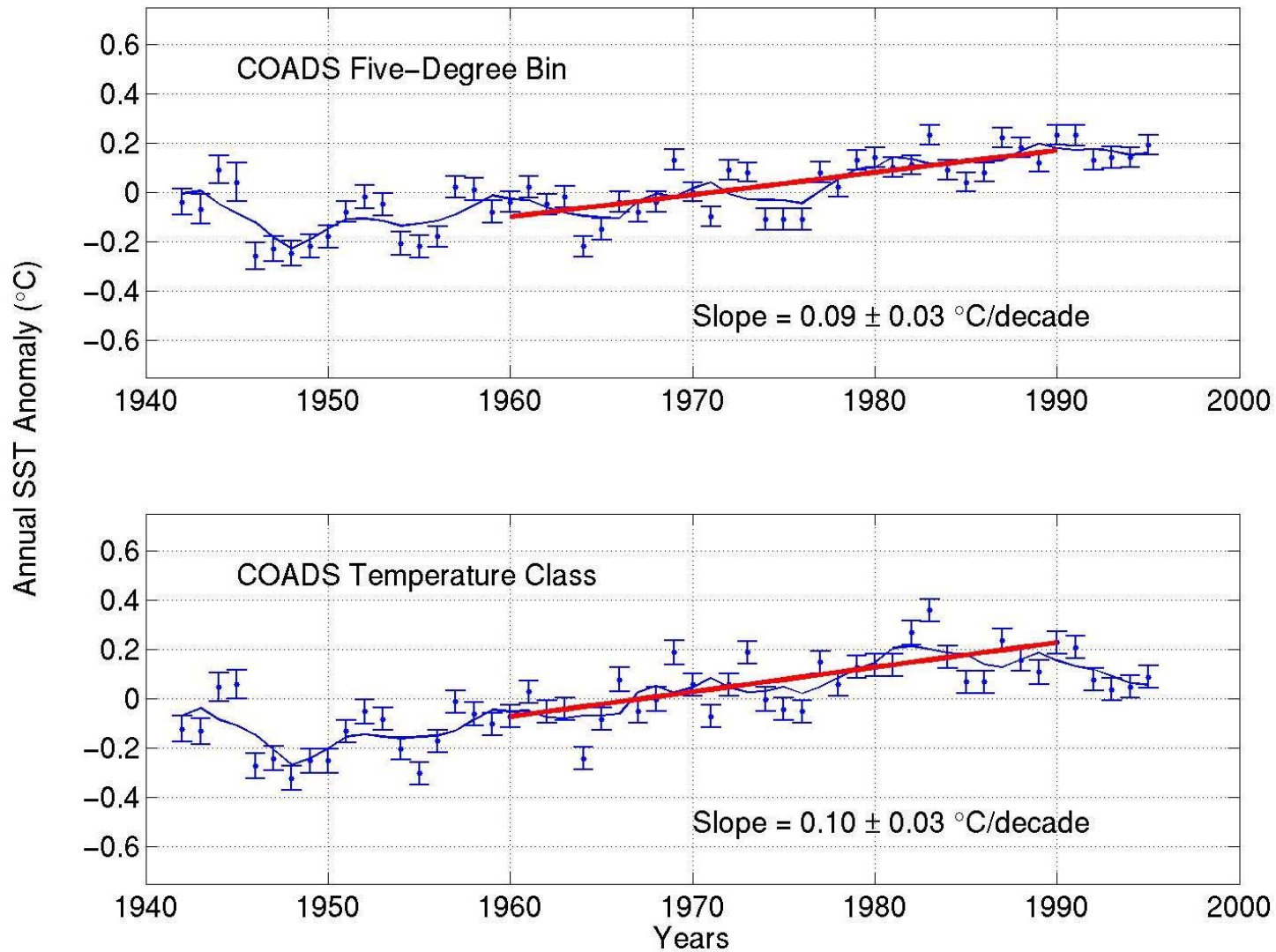
- Create WOA94 and COADS anomalies from AVHRR Pathfinder climatology
- Average into 5° bins or temperature class
- Calculate global and regional SST trends...



(Casey and Cornillon, 2001)



## Global Annual Anomalies and Trends

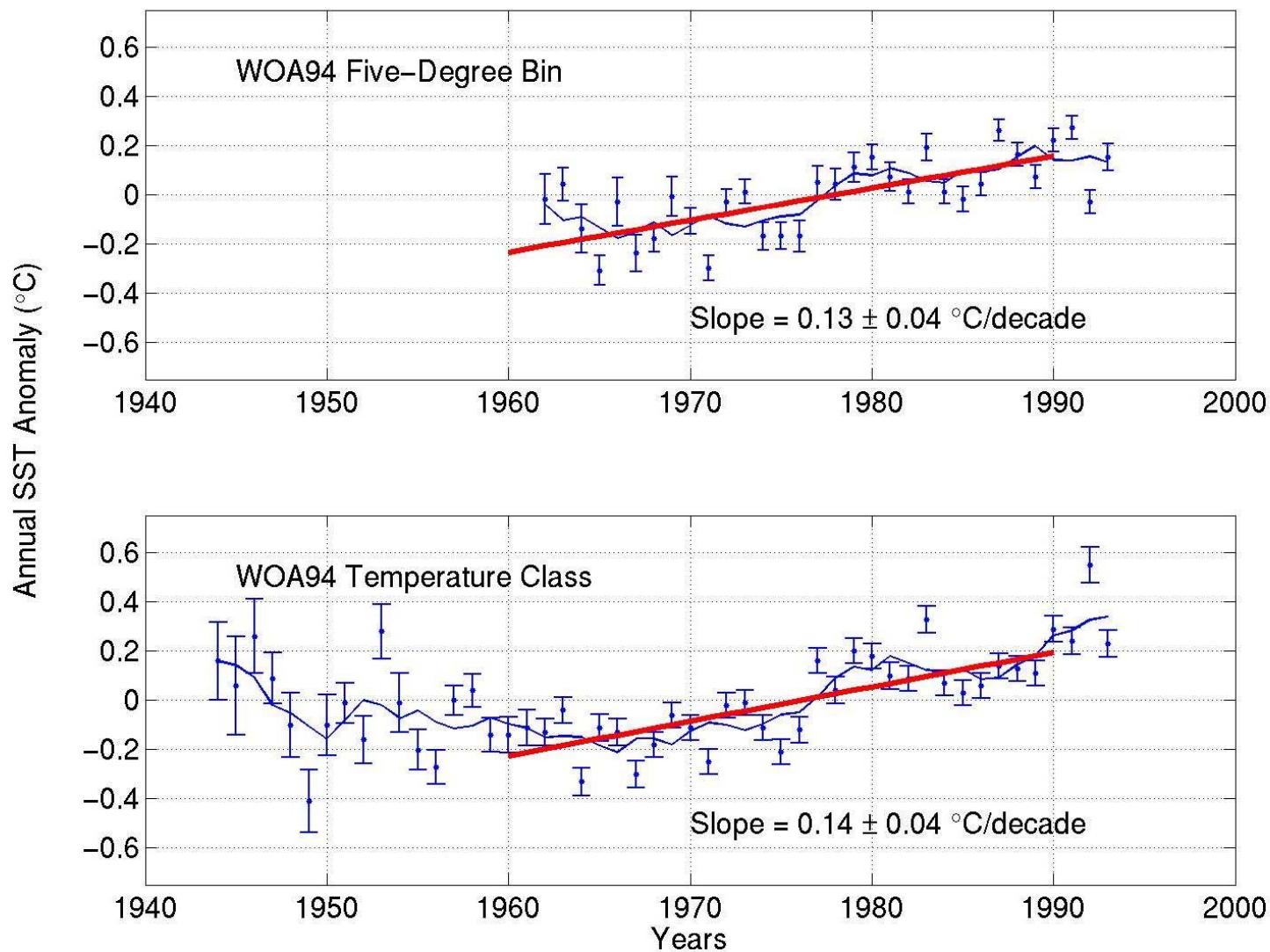


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## Global Annual Anomalies and Trends



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# Statistical Efficiency

- Measure relative ability of two averaging methods
- Compare mean variances and number of observations in monthly bins to achieve smallest standard error,  $\sigma^2/N$
- Efficiency parameter =  $\sigma_5^2 / \sigma_T^2$
- Determine needed  $N_T$  to achieve lower  $\sigma_T^2/N_T$  than  $\sigma_5^2/N_5$



# Statistical Efficiency

Dataset	$\frac{\sigma_5^2}{\sigma_T^2}$	$N_T/N_5$ needed	$N_T/N_5$ observed
COADS	0.67	1.49	4.73
WOA94	0.49	2.04	2.47
WOA94 clustered	0.52	1.92	2.22

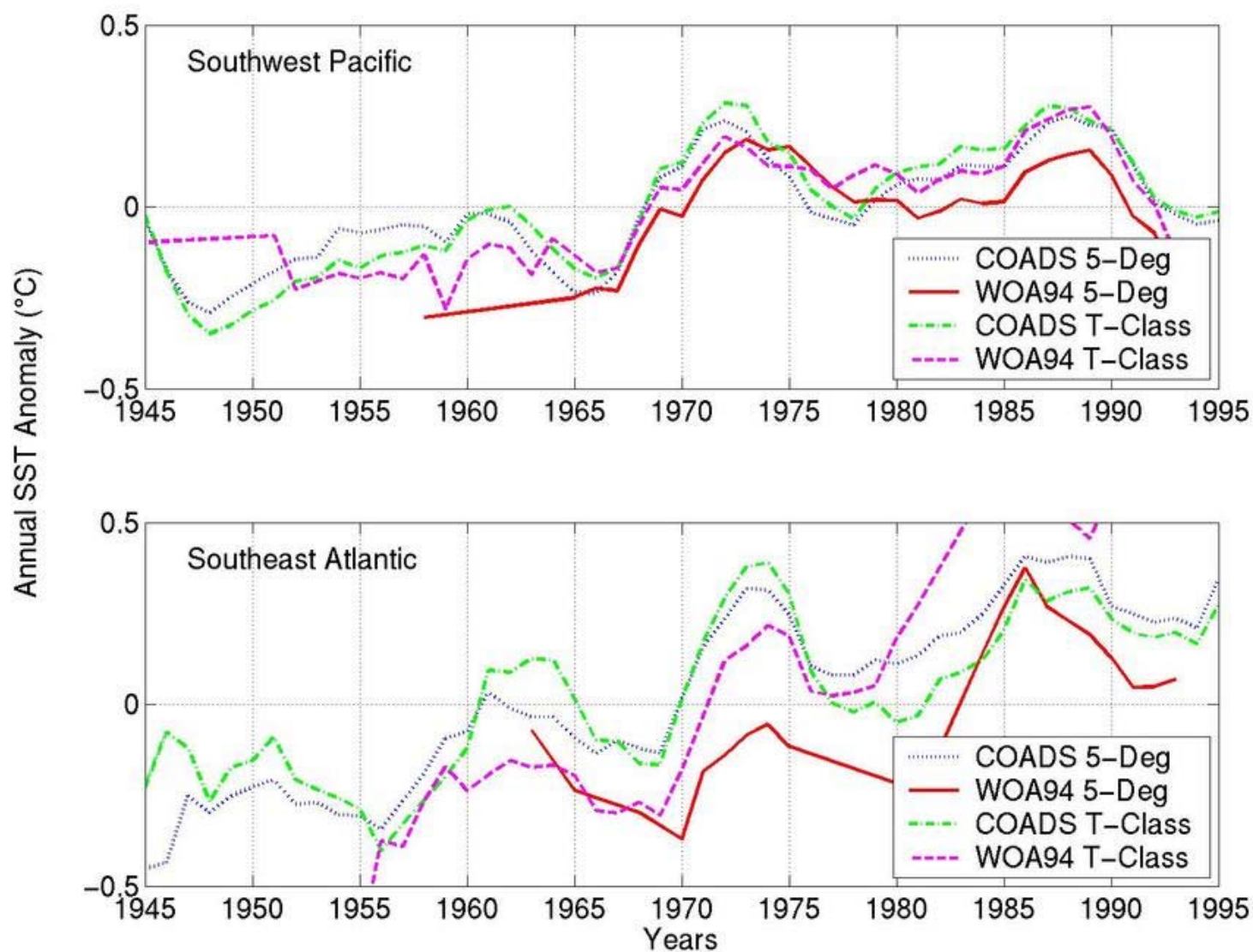
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# Regional SST Trends

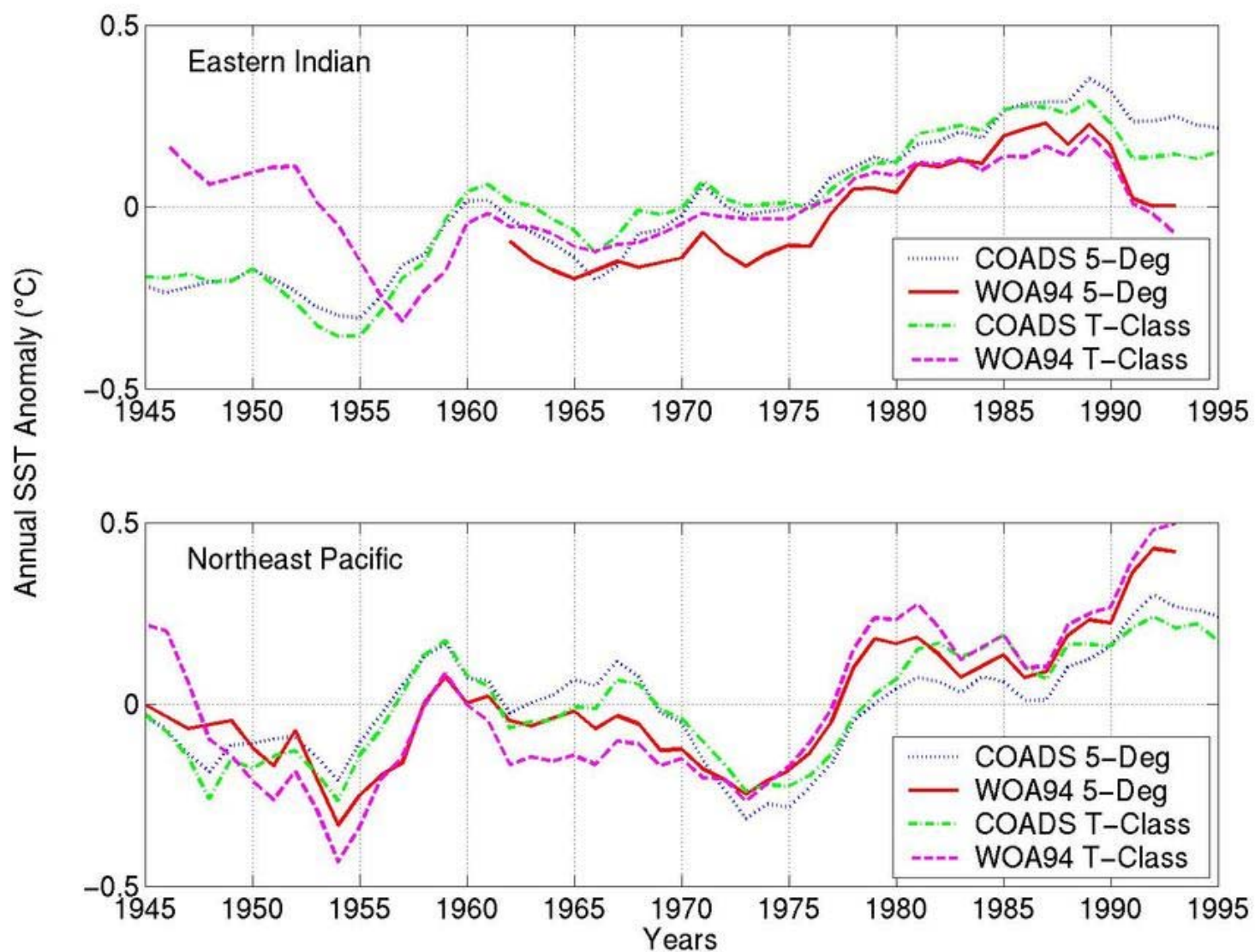
- 🌍 Determine annual anomalies in each temperature class or 5° bin
- 🌍 Average within regions
- 🌍 Calculate linear trends from 1960-1990
- 🌍 Plot and compare...



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



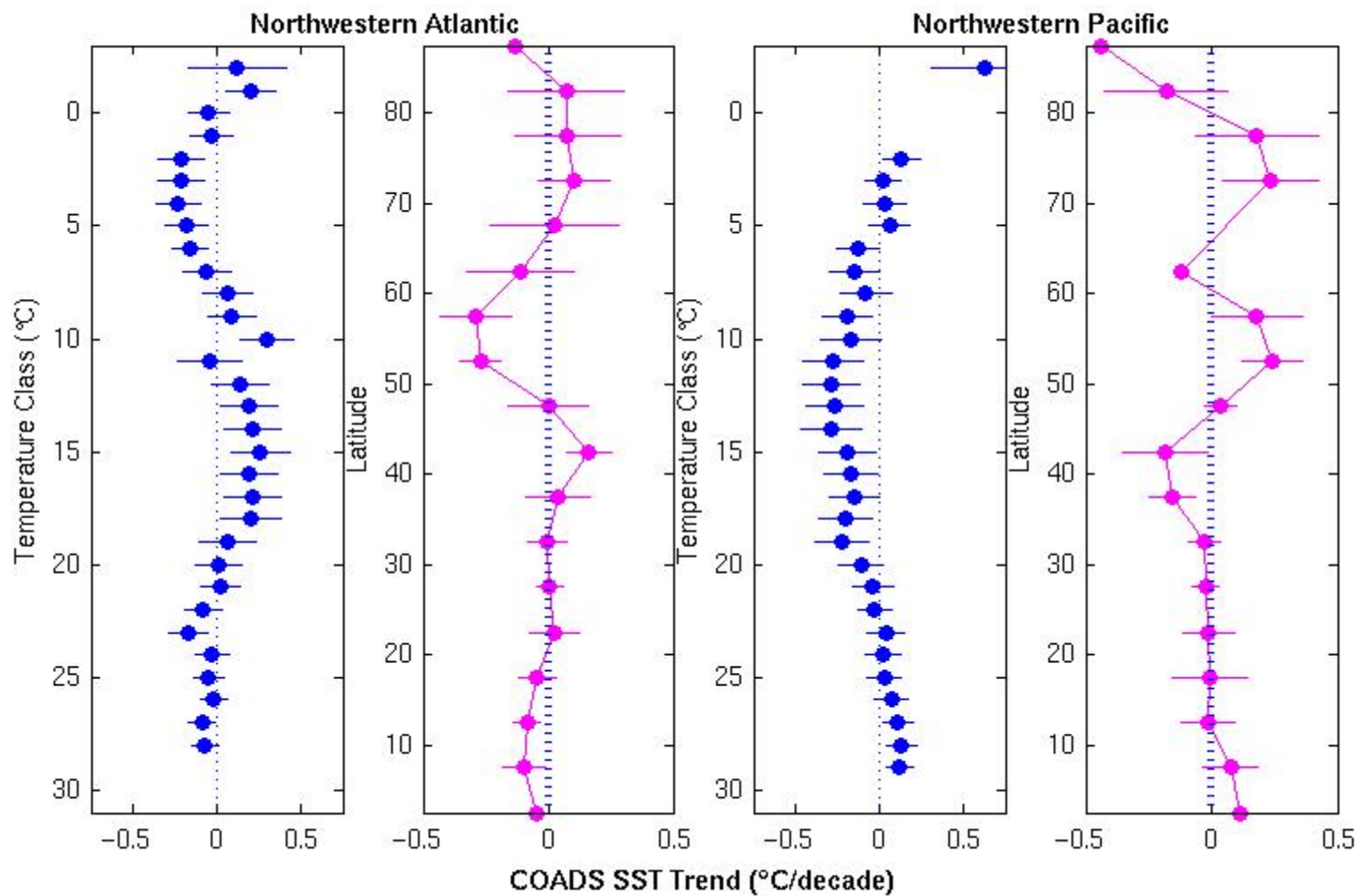
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# Subregional Trends

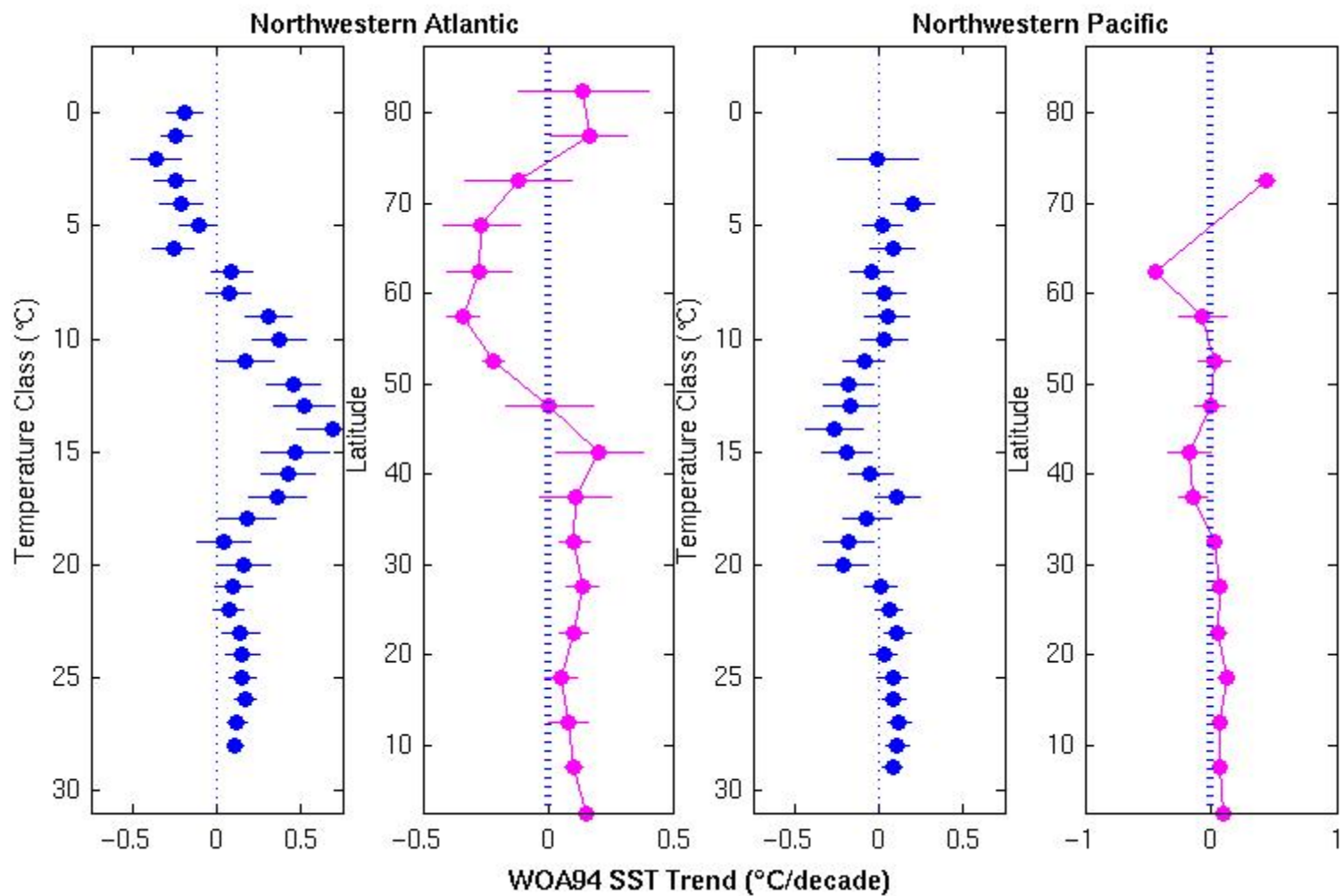
-  **Bin anomalies by temperature class and plot 1960-1990 linear trends**
-  **Compare with trends calculated from 5° bins averaged latitudinally**



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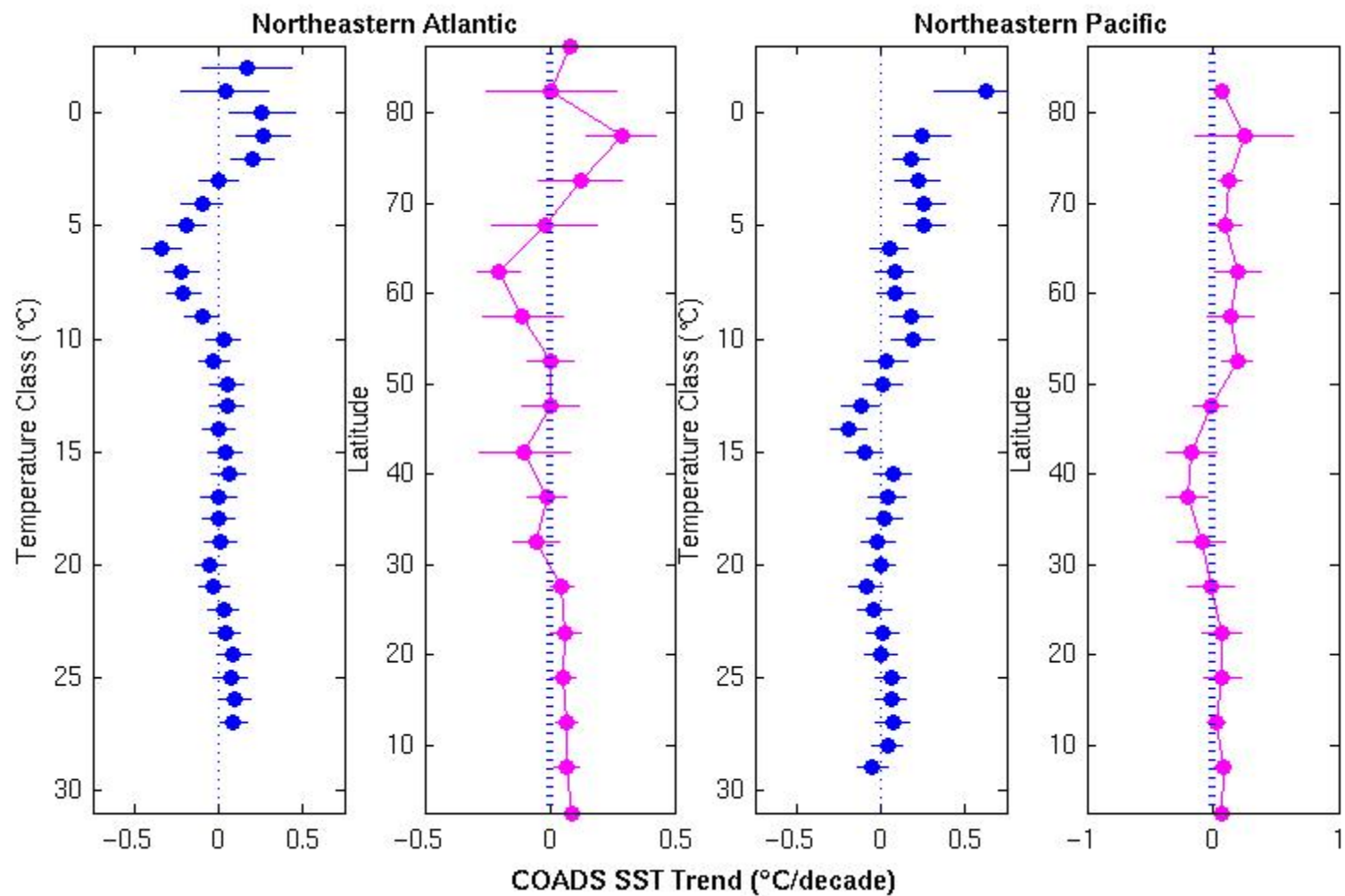


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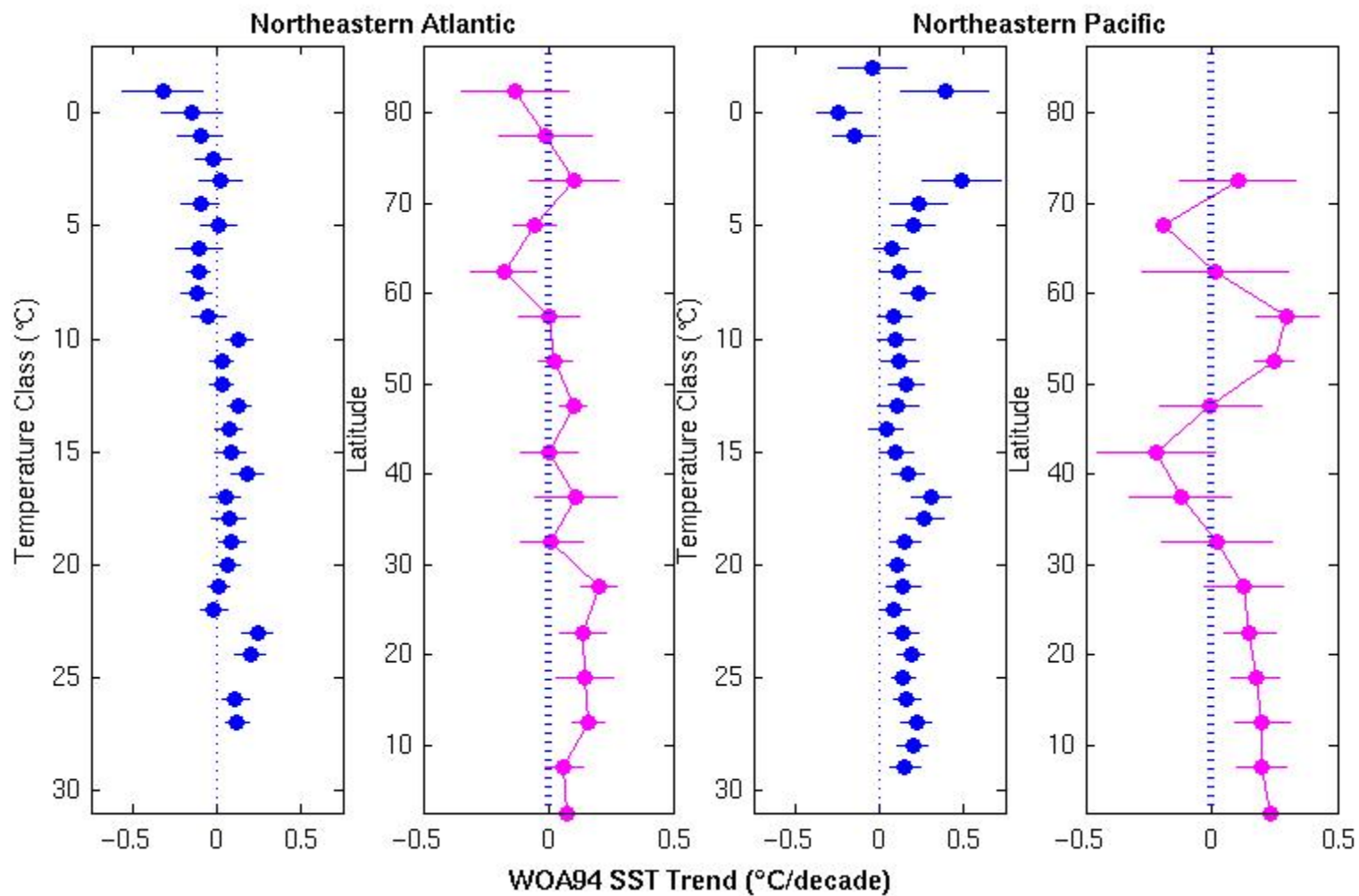


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# Temperature Class Summary

- AVHRR Pathfinder SST climatology
- New perspective for climatology testing and trend estimation
- Similar results in well-sampled years
- Trends extended further back in time
- Smaller error in data-sparse years

## For More Info...

- 🌍 Casey, K.S. and P. Cornillon (1999). A comparison of satellite and in situ based sea surface temperature climatologies, *Journal of Climate*, vol 12, no 6, pp. 1848-1863
- 🌍 Casey, K.S. and P. Cornillon (2001). Global and regional sea surface temperature trends, *Journal of Climate*, vol 14, no 18, pp. 3801-3818.
- 🌍 PPT presentation and PDF and PS versions at:  
<http://intra.nodc.noaa.gov/Information/kcasey>