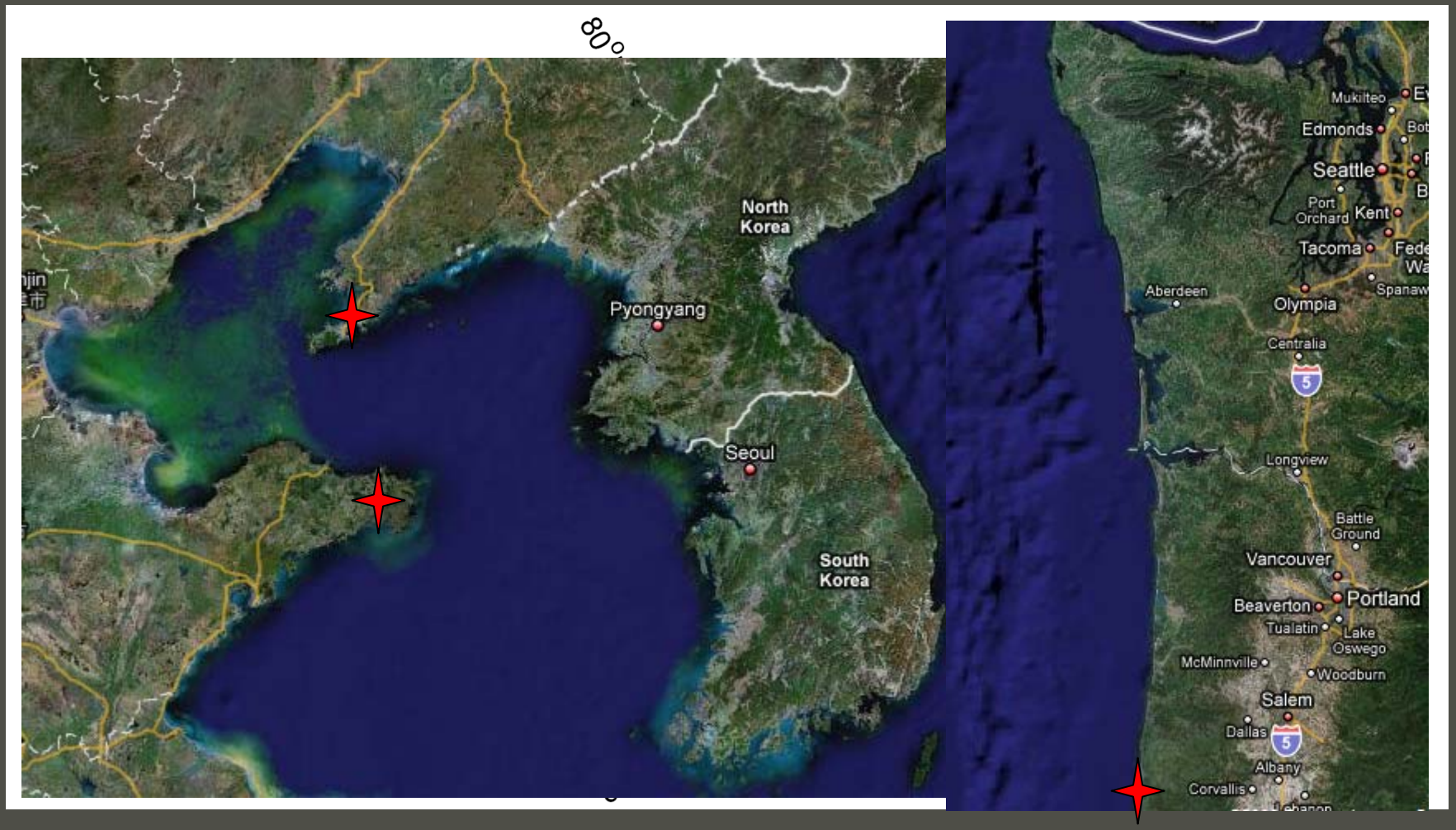
Coupling between zooplankton spatial distribution and physical processes off Washington and Oregon

Hongsheng Bi[1], William T. Peterson[2],
Jesse Lamb[1], Cheryl Morgan[1]

1.CIMRS, Oregon State University - HSMC, Newport, OR 97365
2.Fisheries Newport Station, Newport, OR 97365

Oregon State UNIVERSITY OSU

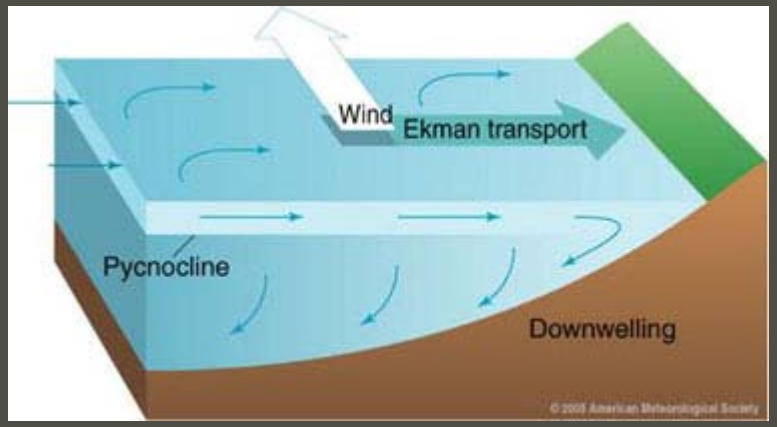
Cross the Pacific



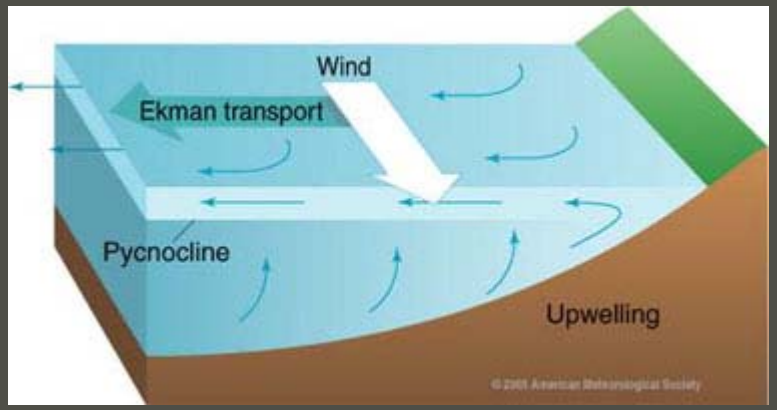
Introduction: winds and current structure

- Winter
  - Winds from the south
  - Downwelling
  - Poleward-flowing Davidson Current
  - Subtropical/southern species transported northward & onshore
- Summer
  - Strong winds from the North
  - Coastal upwelling
  - Northern species transported southward

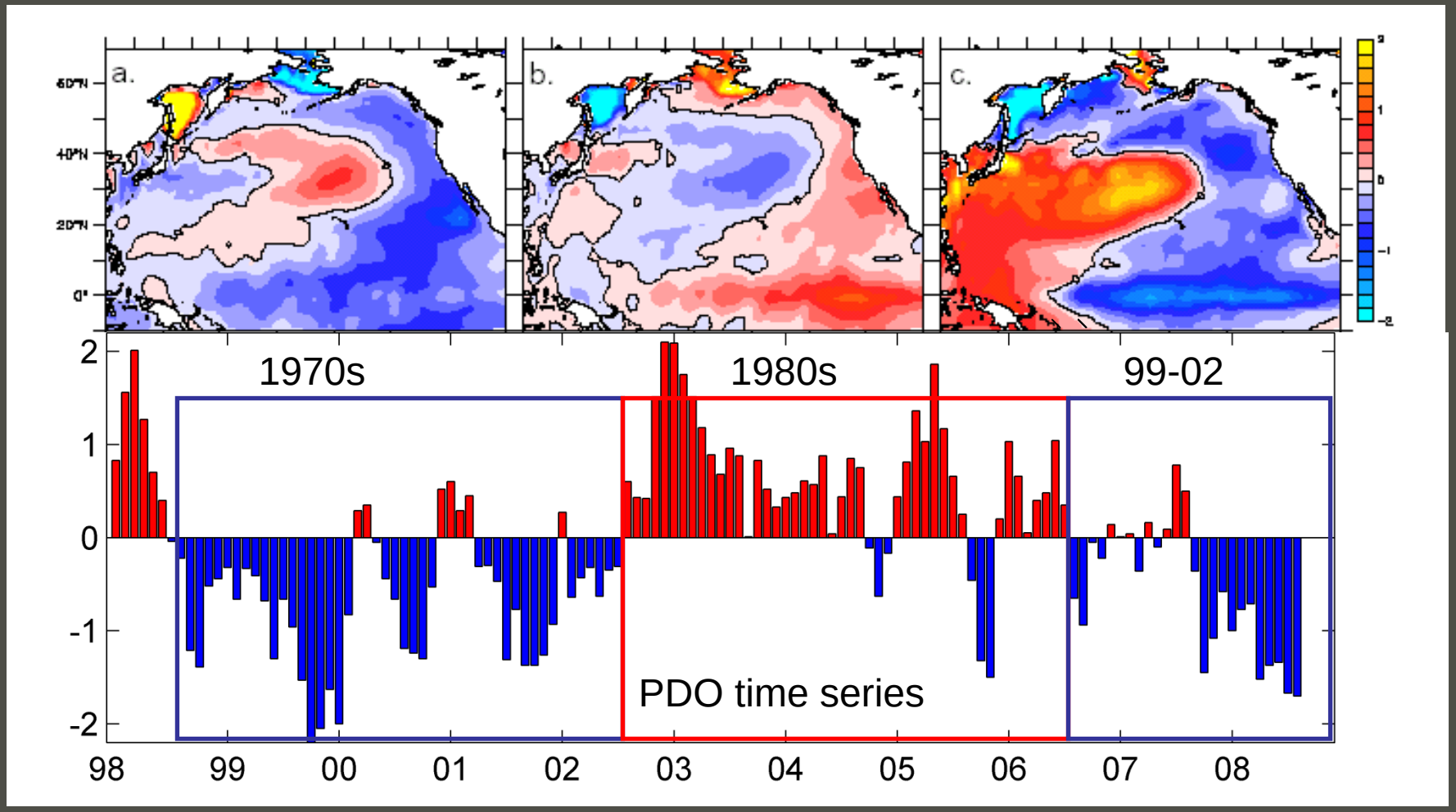
Winter:



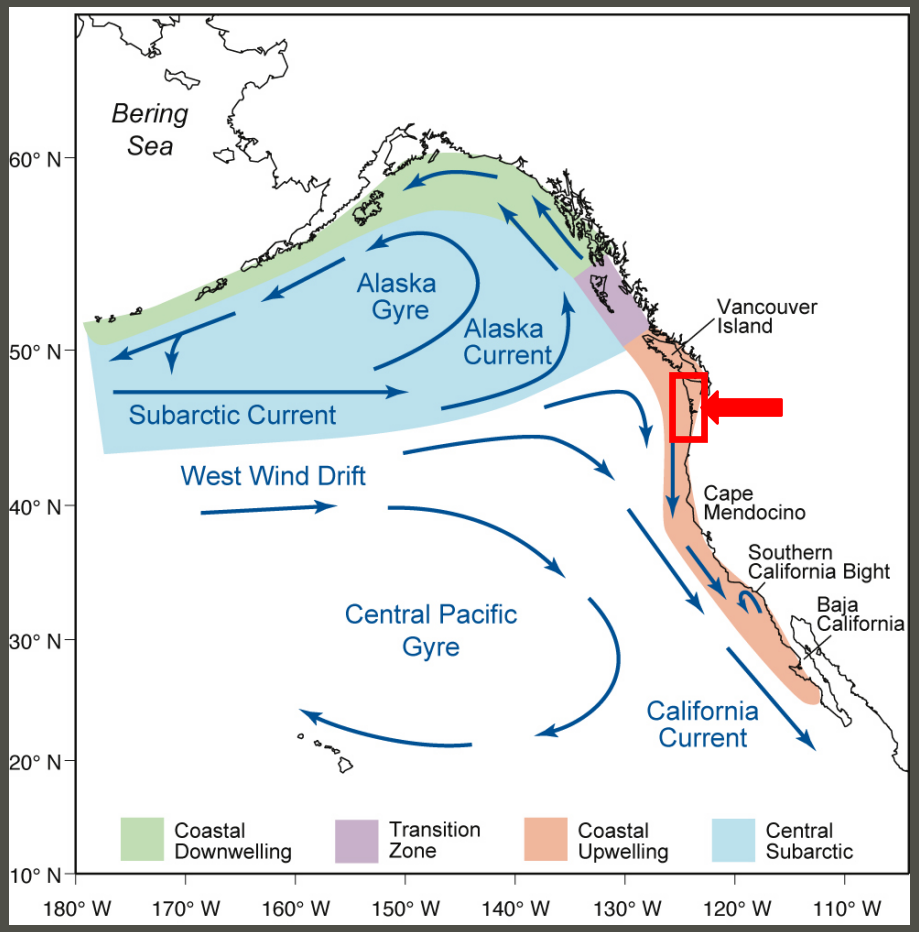
Summer:



Phase shifts are tracked by the Pacific Decadal Oscillation (PDO): negative = cool; positive = warm.



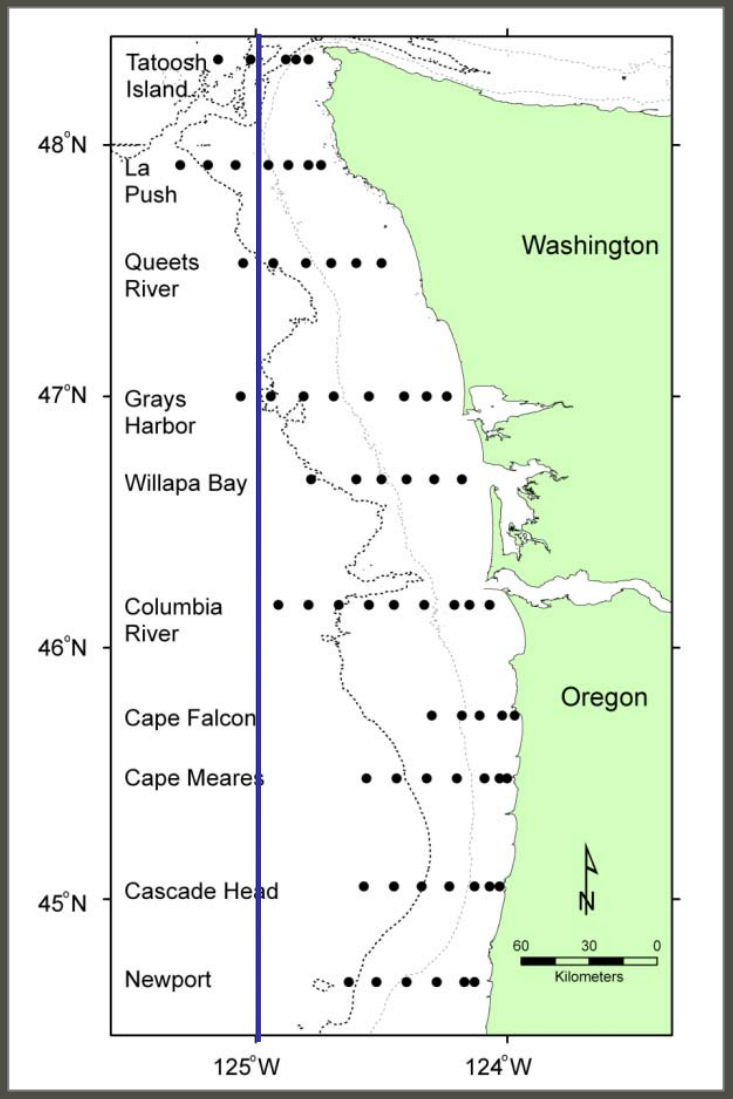
Circulation off the Pacific Northwest



- CC is primarily along the shelf break and offshore
- Currents over the shelf dominated by local winds. Winds reverse from northward to southward in spring.
- Subarctic intrusion

Sampling and methods

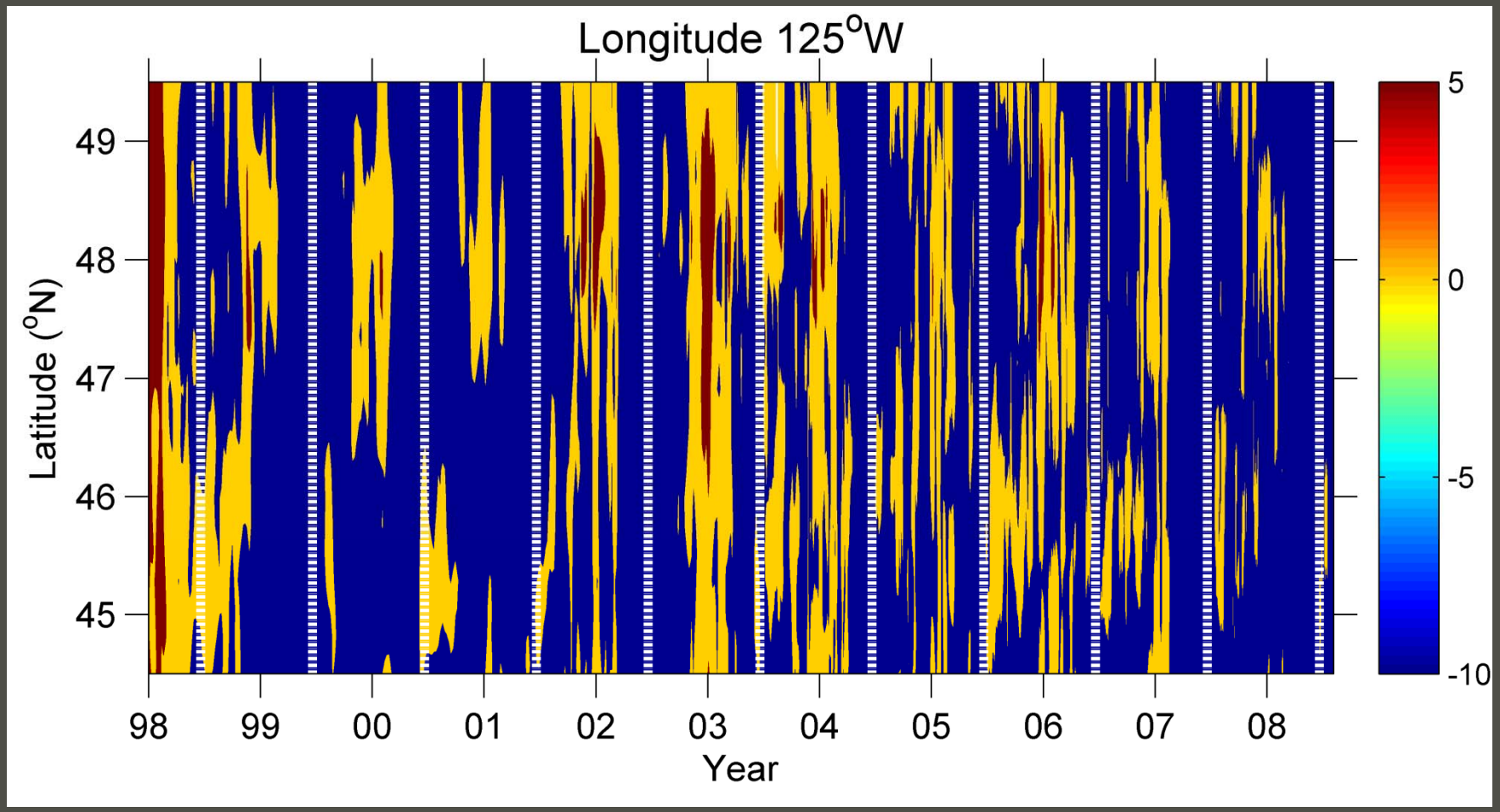
- Field samples: June 1998 – present
- Zooplankton
  Vertical net
- Temperature and salinity
- Sea surface height
  Altimeter data
- Sea surface temperature
  AVHRR



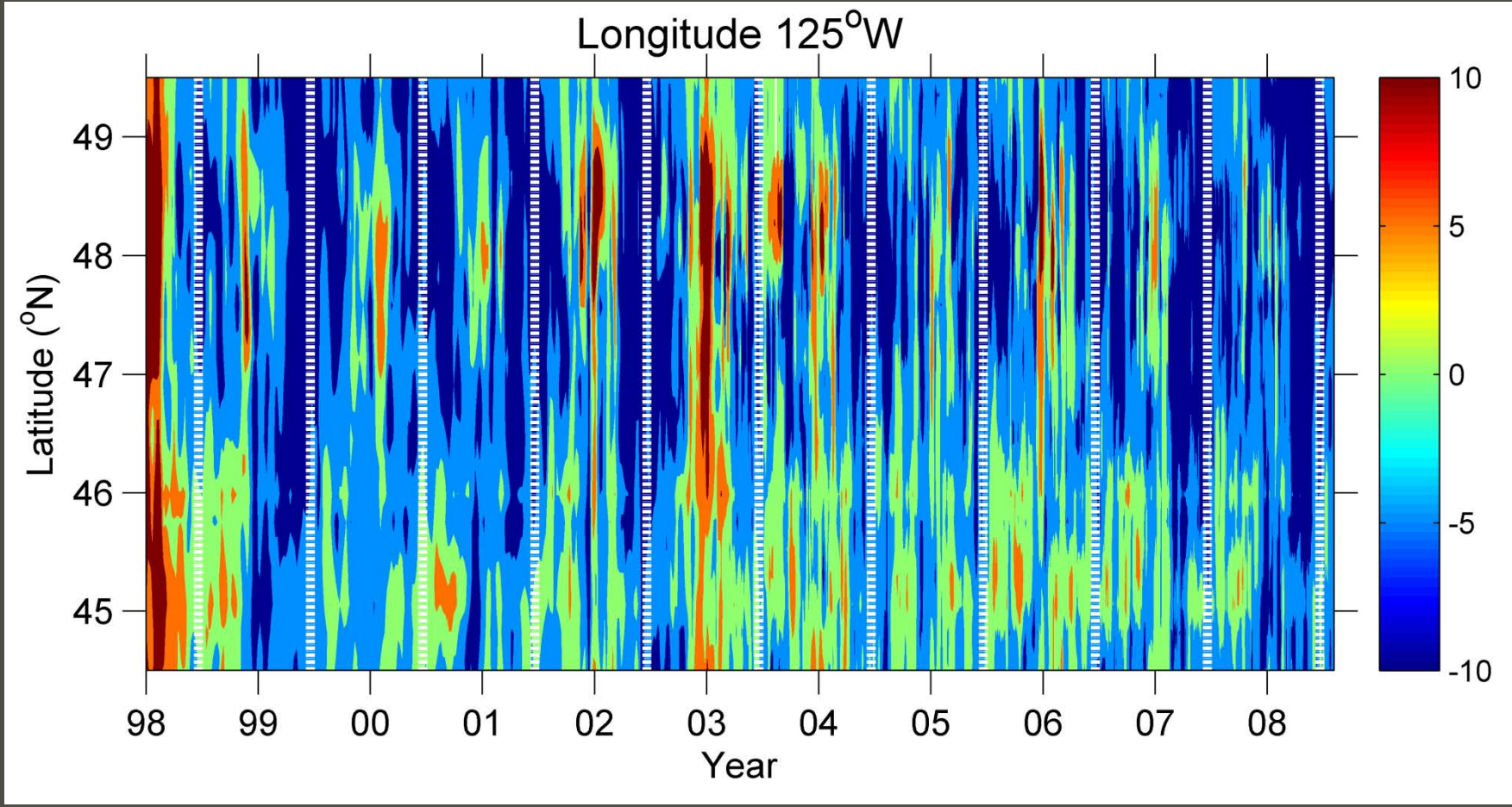
Objectives

- To understand how zooplankton spatial distribution was influenced by different physical processes
  - Upwelling: cross shelf (Zonal)
  - Pacific decadal oscillation: North-south (Latitudinal)
  - Warm oceanic copepods: *Calanus pacificus*
  - Cold neritic copepods: *Calanus marshallae*

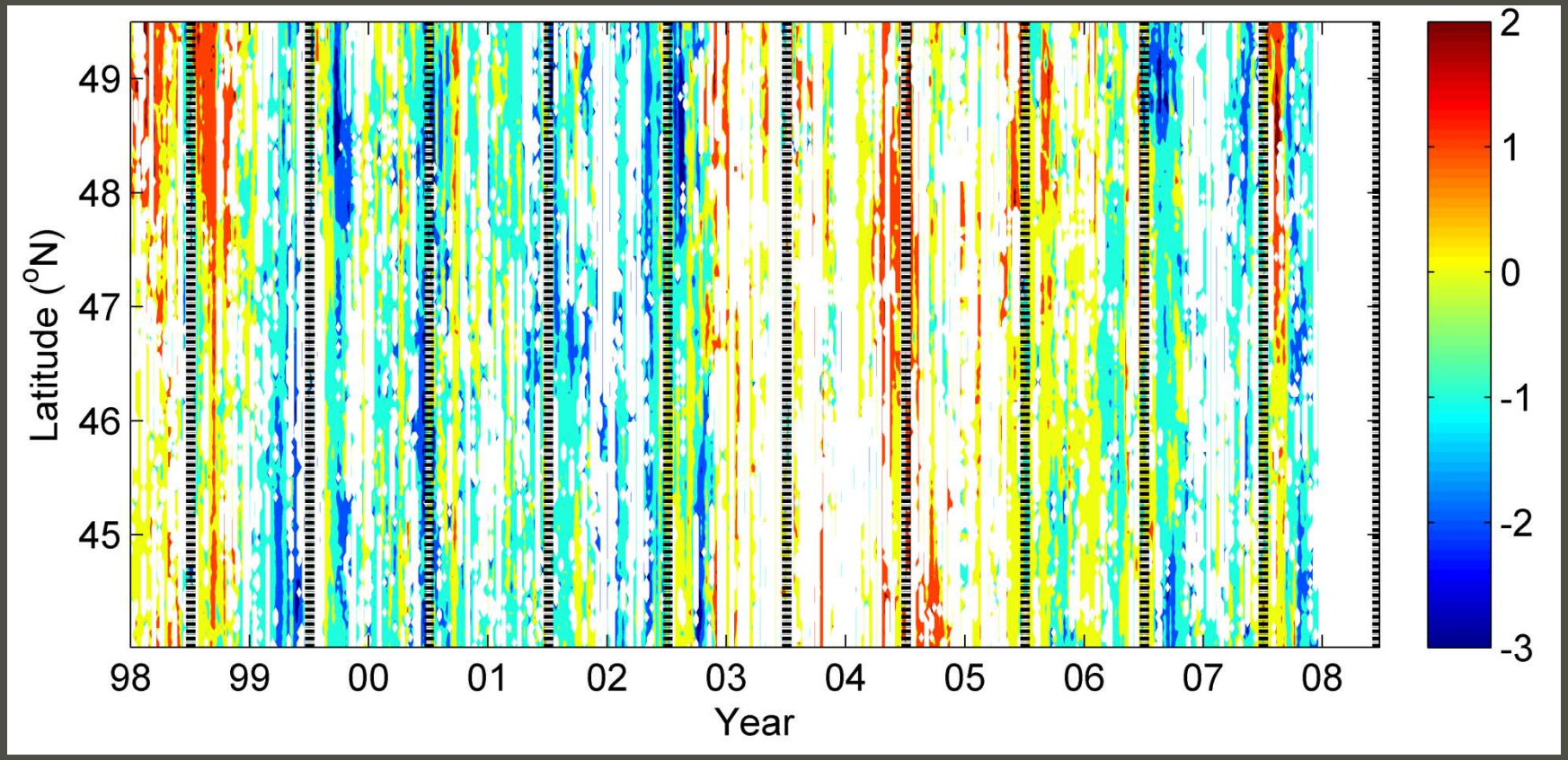
Sea level anomalies from the Altimeter



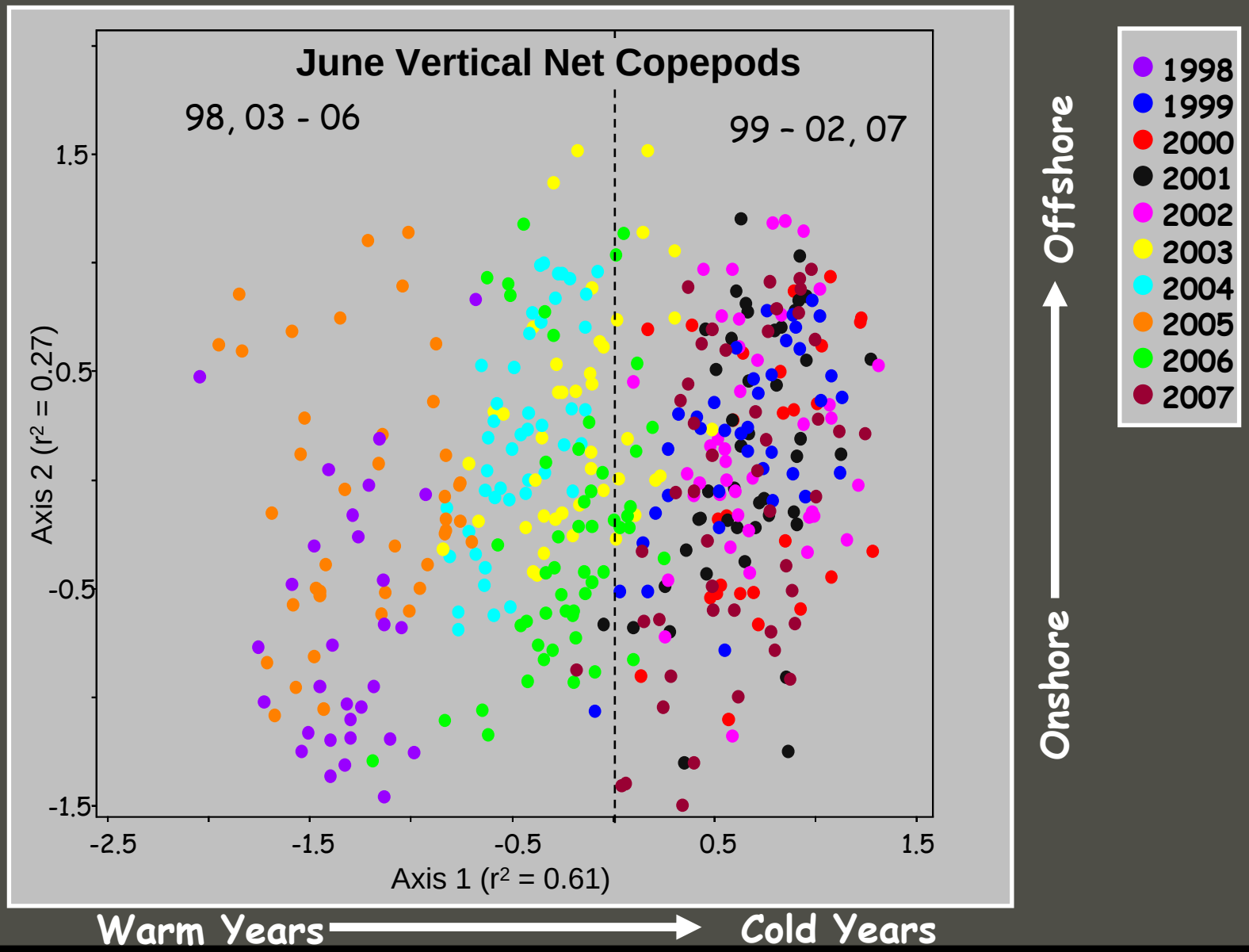
Sea level anomalies: non-seasonal
Predominantly southward 99-02, 08



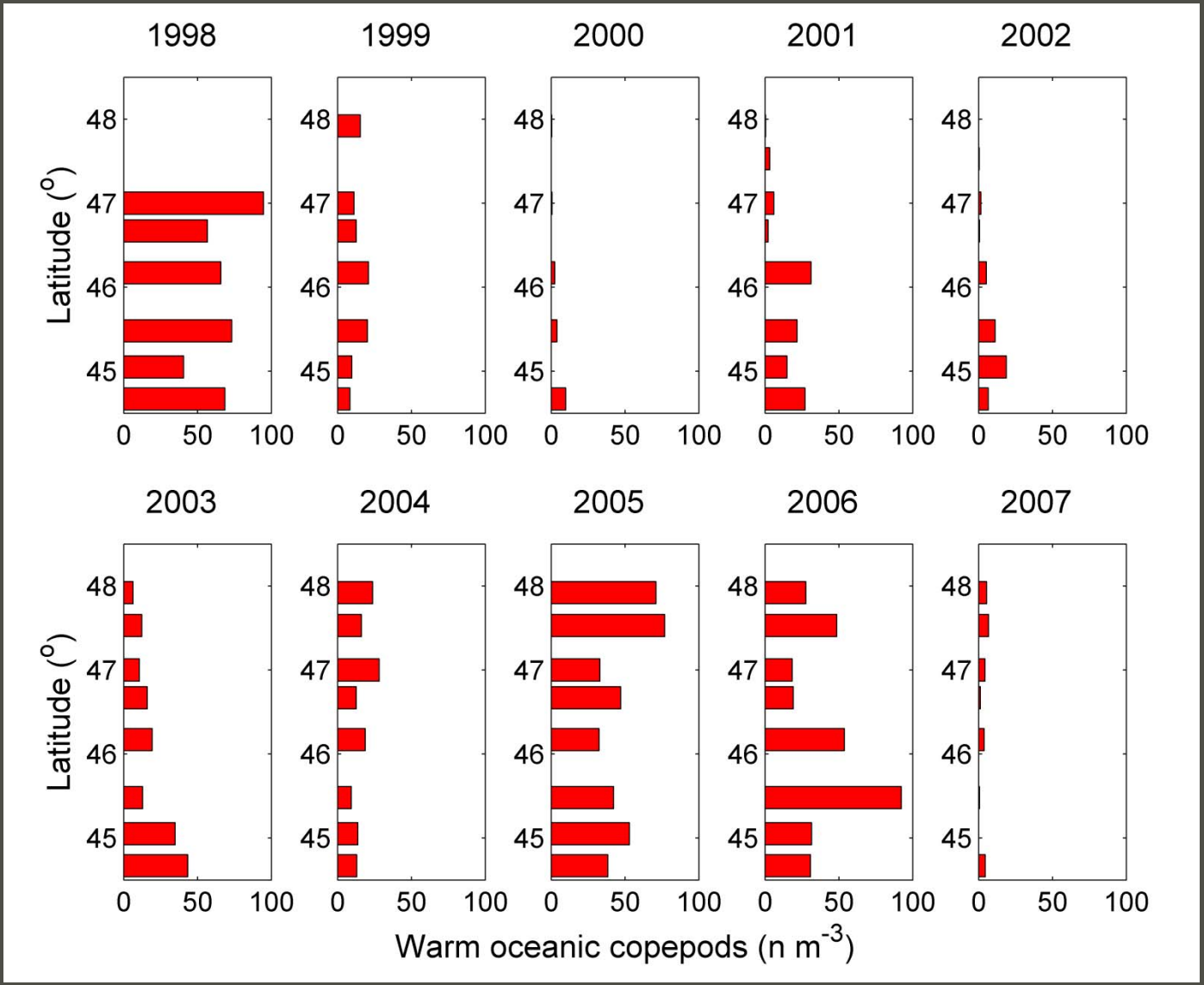
Sea surface temperature anomalies



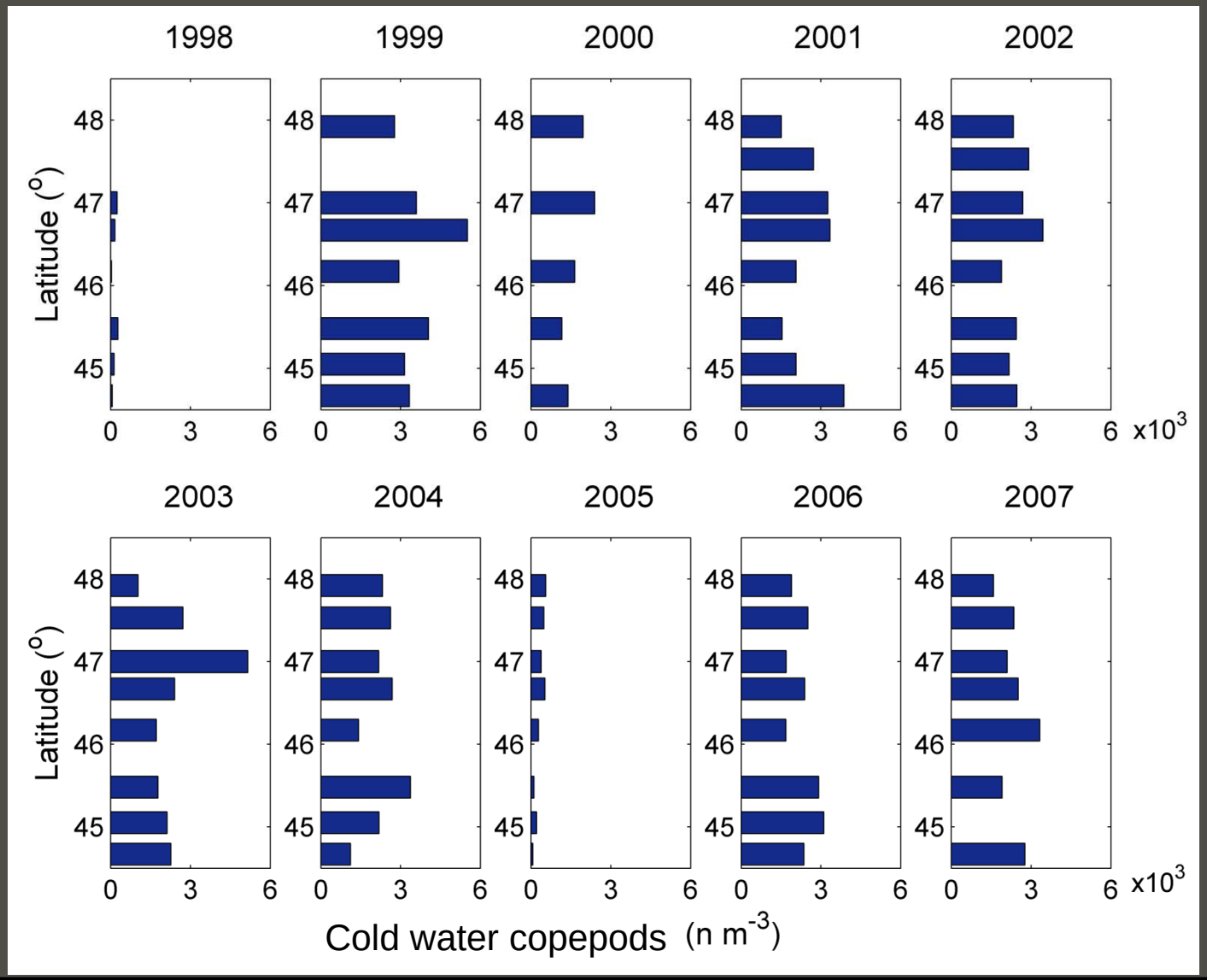
June 1998 to 2007 Ordination



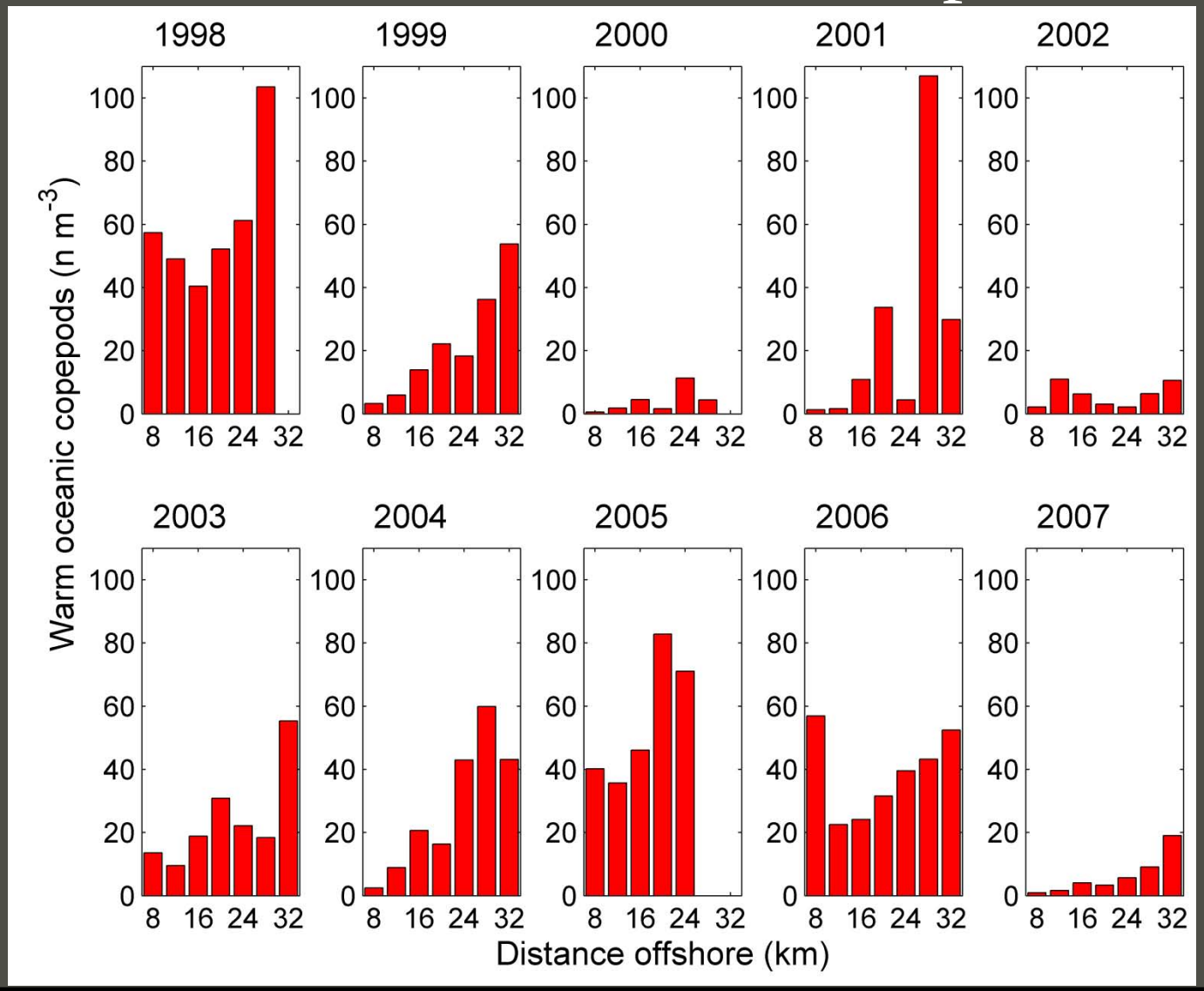
Latitudinal distribution: warm species



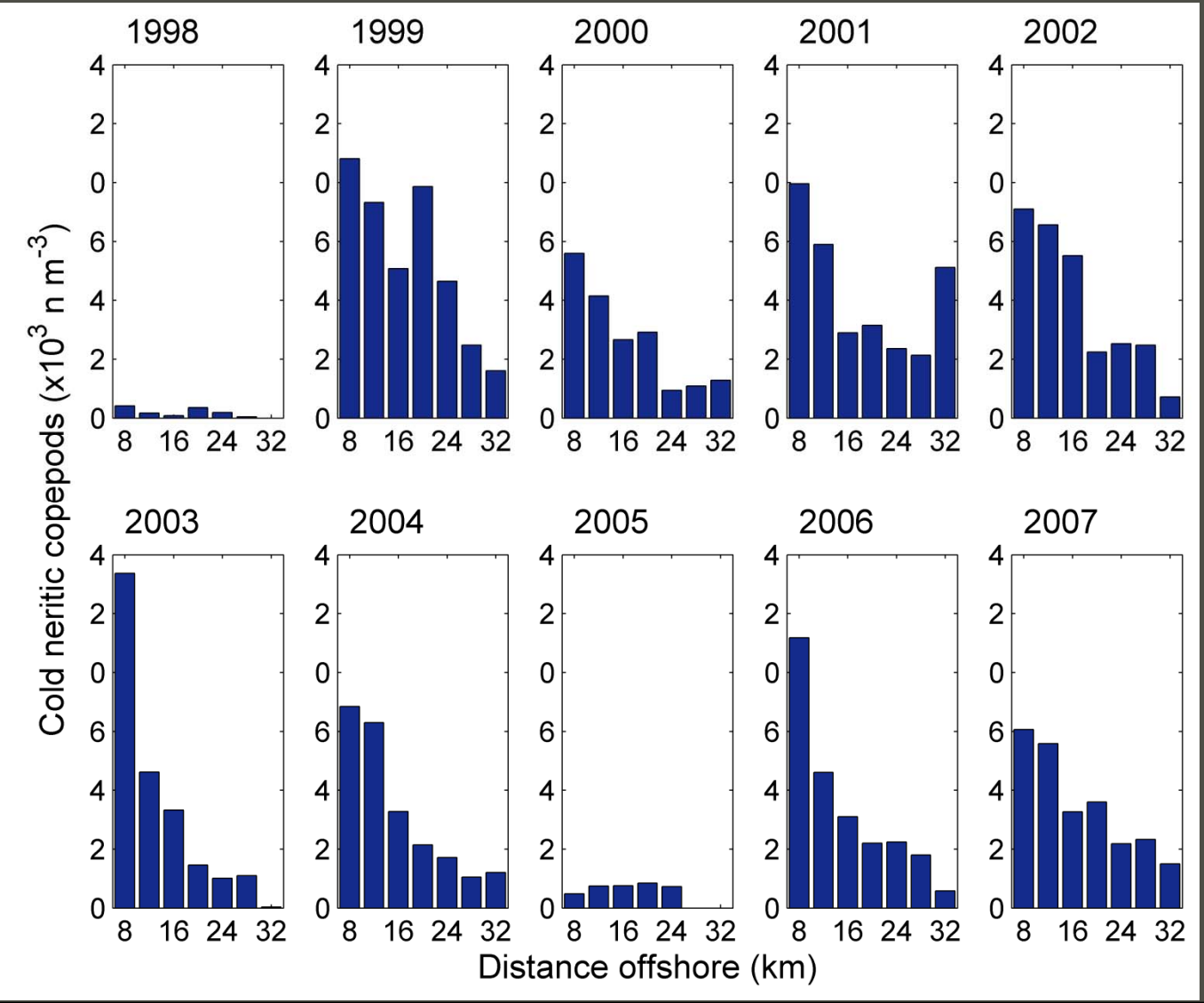
Latitudinal distribution: cold species



Zonal distribution: warm species



Zonal distribution: cold species



Conclusions

- Interannual variation in both warm oceanic and cold neritic copepods were consistent with offshore SLA and SST patterns
- Zonal patterns were clear for both types of copepods
- Latitudinal patterns were not clear for cold neritic copepods
- In cold years (1999-2002, 2006- 2008), warm oceanic copepods were more abundant in south

Acknowledgements

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  - NASA JPL
- Comments from Dr. Ted Strub and Rosemary Morrow
- Field data collection team and database management team

Mean abundance