

# **Determination of the South China Sea Surface Height Variability Using TOPEX/POSEIDON data**

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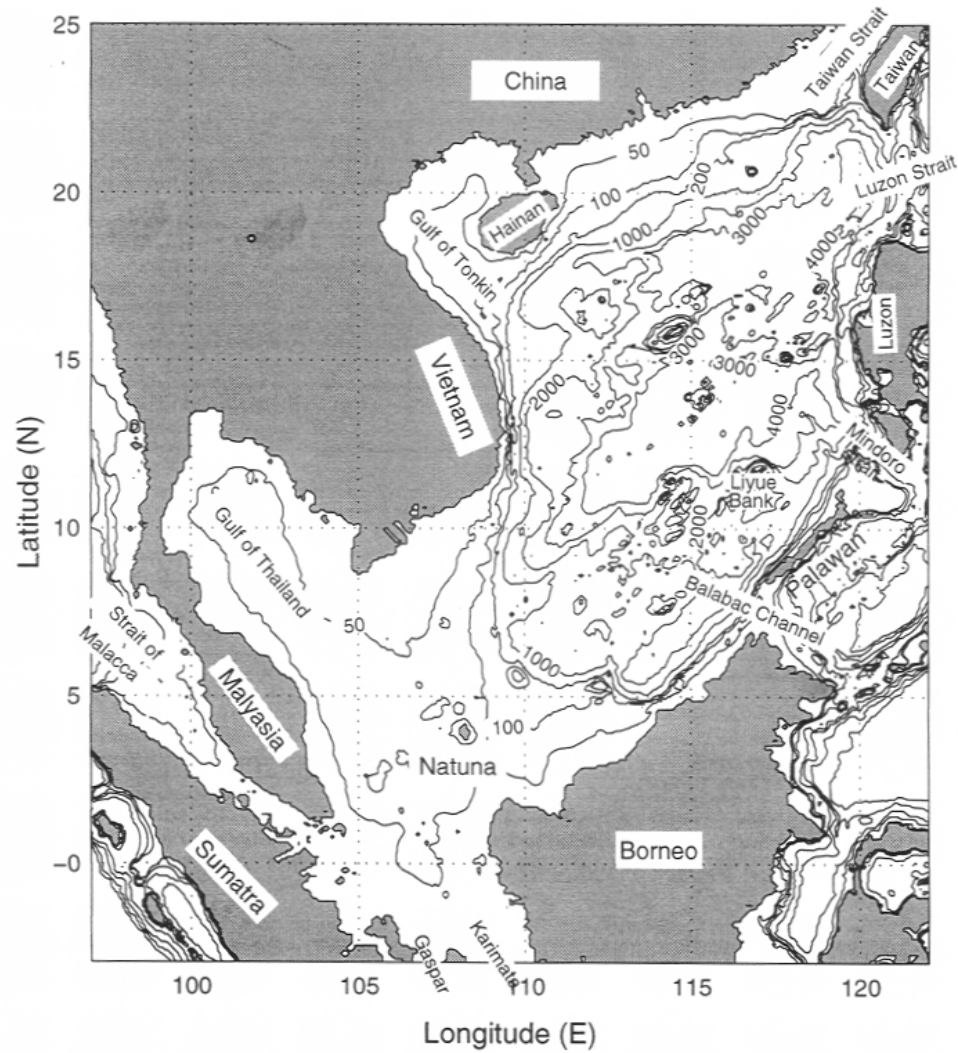
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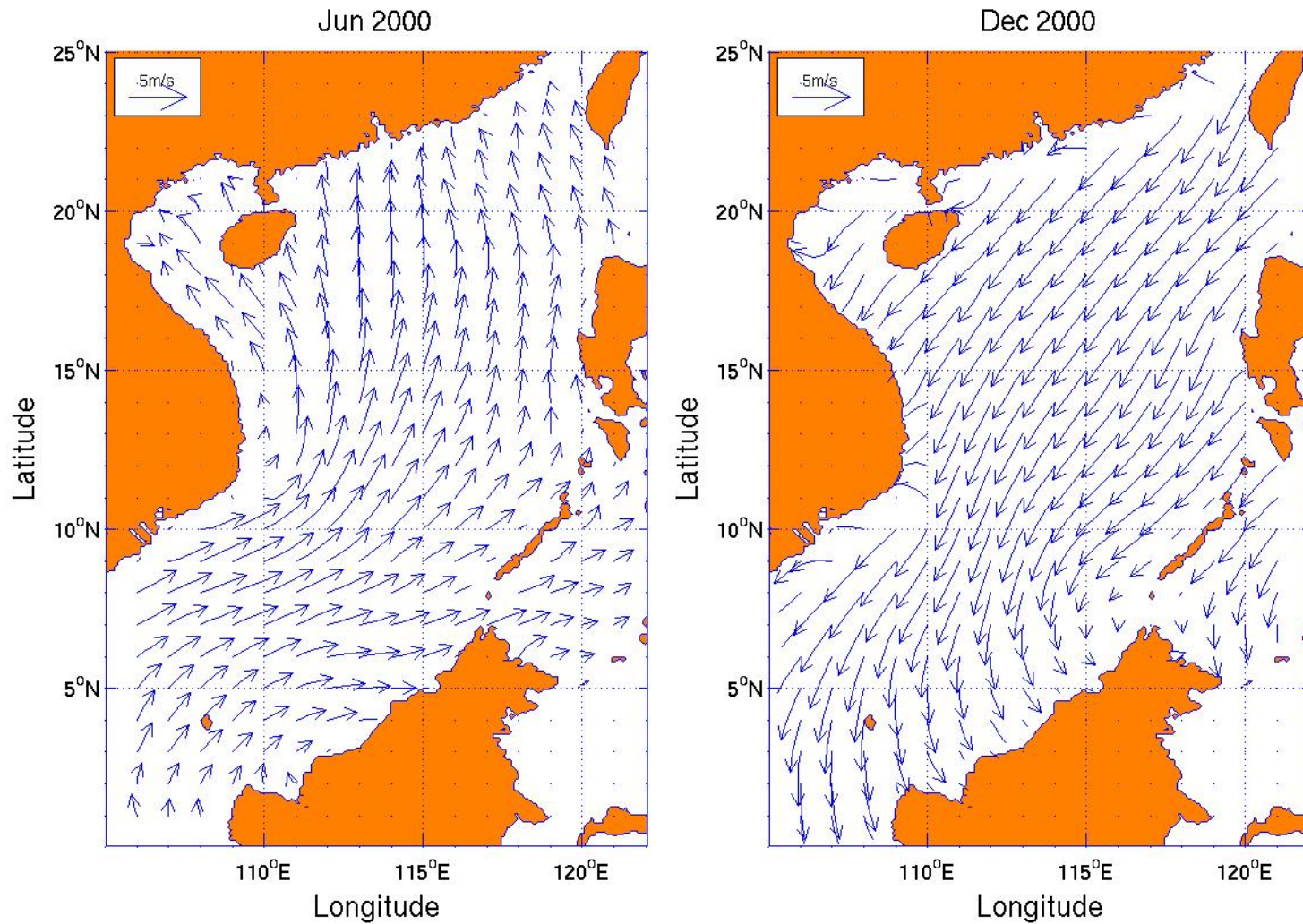
Website: [www.oc.nps.navy.mil/~chu](http://www.oc.nps.navy.mil/~chu)

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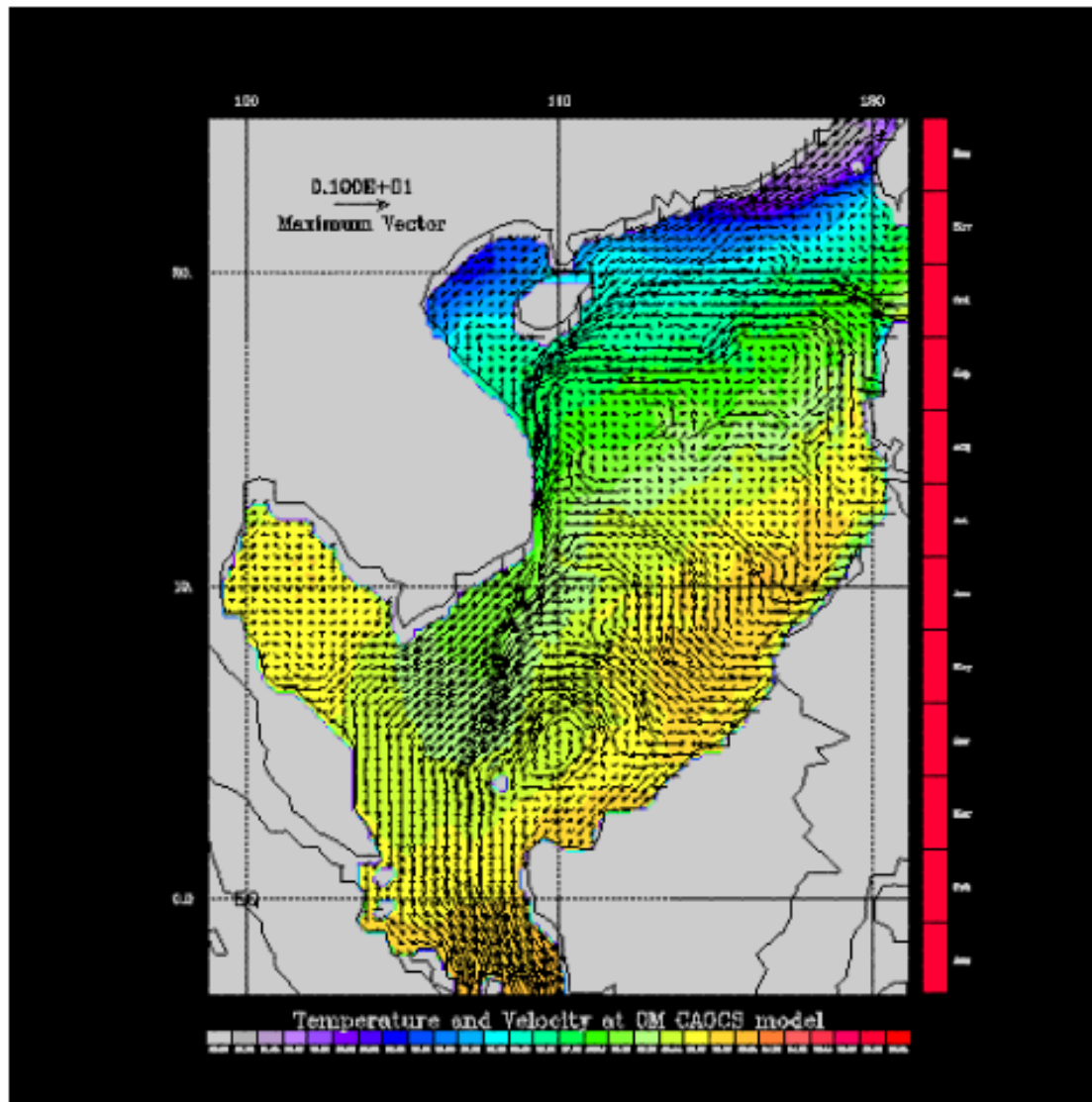
# South China Sea



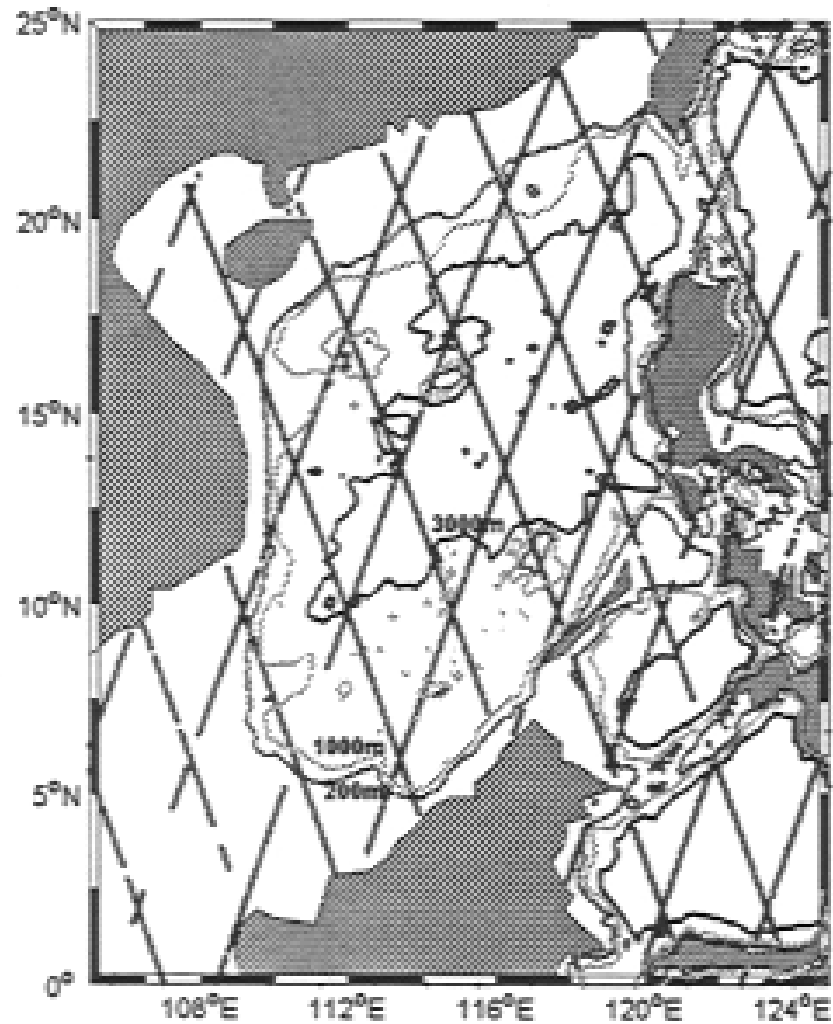
# Monsoon Winds (from QuikScat Data)



# Model Simulated SCS Surface Circulation and SST (Chu et al. 2000)



# T/P Tracks and Crossover Points



# Data

- October 1992 to September 1999 (257 cycles). There are 24 crossover points over SCS. After removing the tides, the monthly mean values (84 months all together) are calculated for each crossover point.

# EOF Analysis

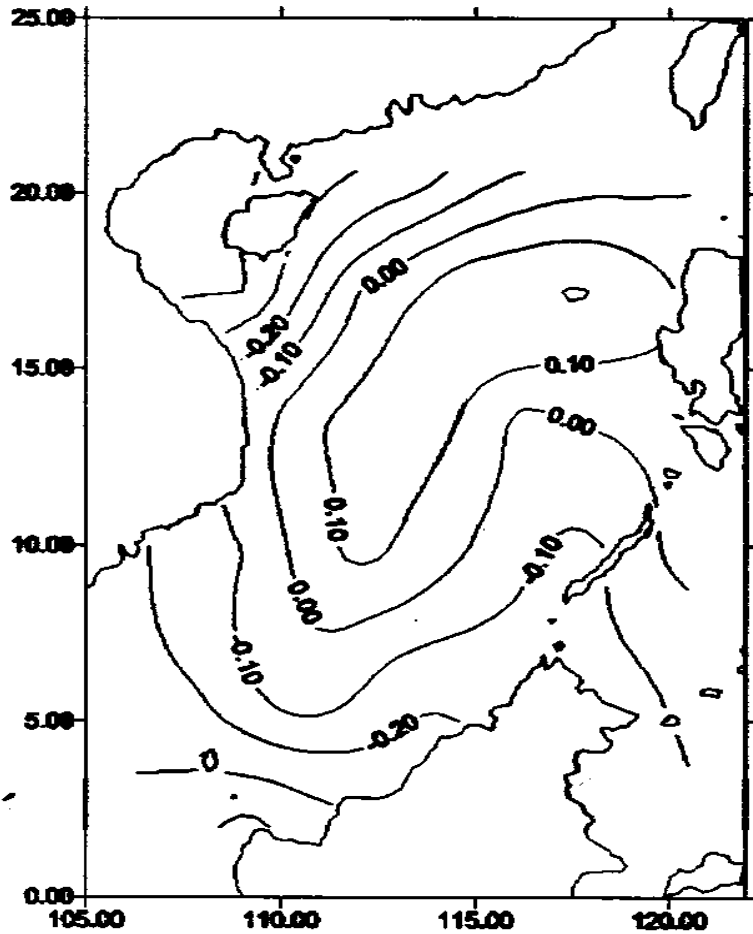
- The monthly sea surface height anomaly (SSHA) data from T/P form an  $N \times P$  matrix. Here  $P = 84$ , is the total number of time points used for computing the covariance matrix.  $N = 24$ , corresponds to the number of crossover points.
- From this data matrix a 24-square spatial covariance matrix is calculated

**Table 1. Variances of the First Five Leading EOFs**

EOF	Variance (%)	Cumulative Variance (%)
1	24.16	24.16
2	14.59	38.75
3	10.76	49.51
4	6.77	56.28
5	5.04	61.32



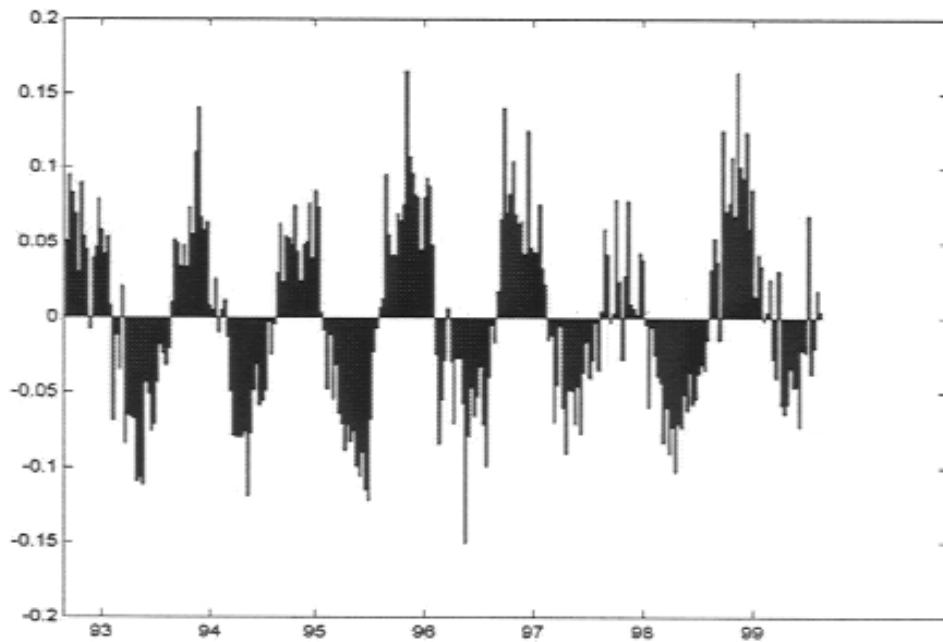
# EOF<sub>1</sub>



- 24.16%
- basin-scale gyre

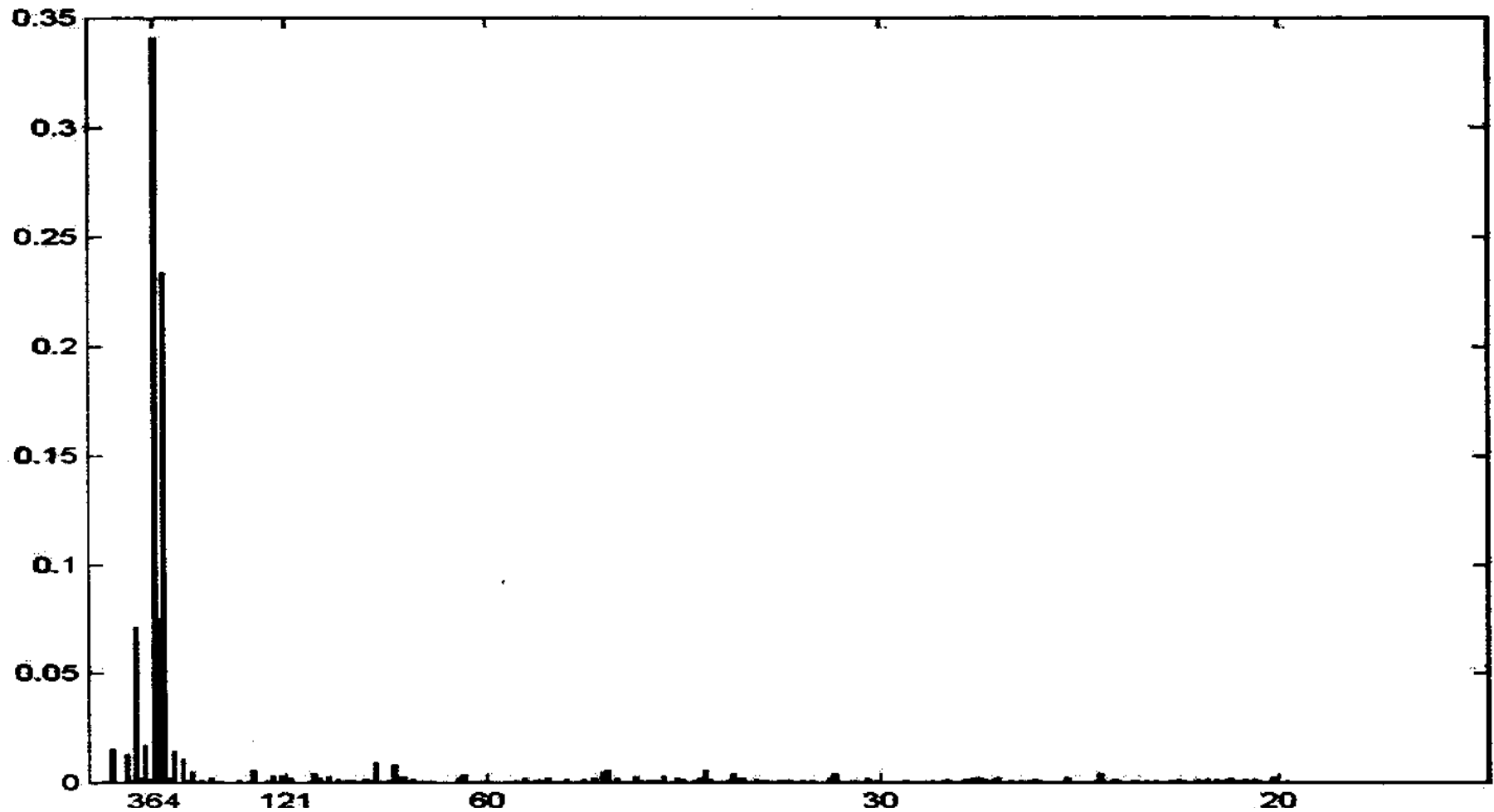
# PC<sub>1</sub>

- October 1992 – September 1999
- Annual Variability

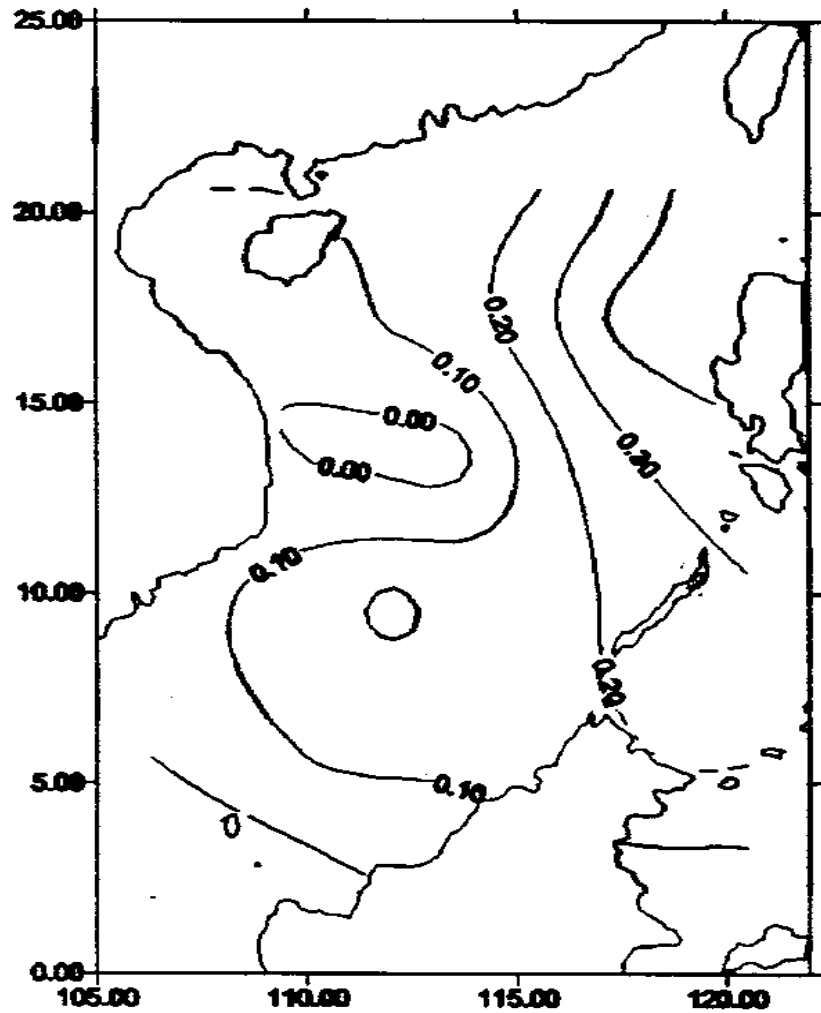


# Power Spectrum of PC<sub>1</sub>

(Peak at one year period)

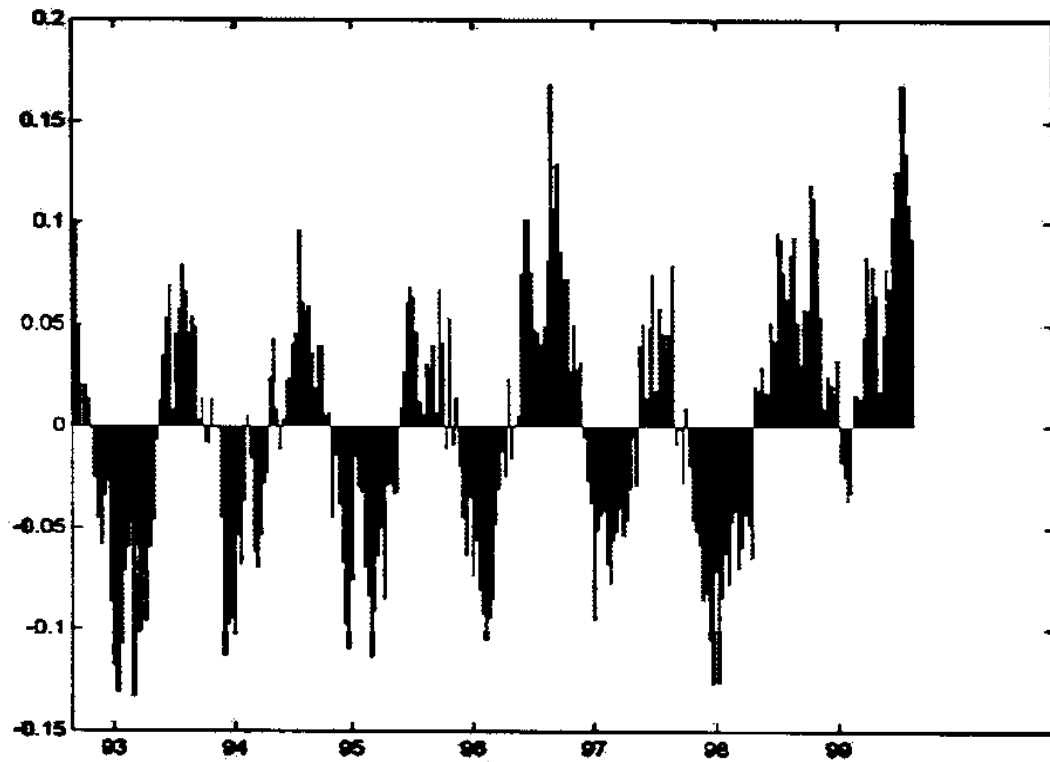


# EOF<sub>2</sub>



- 14.59%
- North-South Double Gyre-Structure

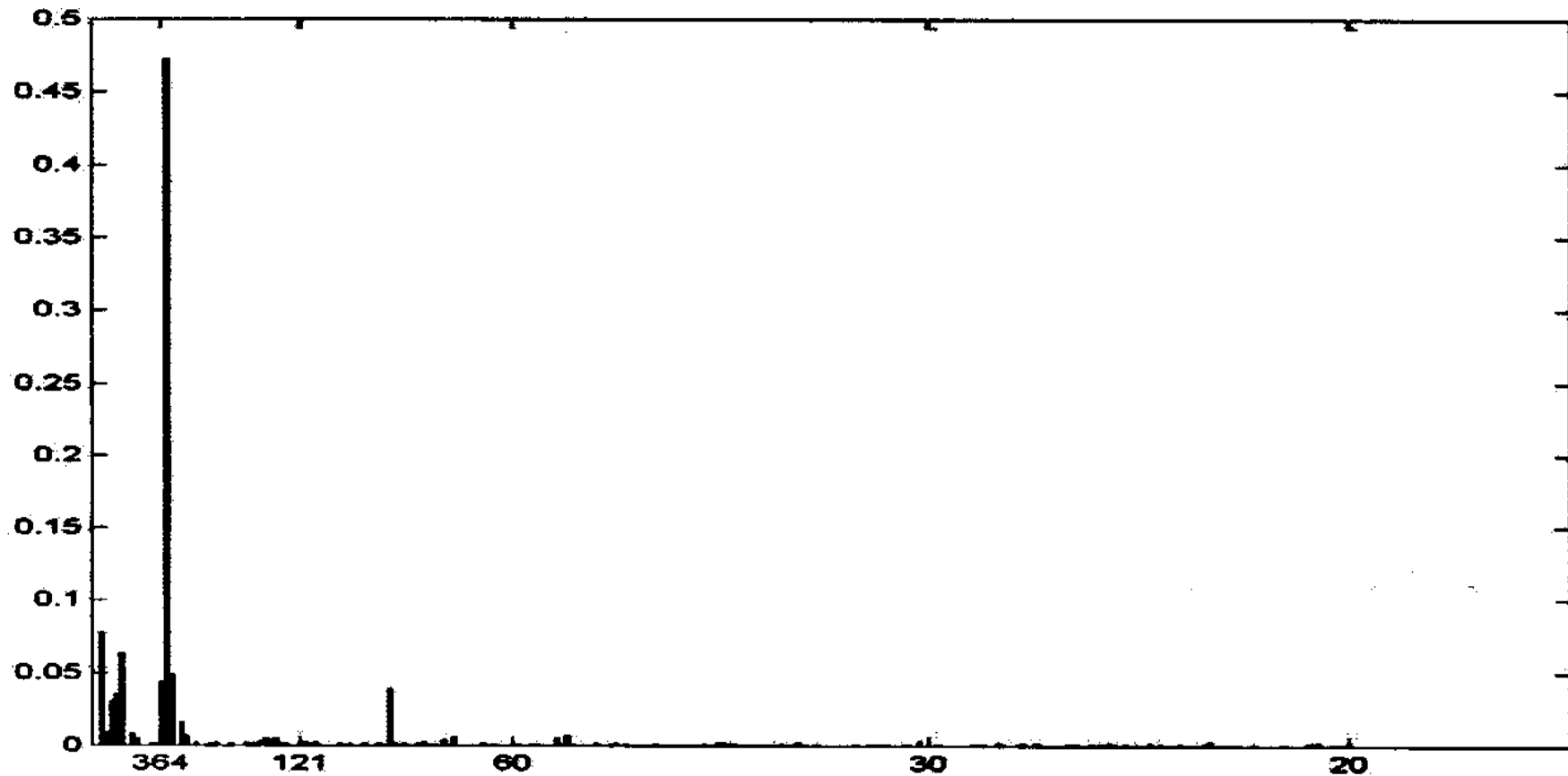
# PC<sub>2</sub>



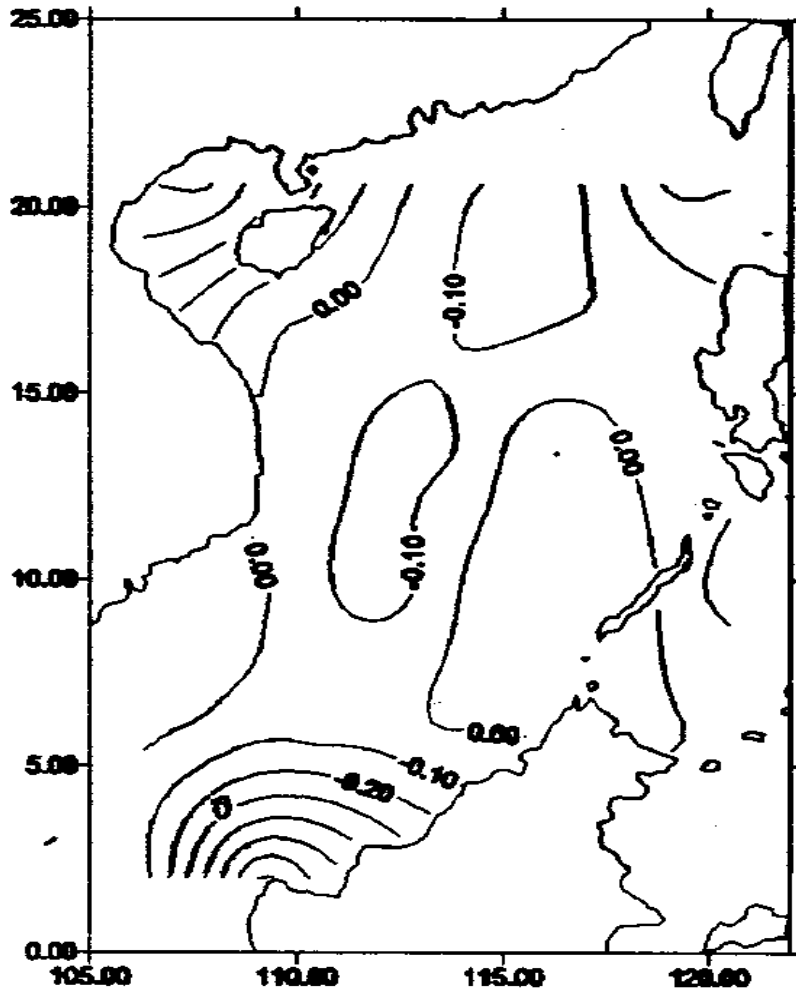
- Annual Variability

# Power Spectrum of $PC_2$

(Peak at one year period)

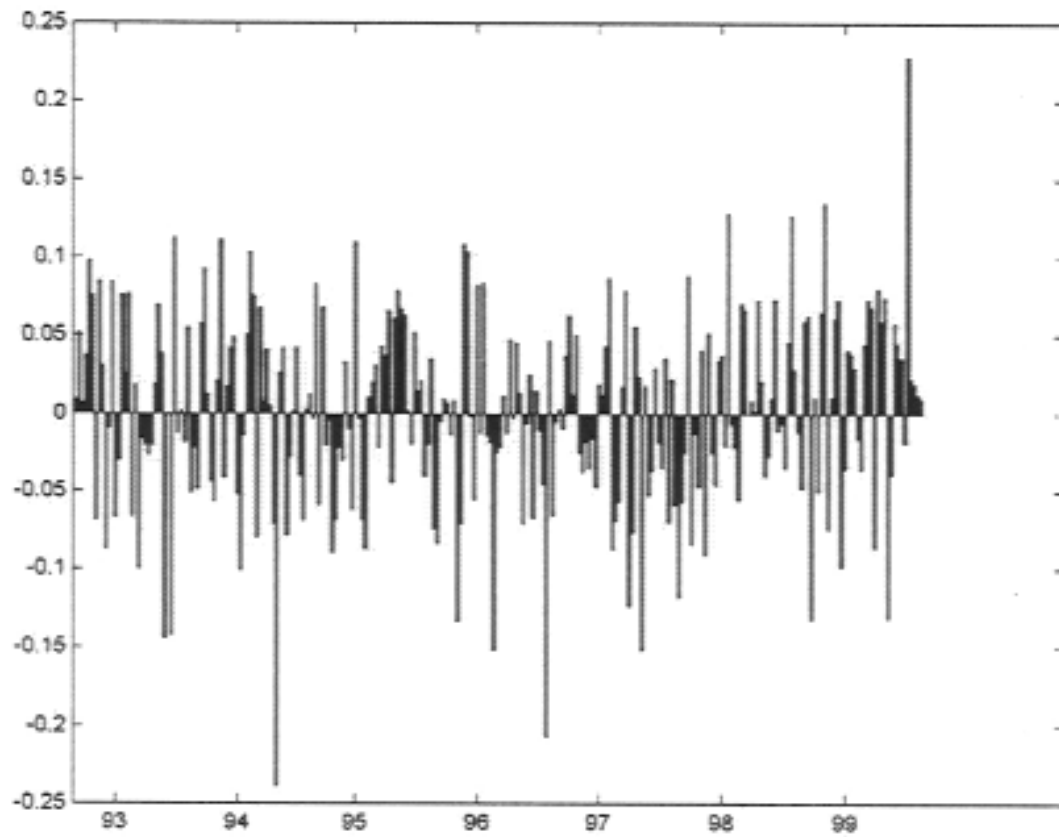


# EOF<sub>3</sub>



- 10.76%
- Multi Gyre-Structure

# PC<sub>3</sub>

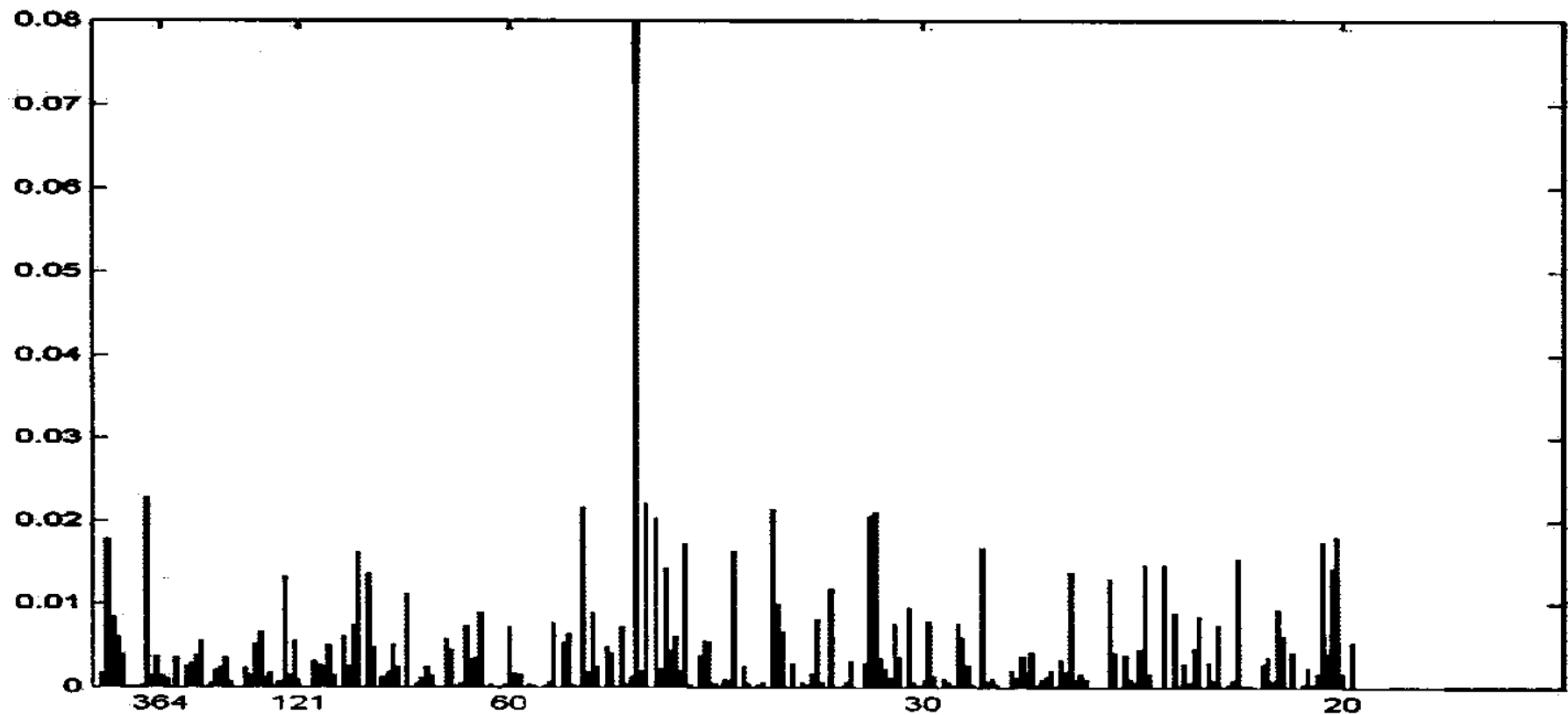


- Intra-Seasonal Variability

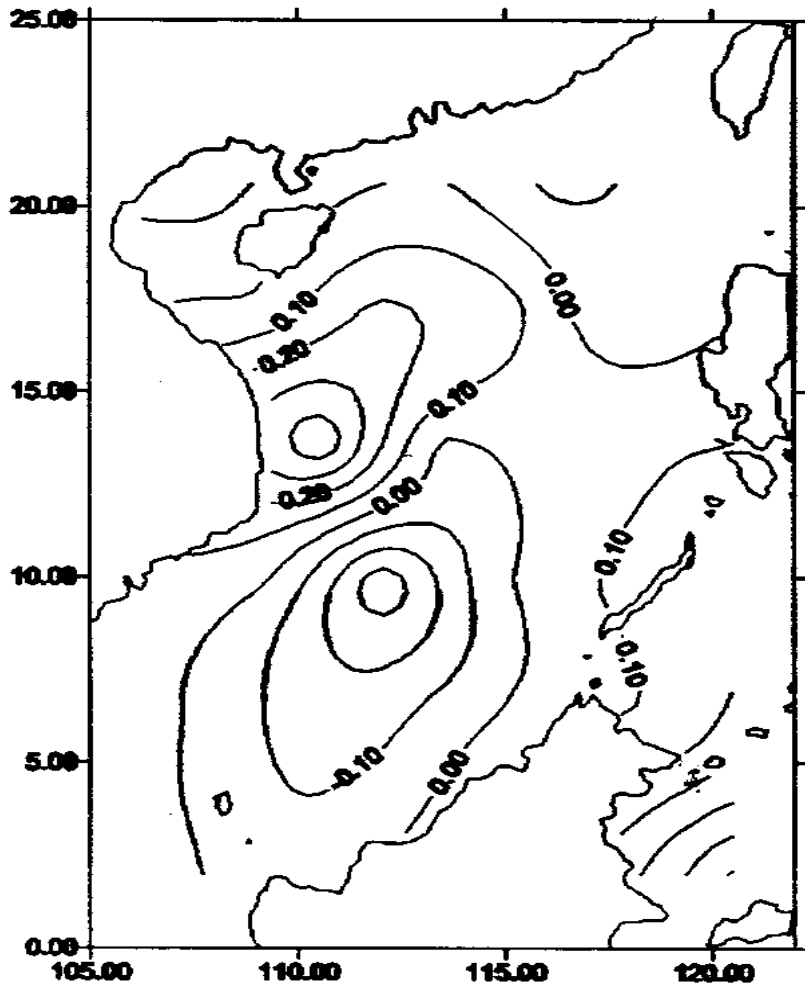


# Power Spectrum of $PC_3$

(Peak at 46 day period)

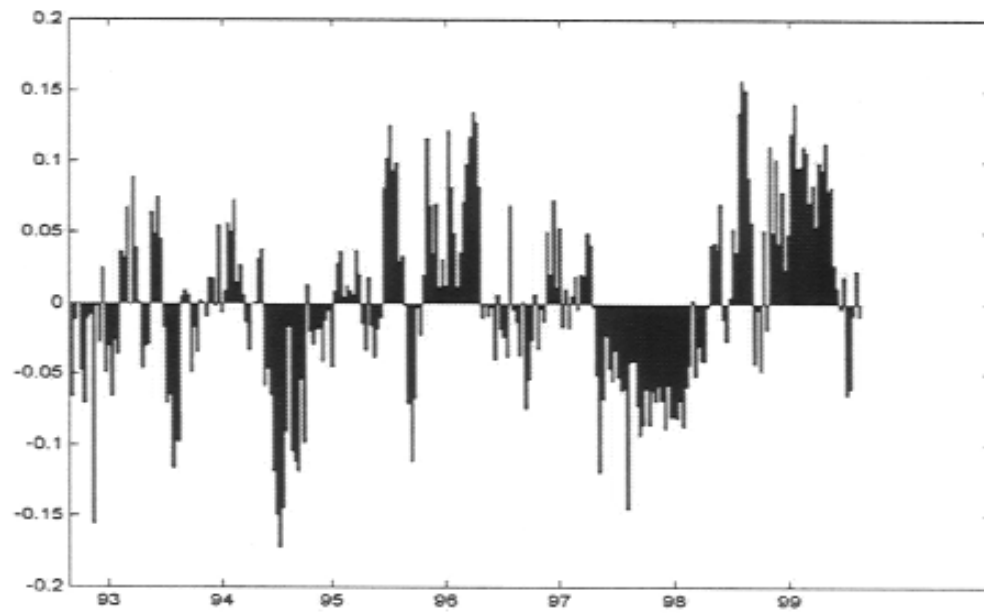


# EOF<sub>4</sub>



- 6.77%
- Double Gyre-Structure

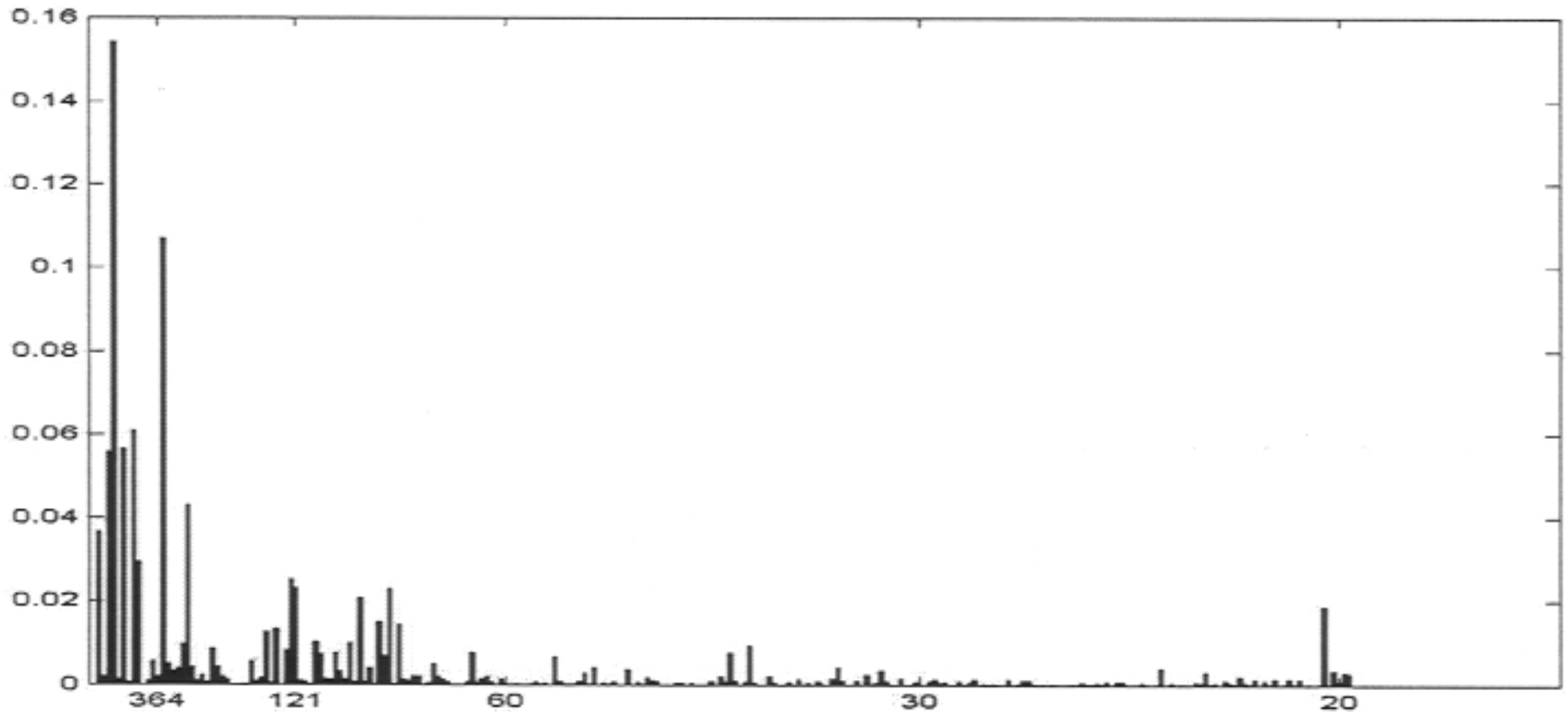
# PC<sub>4</sub>



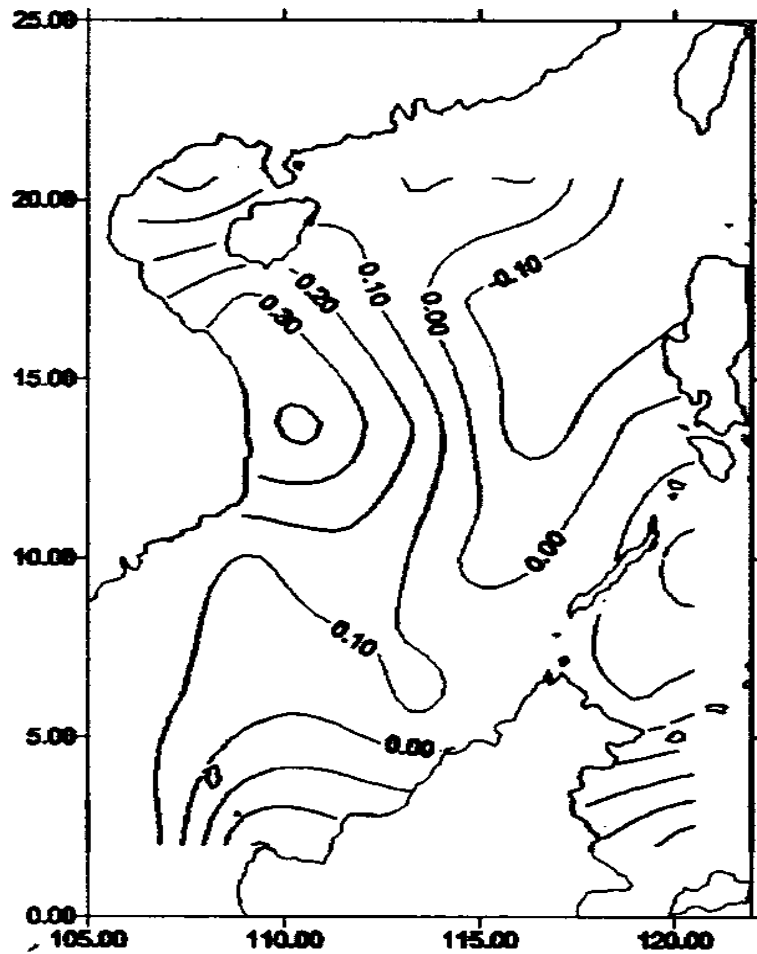
Interannual Variability

# Power Spectrum of $PC_4$

a strong peak (0.15) at 1019 days  
(around 2 years 10 months)

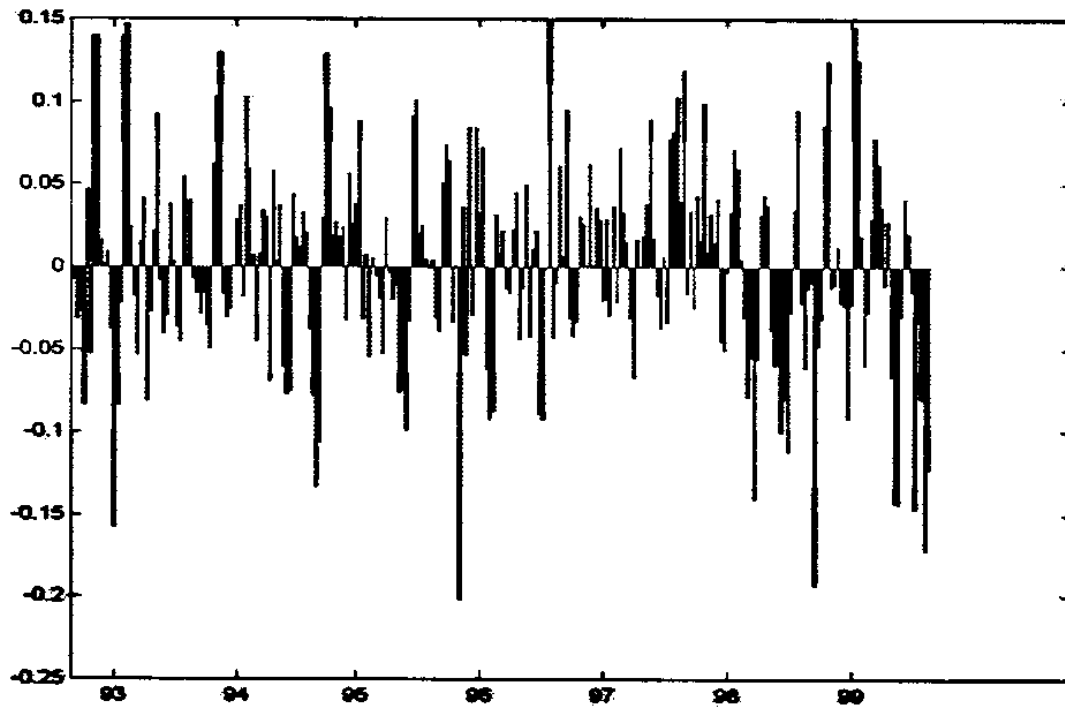


# EOF<sub>5</sub> (6.77%)



- Double Gyre-Structure

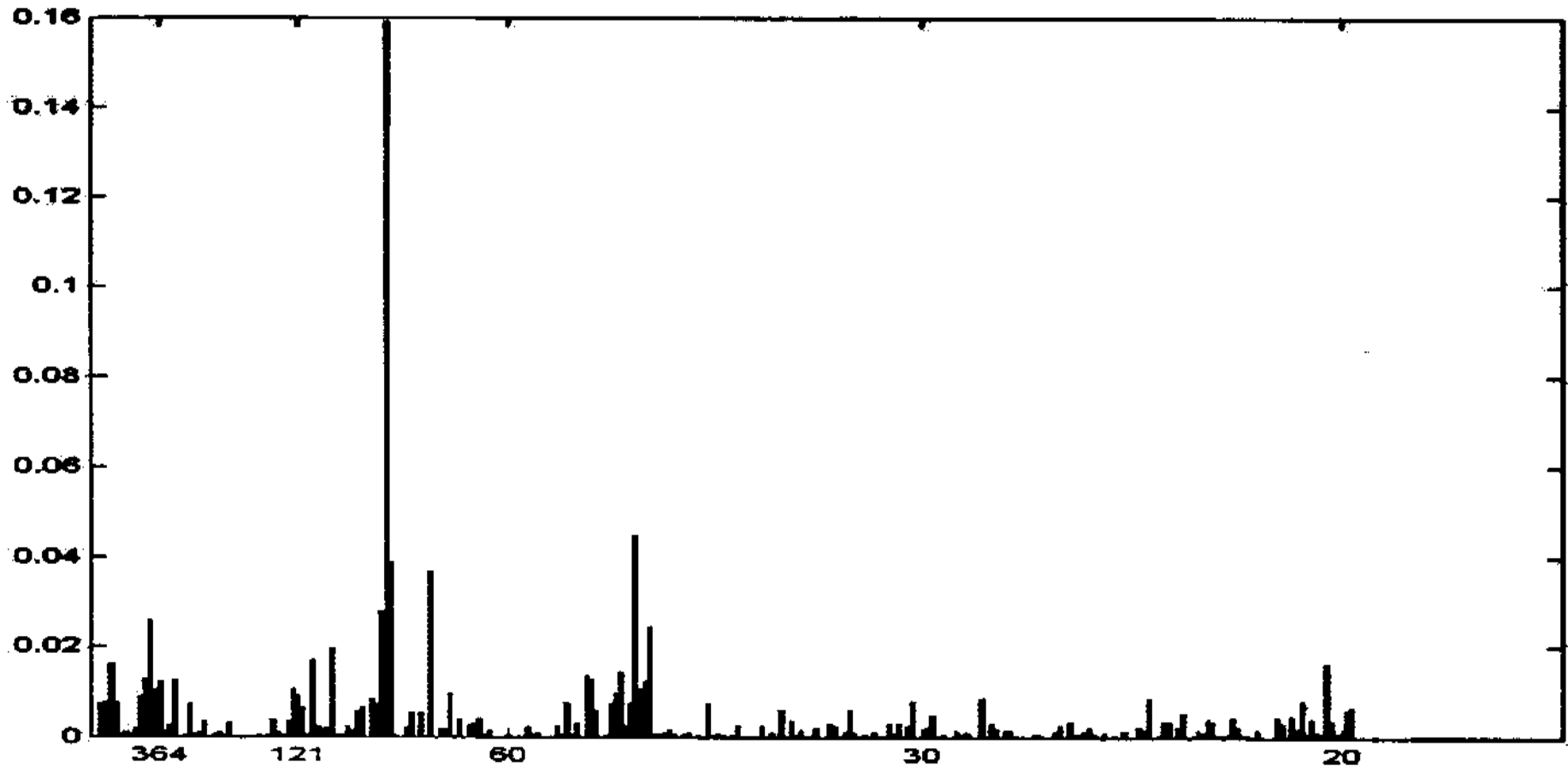
# PC<sub>5</sub>



Intraseasonal  
Variability

# Power Spectrum of $PC_5$

a strong peak (0.16) at 85 days



# **MULTI-SCALE VARIABILITY**

- **Seasonal Variability**
- **Interannual Variability**
- **Intraseasonal Variability**



# Conclusions

- (1) Seasonal variability dominates SSHA with two spatial patterns: basin-wide gyre and north-south double gyres.
- (2) Interannual variability of SSHA has a north-south double gyre pattern.
- (3) Intraseasonal variability of SSH has high spatial variability at the continental shelf such as west of Hainan Island and Borneo, and east-west double gyre structure in the deep basin.
- (4) Scale interaction between seasonal and interannual processes may be taken place at the north-south double gyre pattern.
- (5) An activity center is near the South Vietnamese coast.