

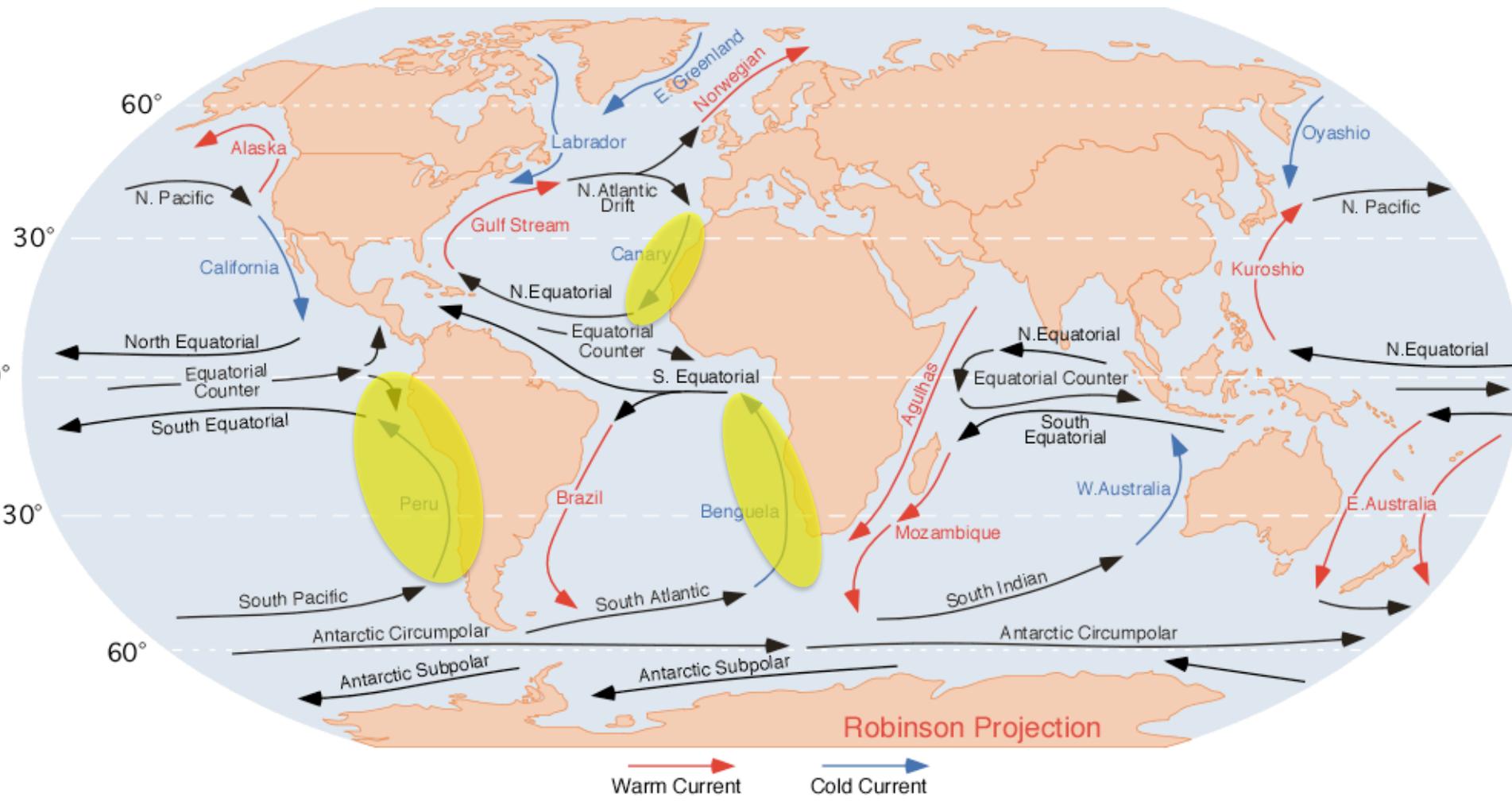
ANNOUNCEMENTS

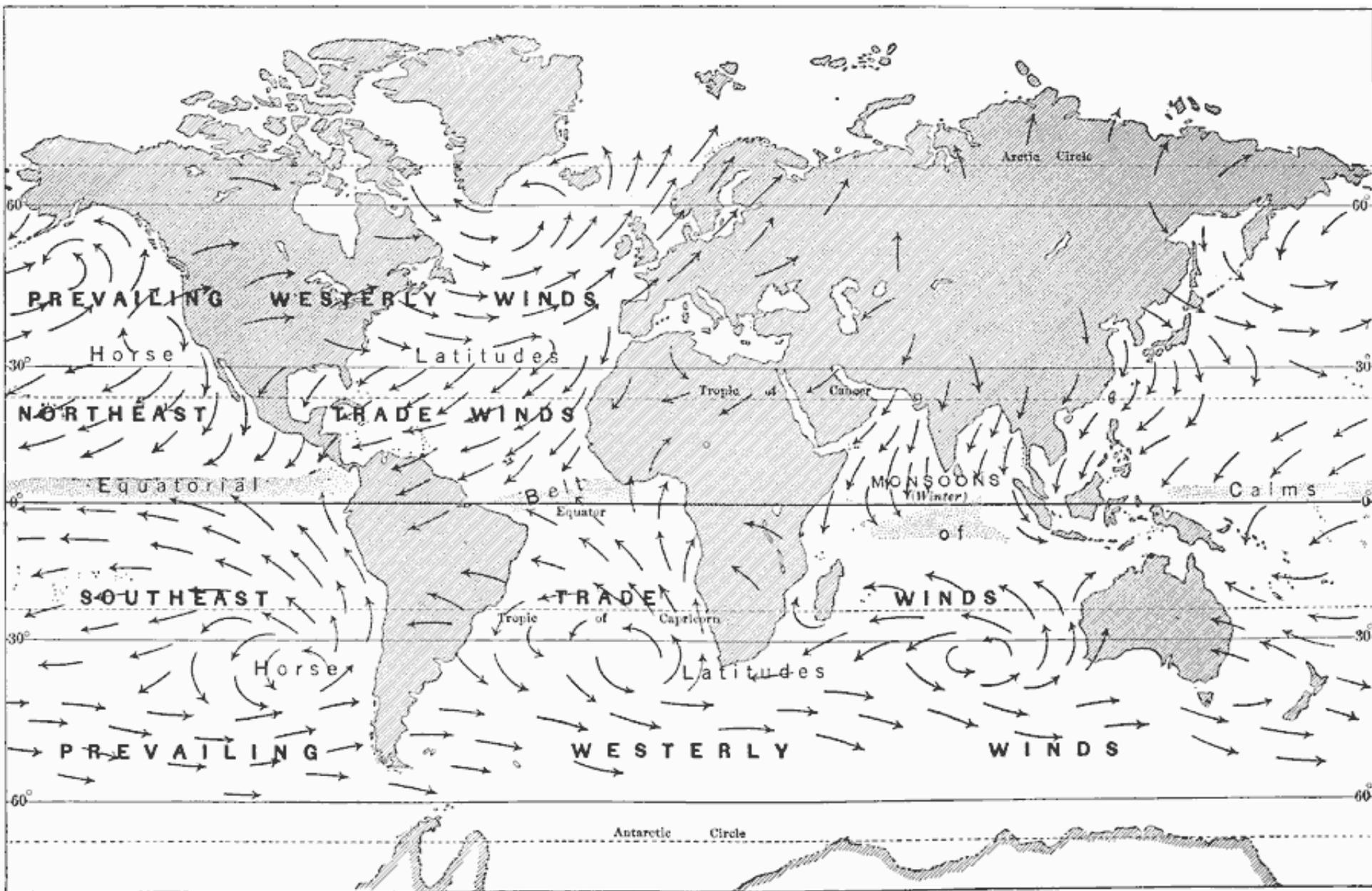
- LAB ACTIVITY DUE TODAY at 1:30pm
- Complete release form for Cruise
- Get your seasick meds soon
- Y2E2 178 Office Hours
 - TUESDAY 8:30-9:30am, 3:30-4:30am

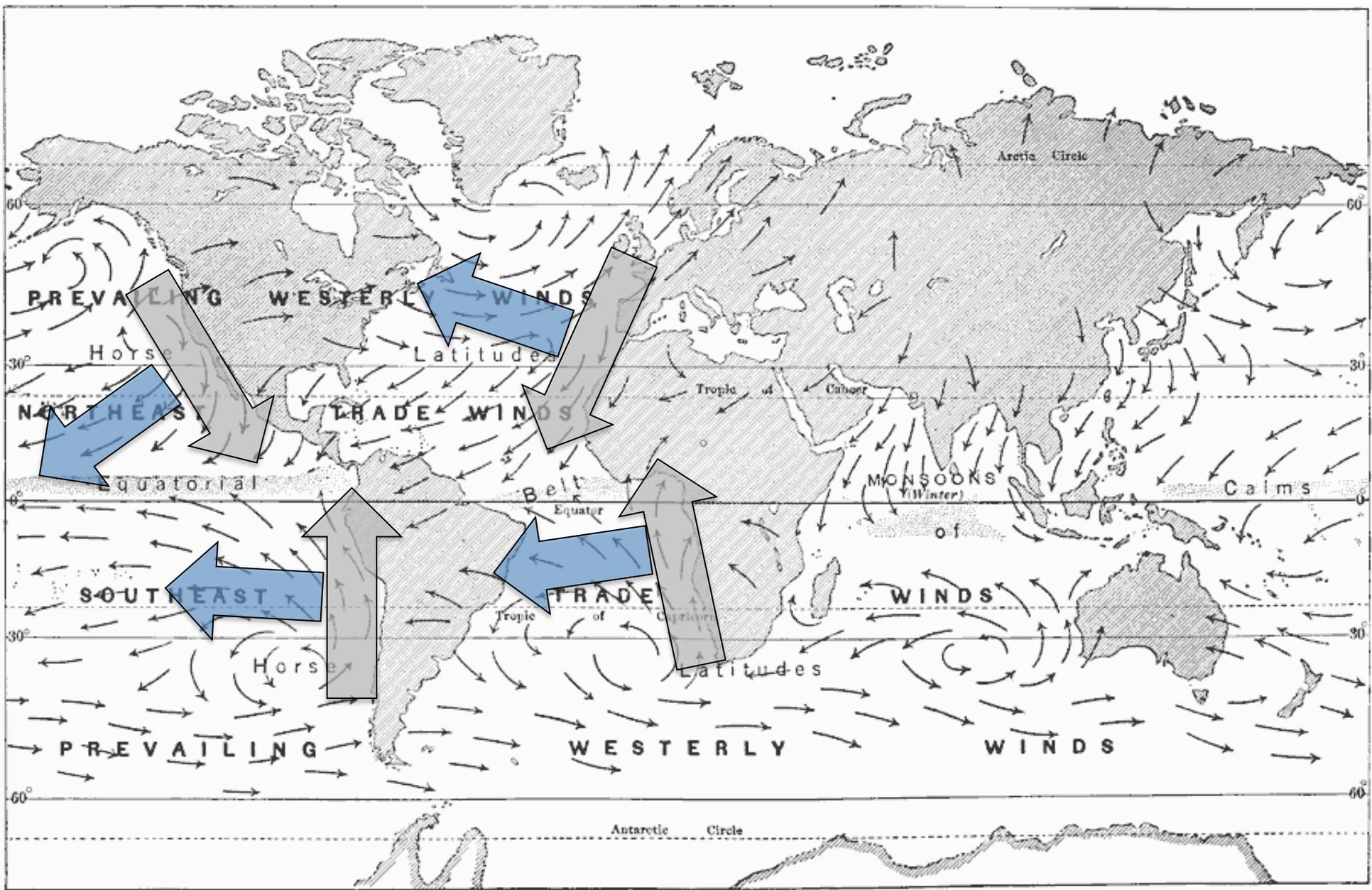


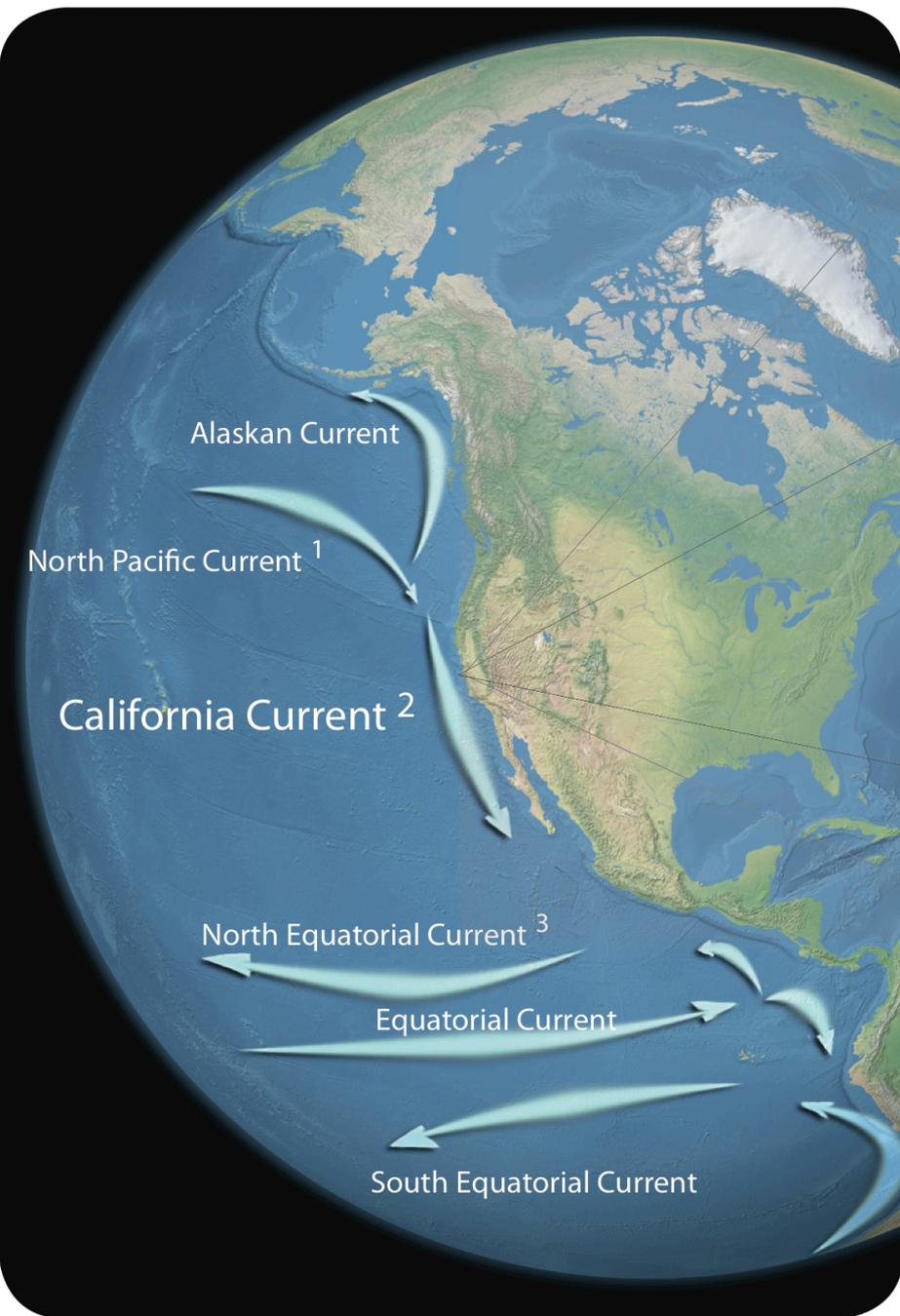
WWW.CENCOOS.ORG

Skogsberg 1946





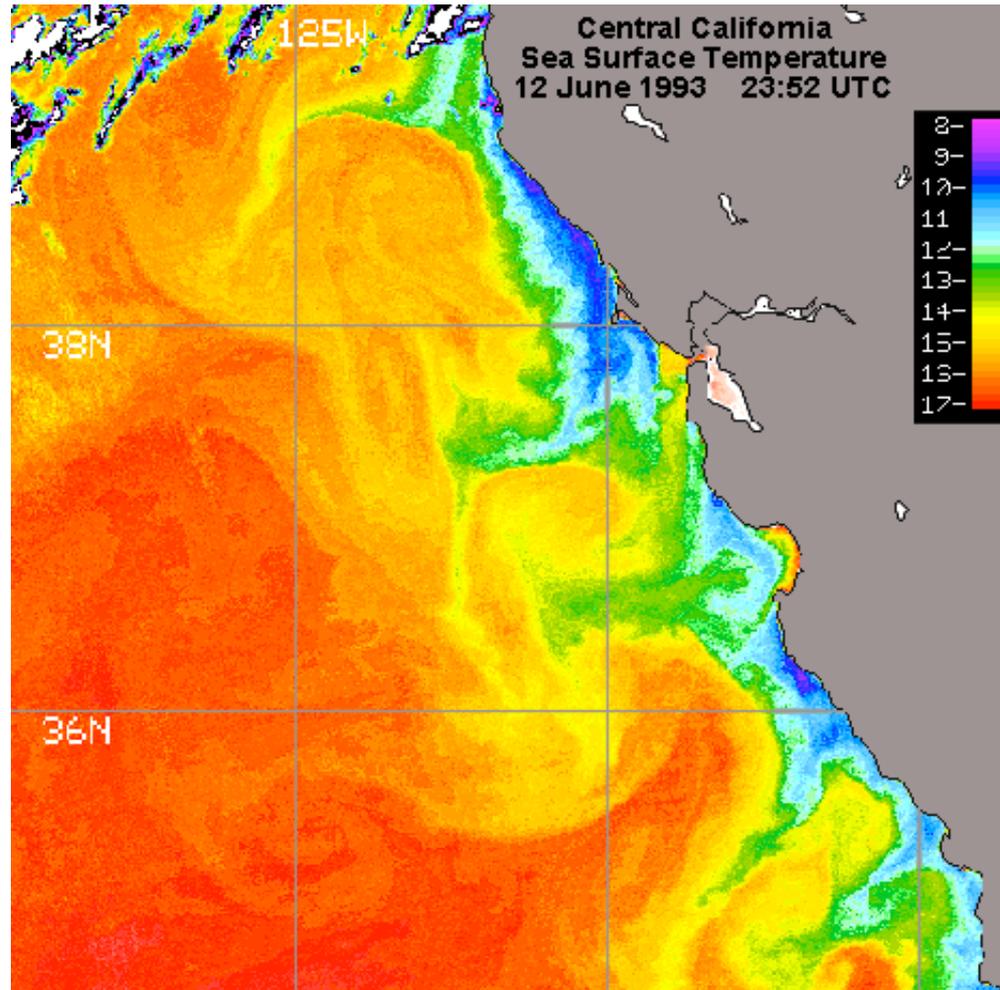




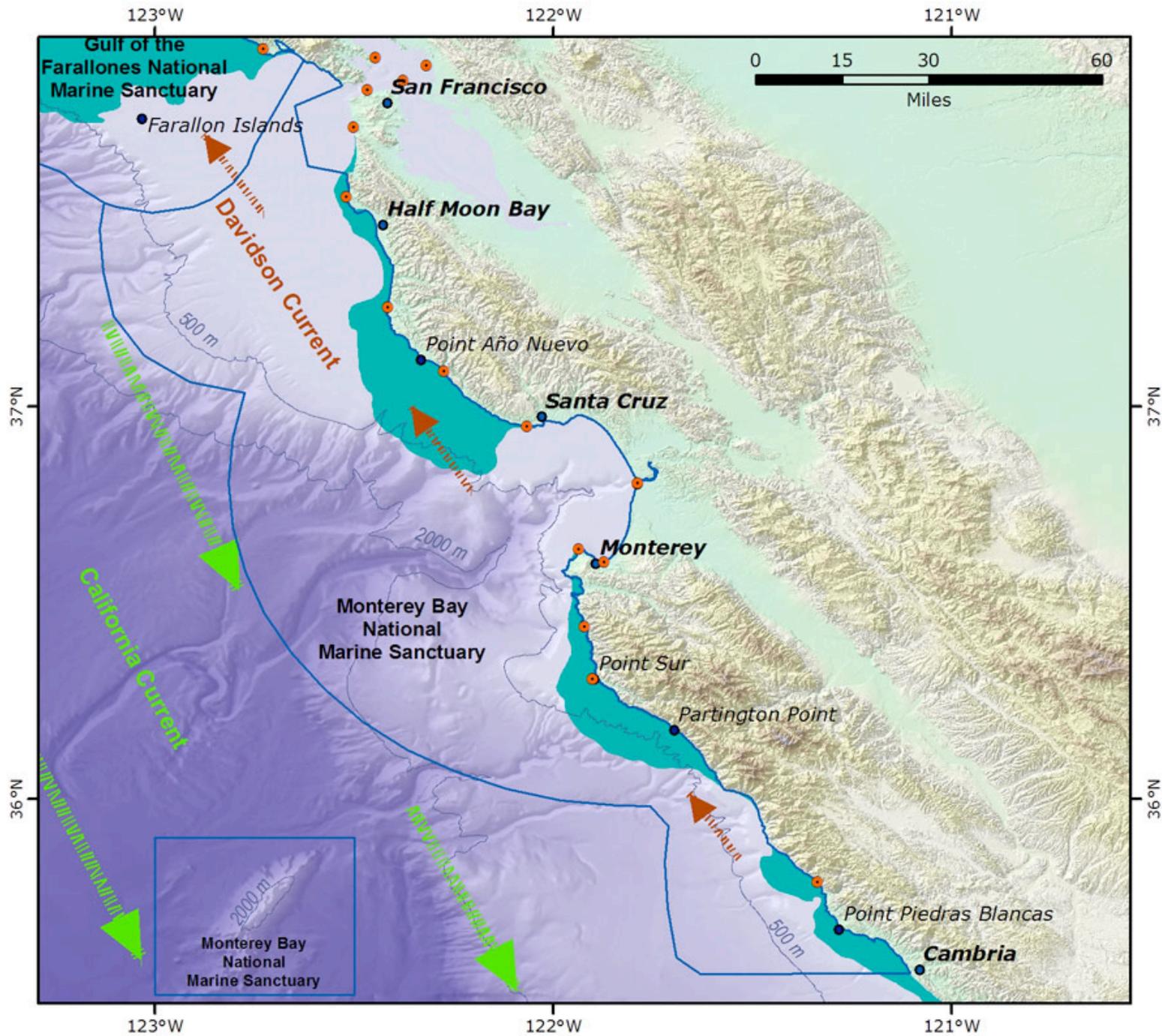
WWW.CENCOOS.ORG

Skogsberg 1946

Eddies and Coastal Jets

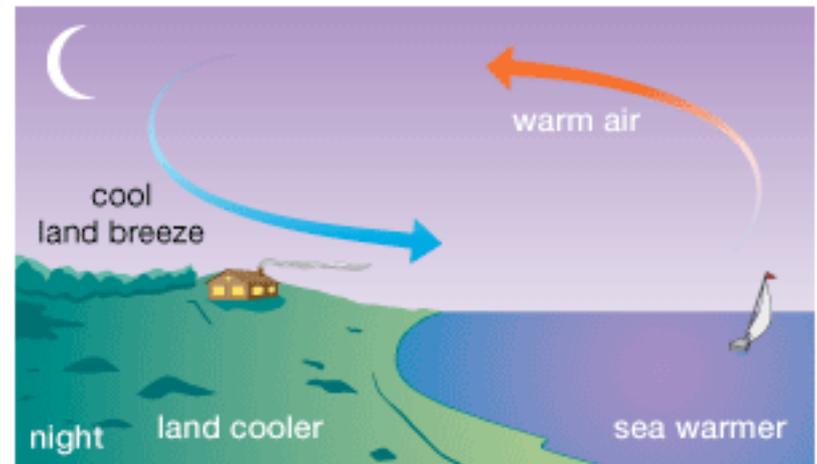
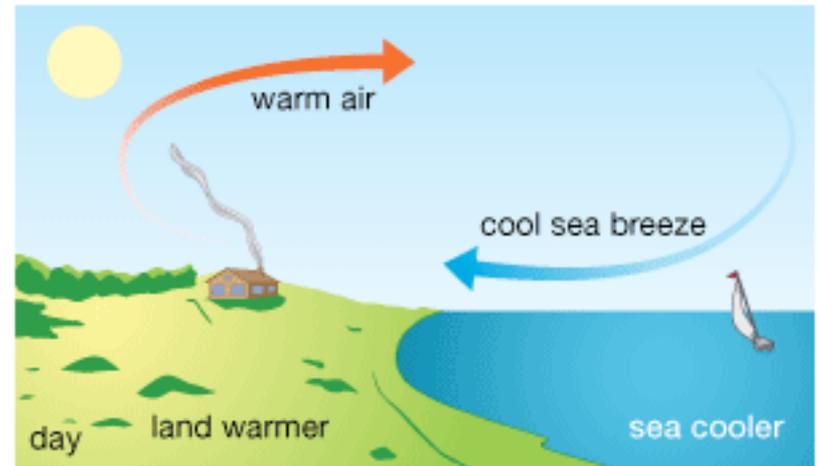


AVHRR infra-red image of sea surface temperature



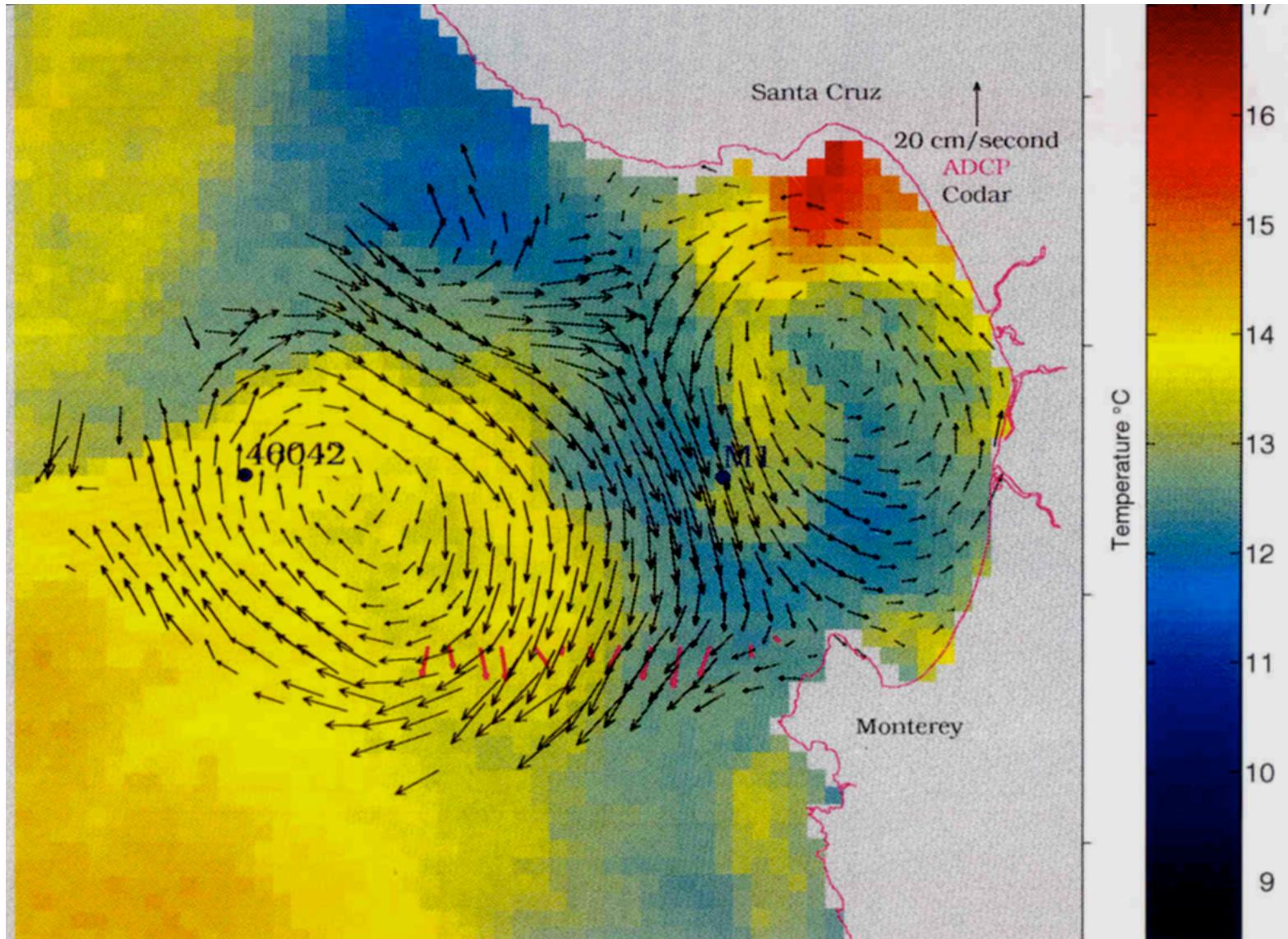
Physical Drivers of Monterey Bay

- California current system
- Mixed semidiurnal tide
- Local Sea-Breeze Winds
- Wind Jets influenced by local land topography

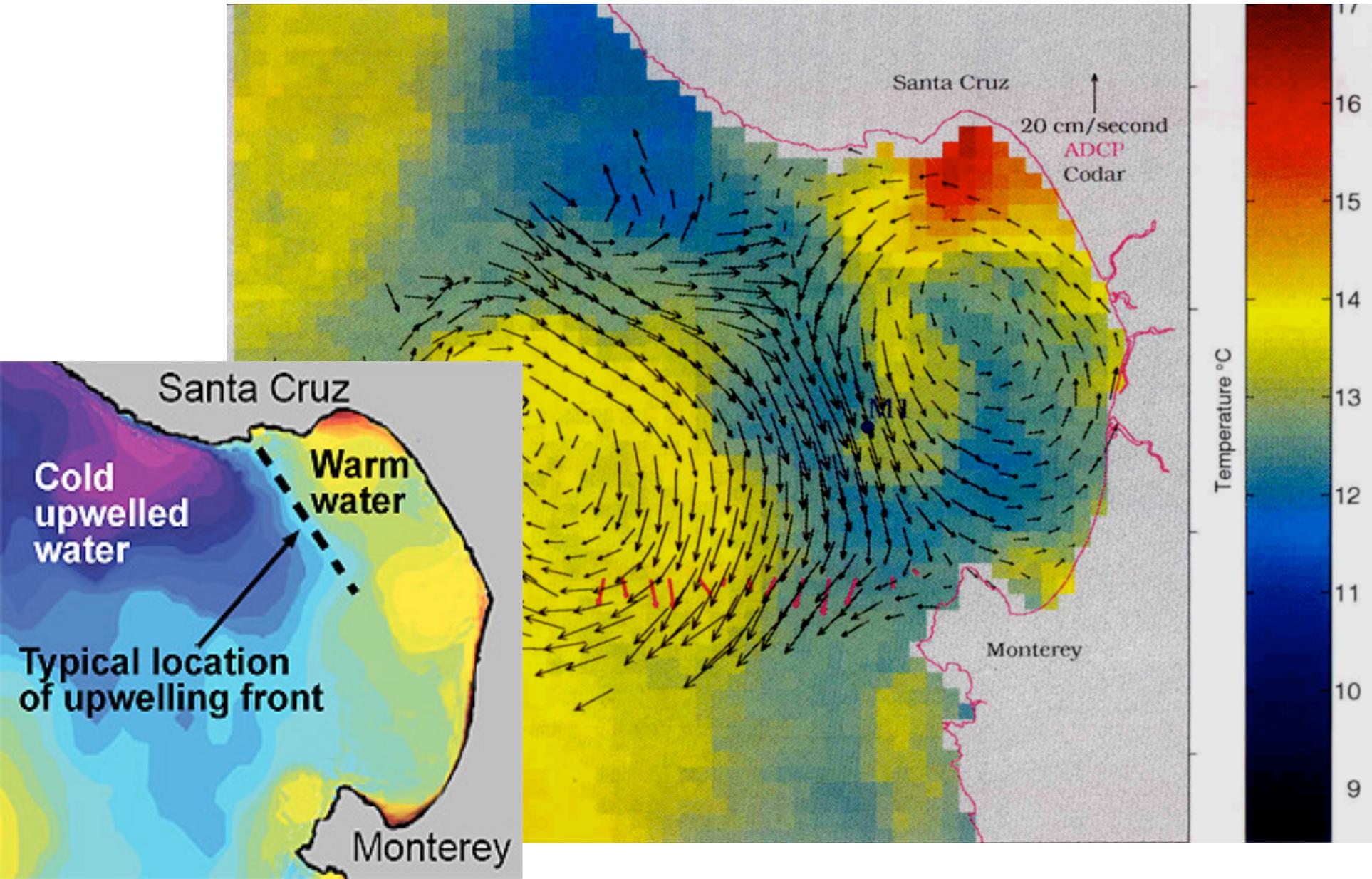


© 2010 Encyclopædia Britannica, Inc.

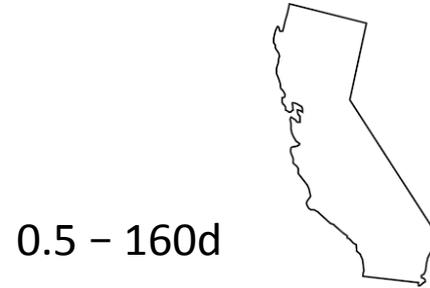
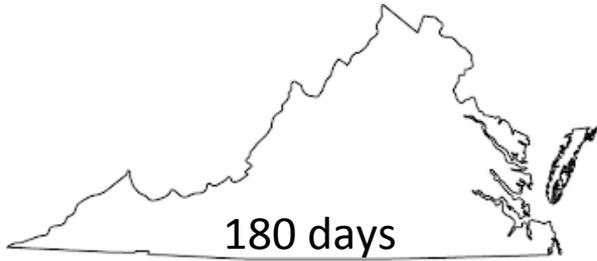
Circulation of Monterey Bay



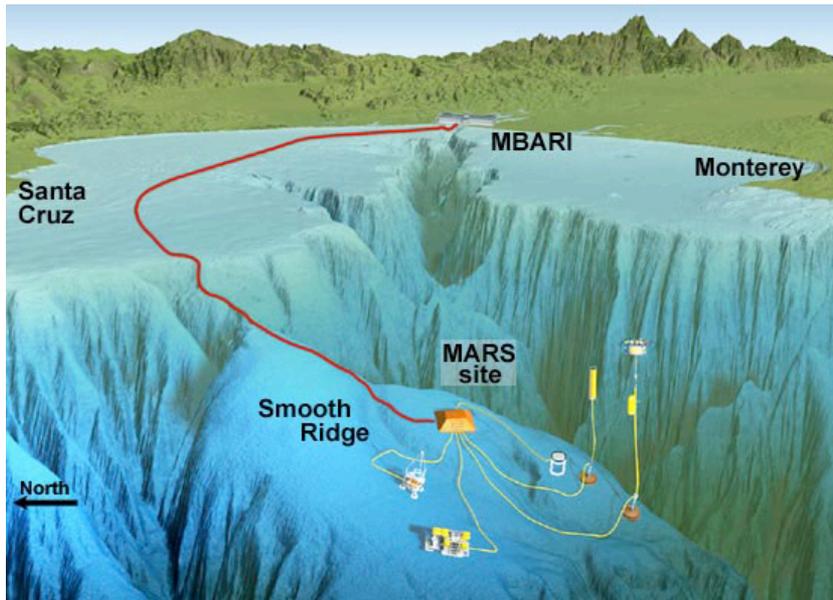
Upwelling Shadow



How does residence time impact the regional ecosystem?

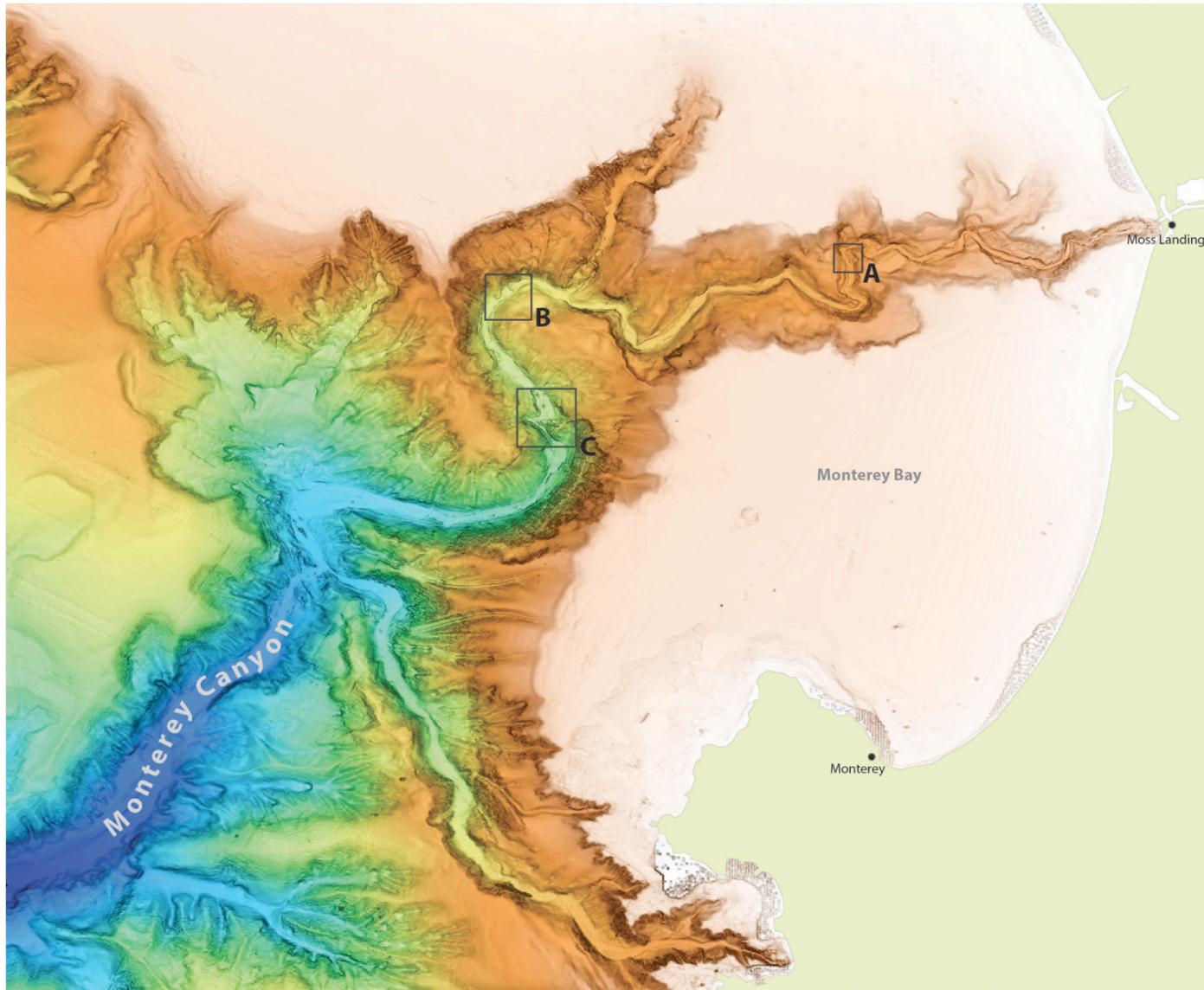


What other features affect circulation

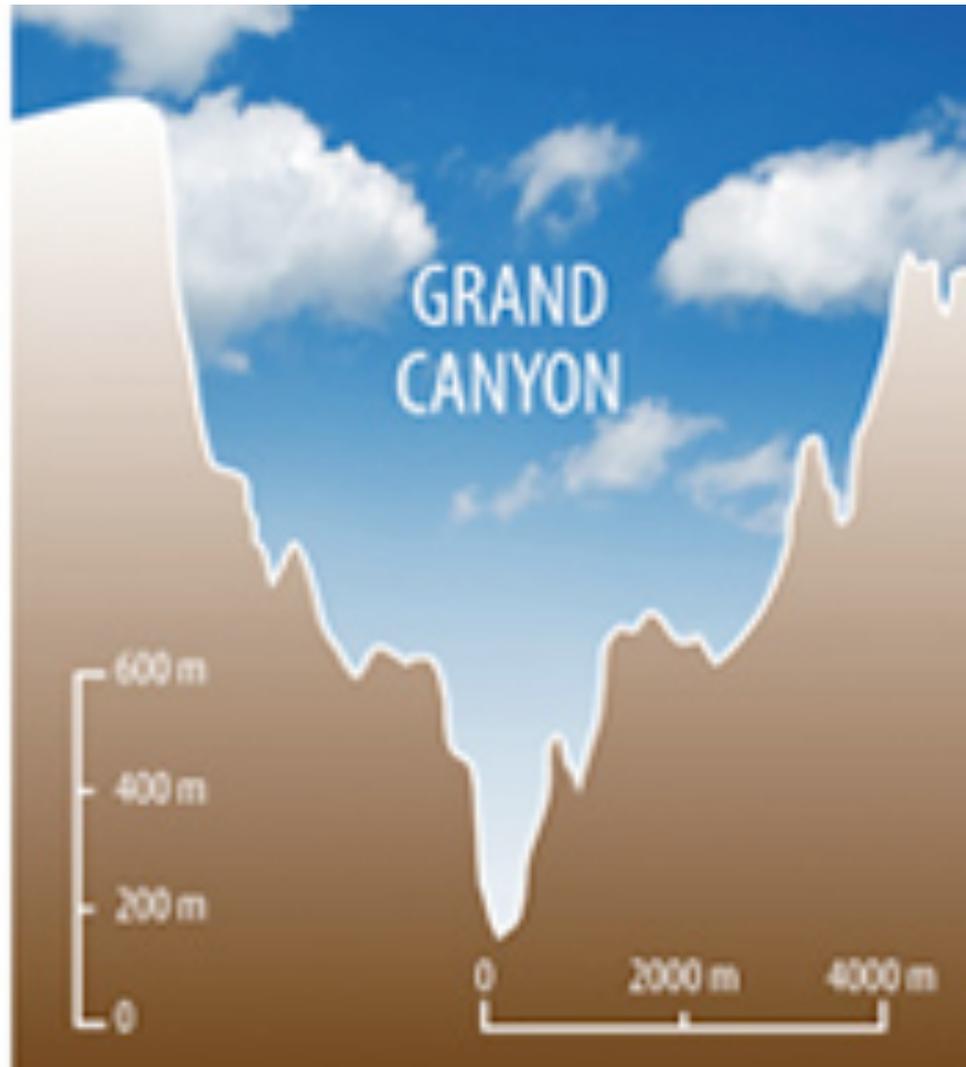
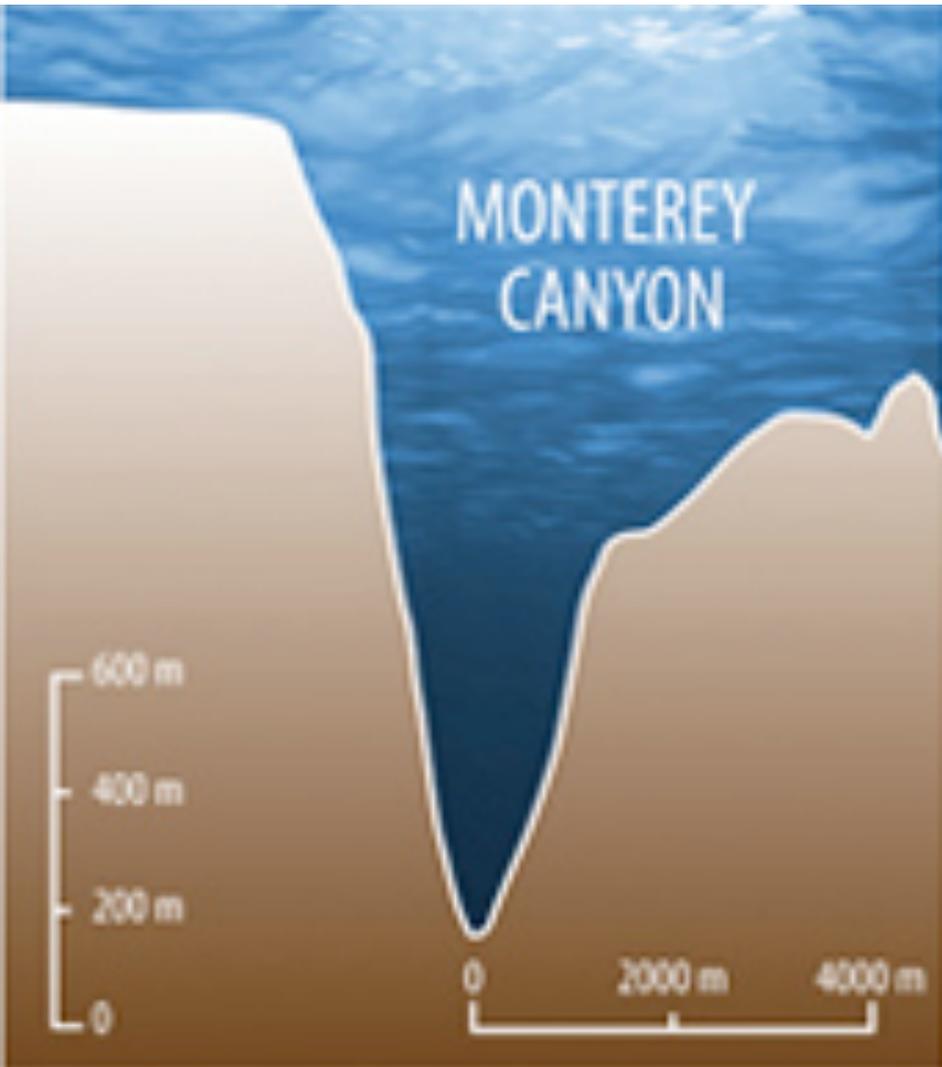


[Hint]

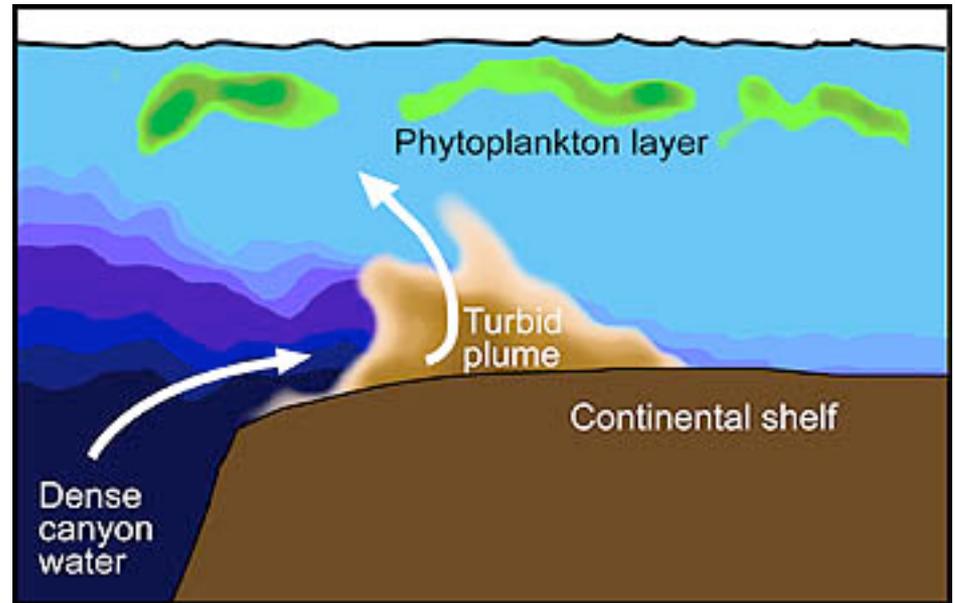
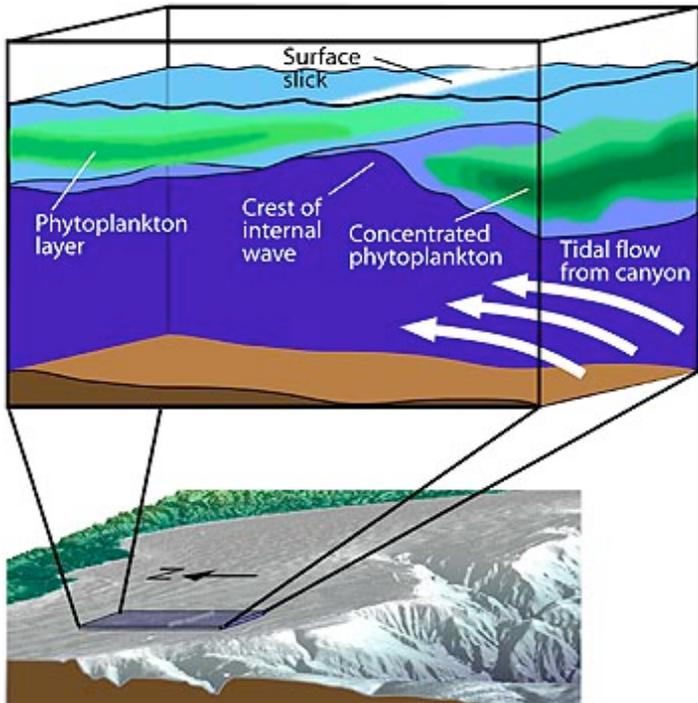
Submarine Canyon



Submarine Canyon



Bathymetry affects circulation





“SEASONS” of the CA CURRENT System

AUG - NOV



Oceanic
Warm Water Phase

NOV - MARCH



WINTER
Low Thermal Gradient or
Davidson Current period

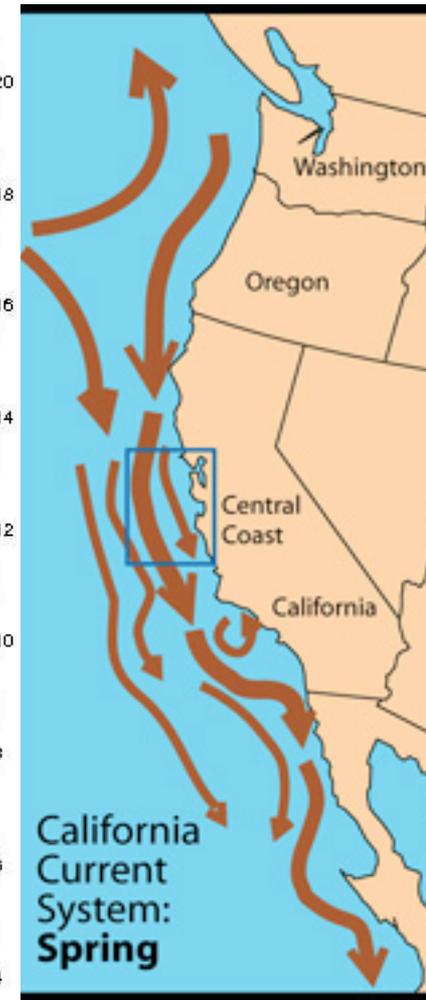
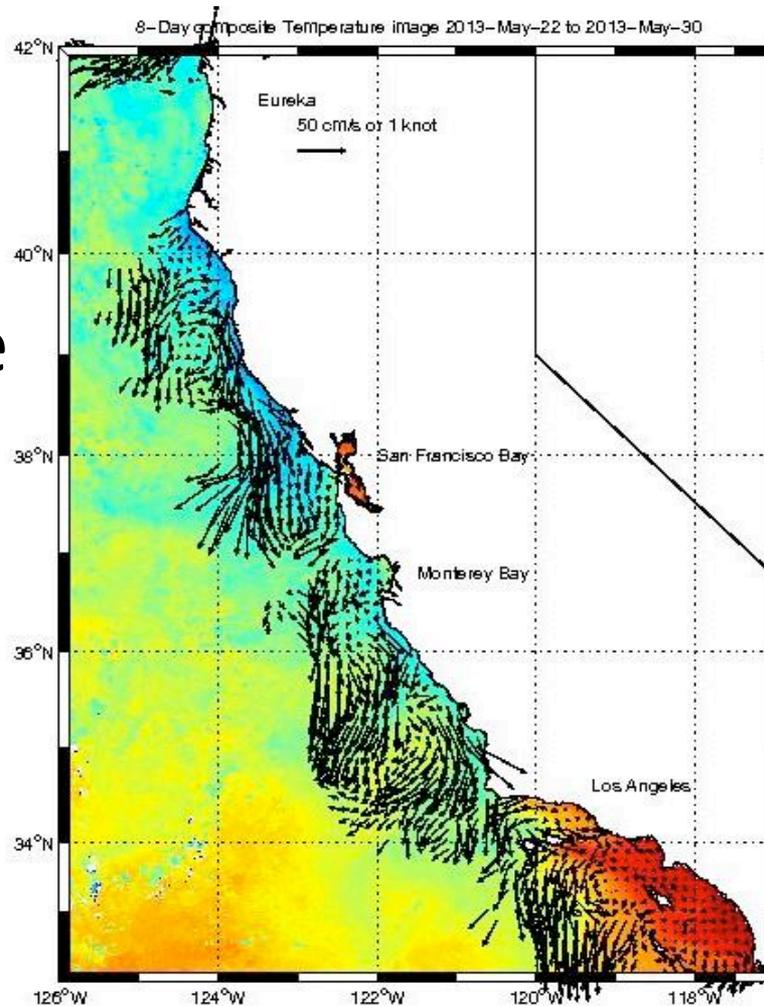
MARCH - AUGUST



UPWELLING
Cold Water Phase

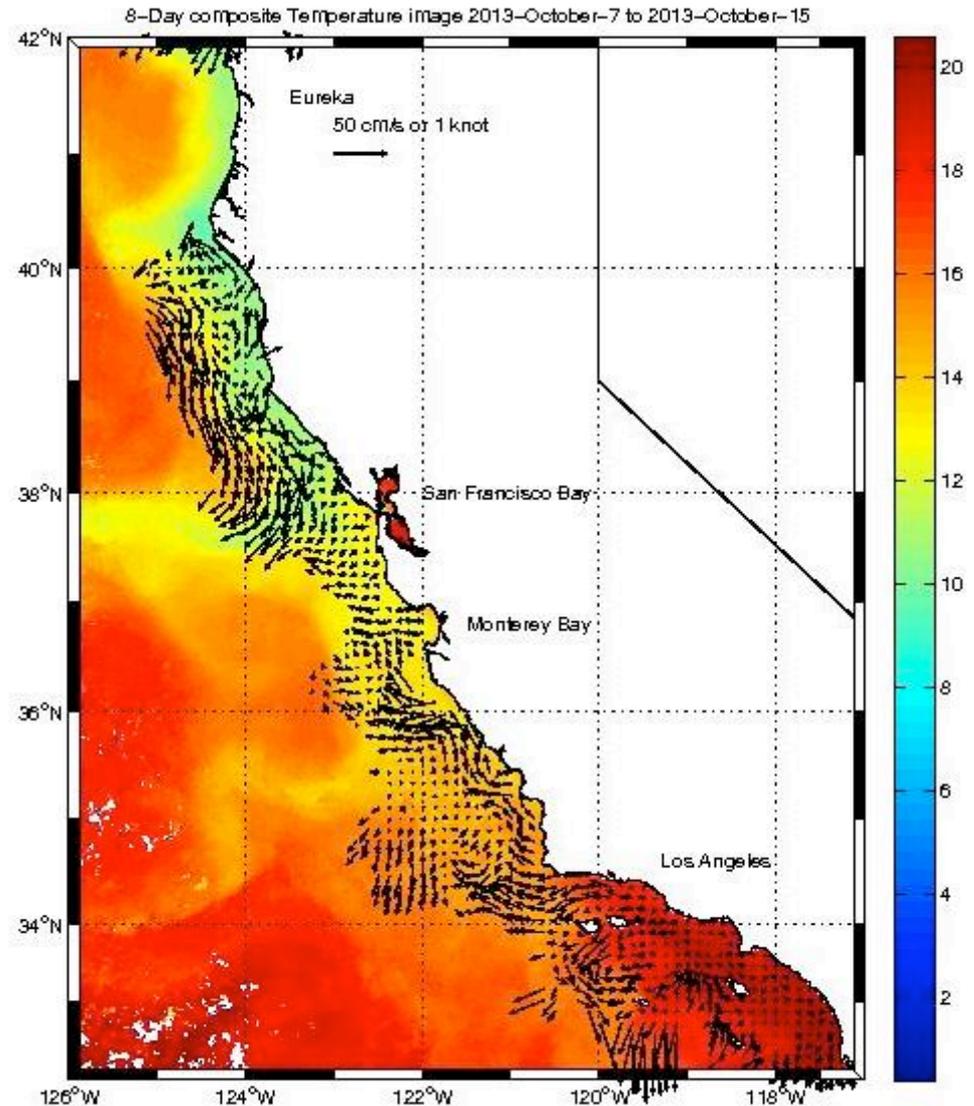
Upwelling Season

- MAR-AUG
- NW winds move waters offshore



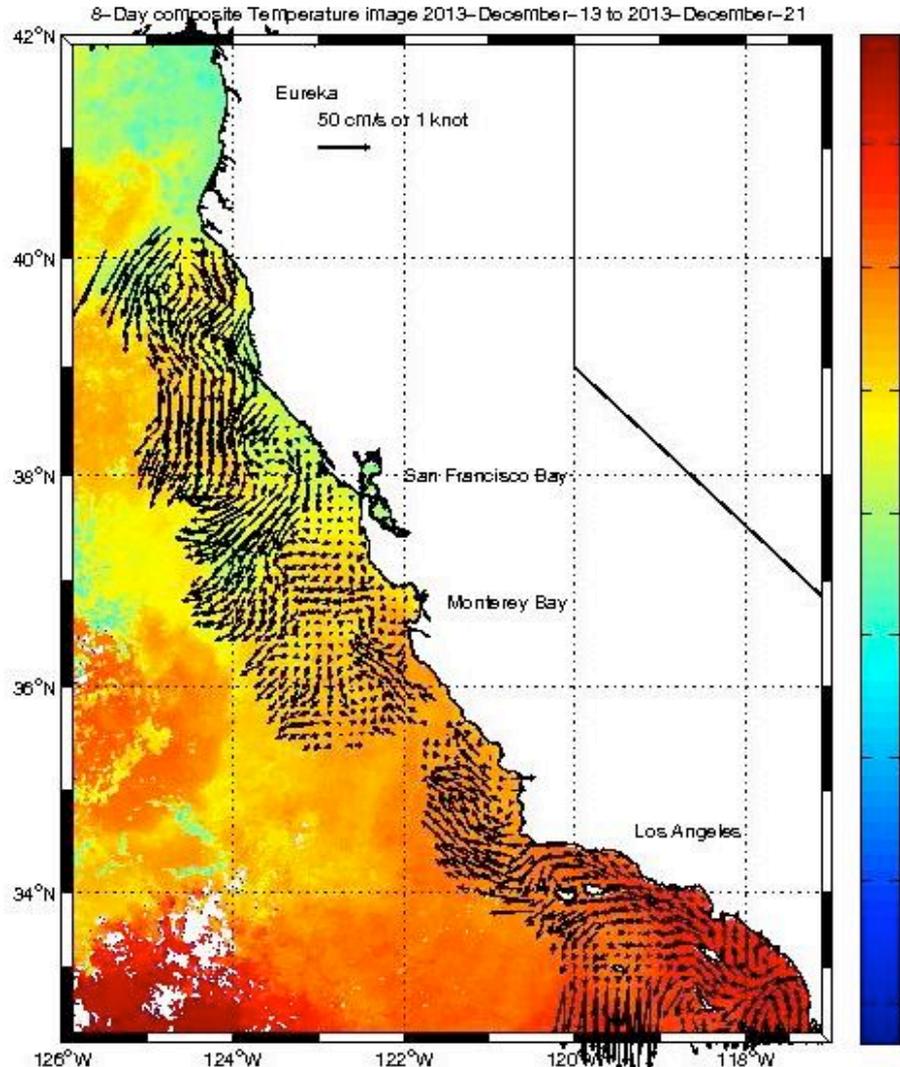
Oceanic Season

- AUG-NOV
- Winds light / variable
- Upwelling absent
- offshore waters move inshore where surface water is heated by sun



Winter Season

- NOV-MAR
- southerly winds off California, along with large waves
- Storm-related deep mixing
- northward Davidson Current enhanced



“SEASONS” of the CA CURRENT System

AUG - NOV

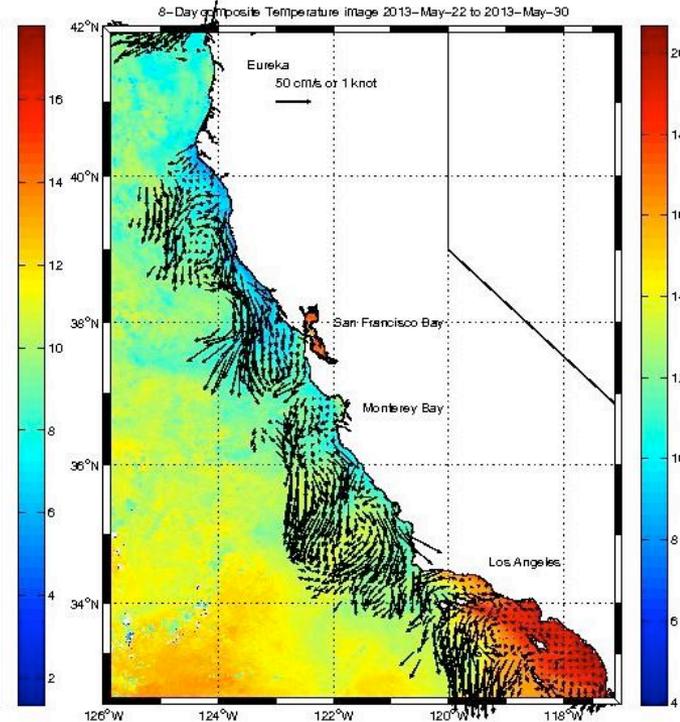
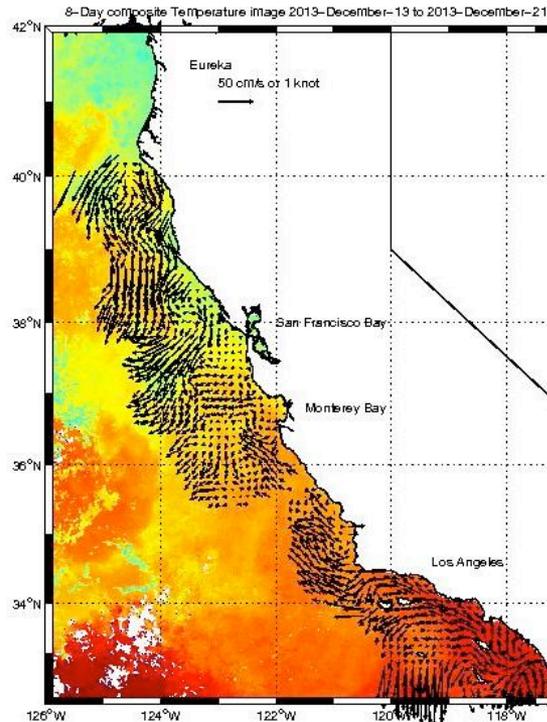
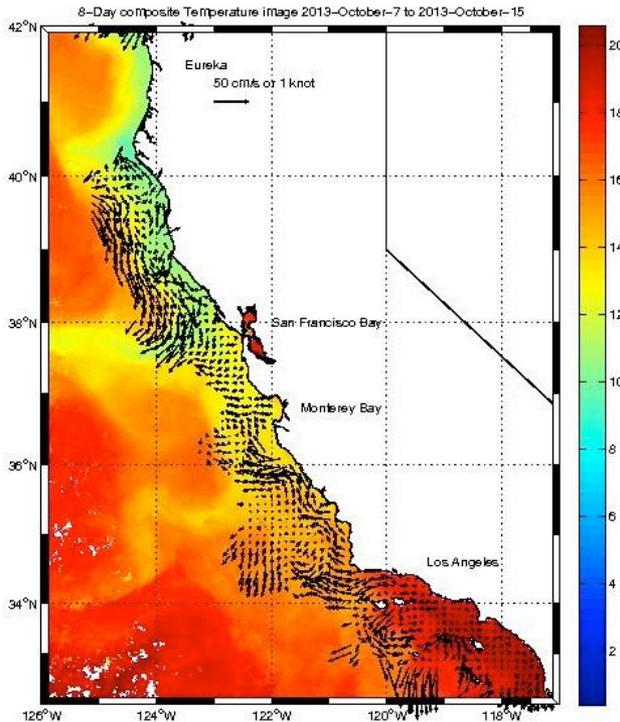
NOV - MARCH

MARCH - AUGUST

Oceanic

WINTER

UPWELLING



Warm Water Phase

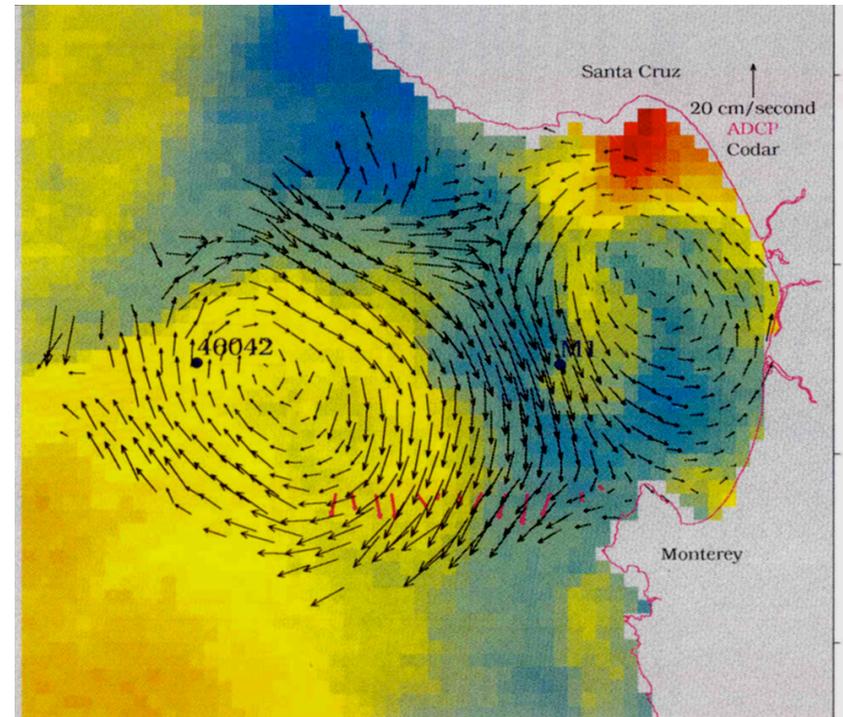
Low Thermal Gradient or
Davidson Current period

Cold Water Phase

Physical-Biological Coupling!

EXAMPLES: PHYSICS IMPACTS BIOLOGY

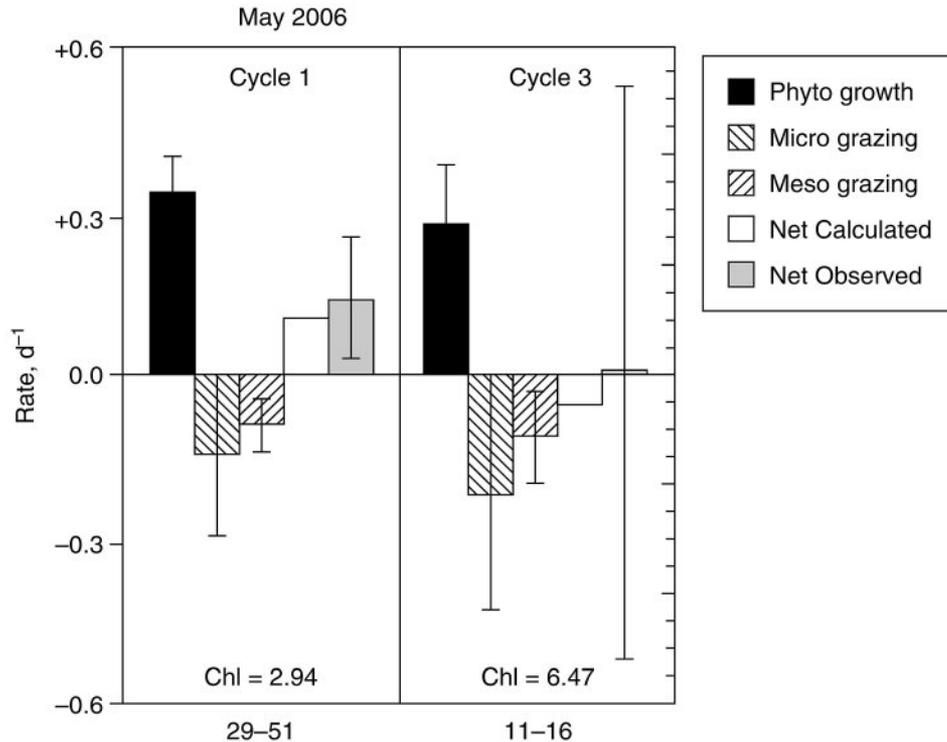
- Advection and Flushing
- Intense upwelling effects
- “Upwelling shadow” effects
- El Niño-Southern Oscillation (ENSO)



El Nino CA impacts

- <https://www.youtube.com/watch?v=69N494UIIS8>

Zooplankton Grazing

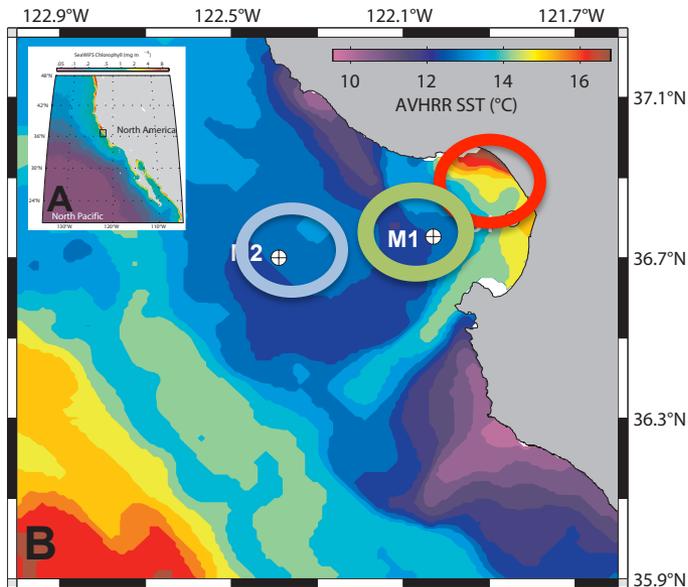


Mesoscale features (Eddies and meanders) yield predictable zooplankton gradients.

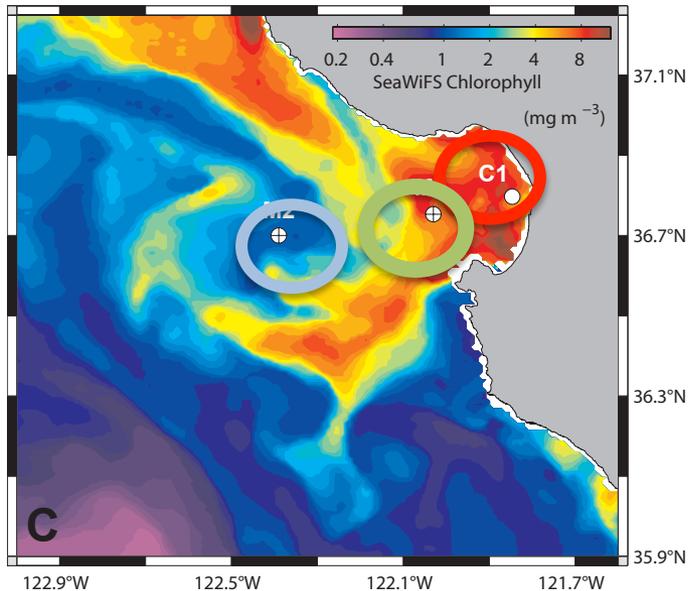
- Krill and copepods
- Larvaceans
- Jellies

- Landry et al. 2009
- Huntley et al. 1995
- Mackas et al. 1991

Long – Term Monitoring Stations

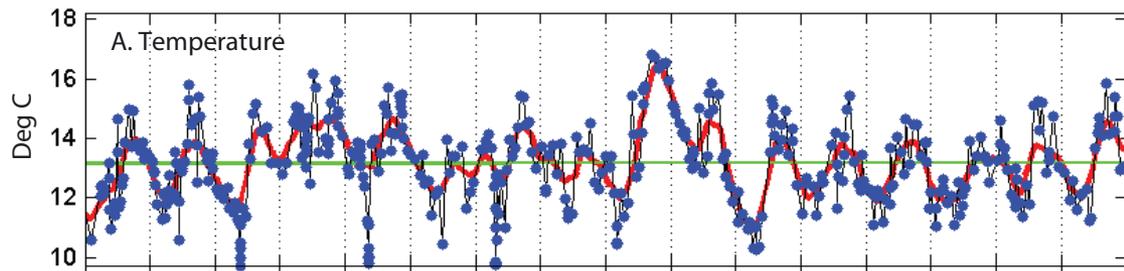


Sea Surface
Temperature

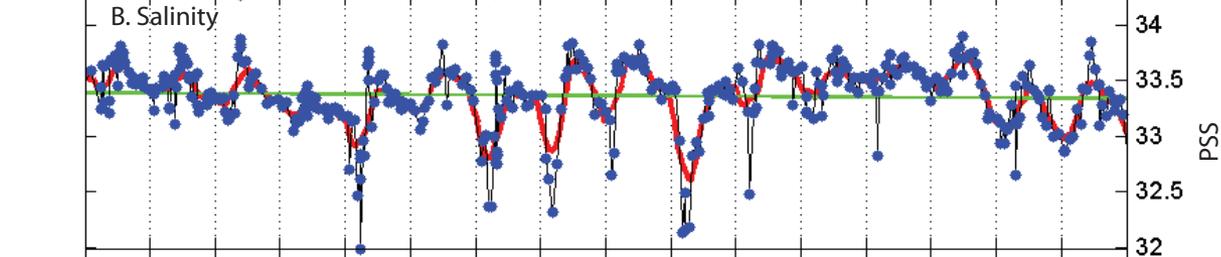


Satellite Chl *a*

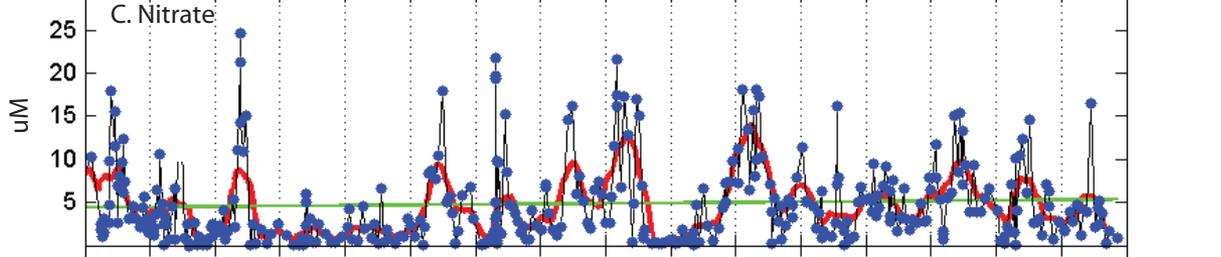
Temperature



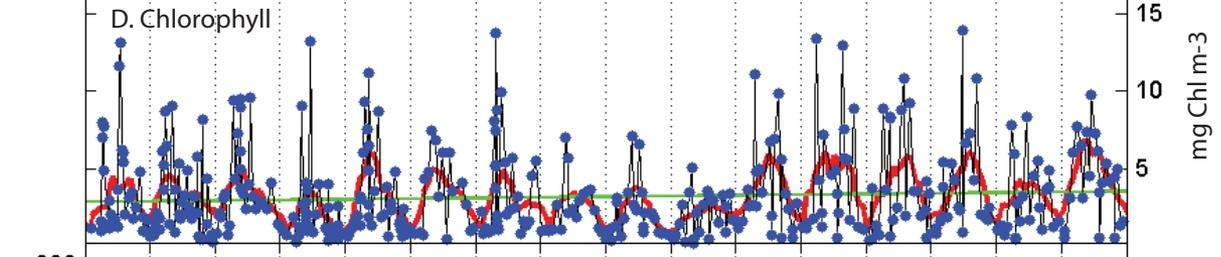
Salinity



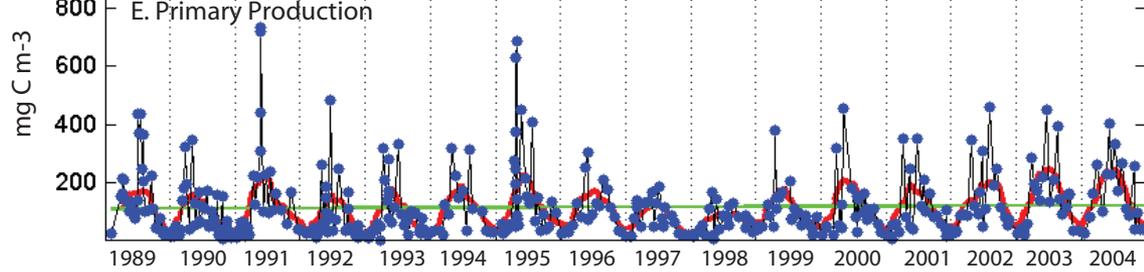
Nitrate



Chl *a*

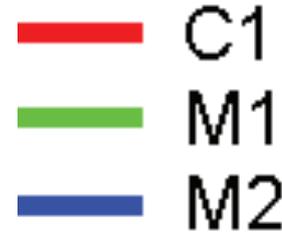
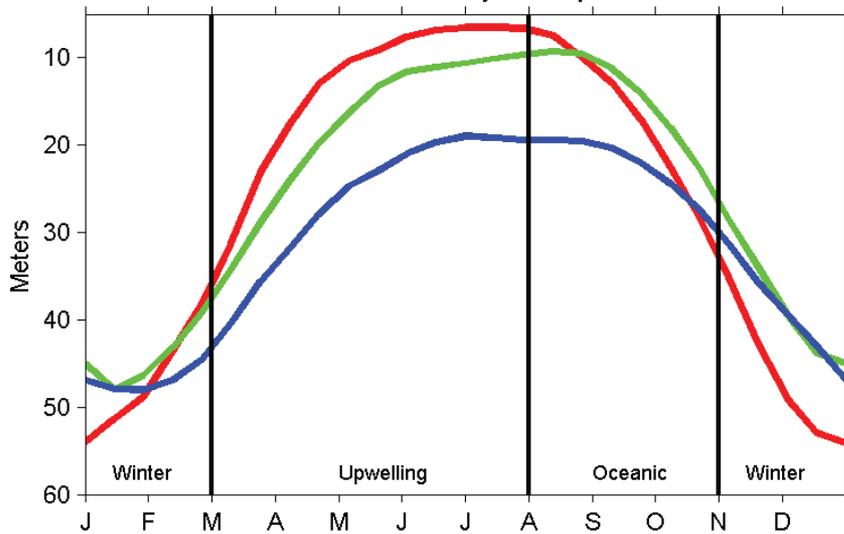


Primary
Production

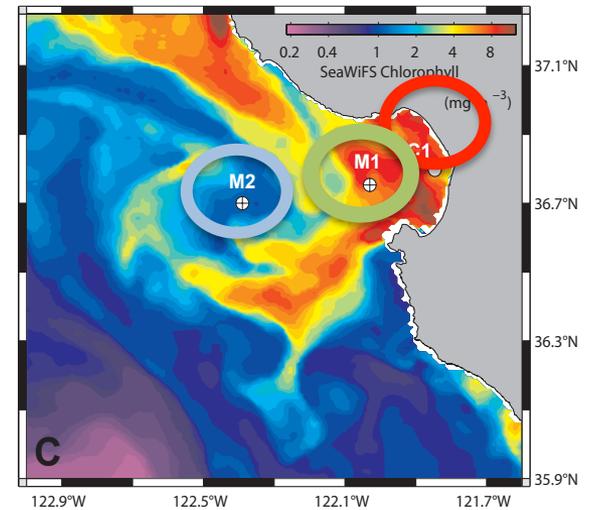
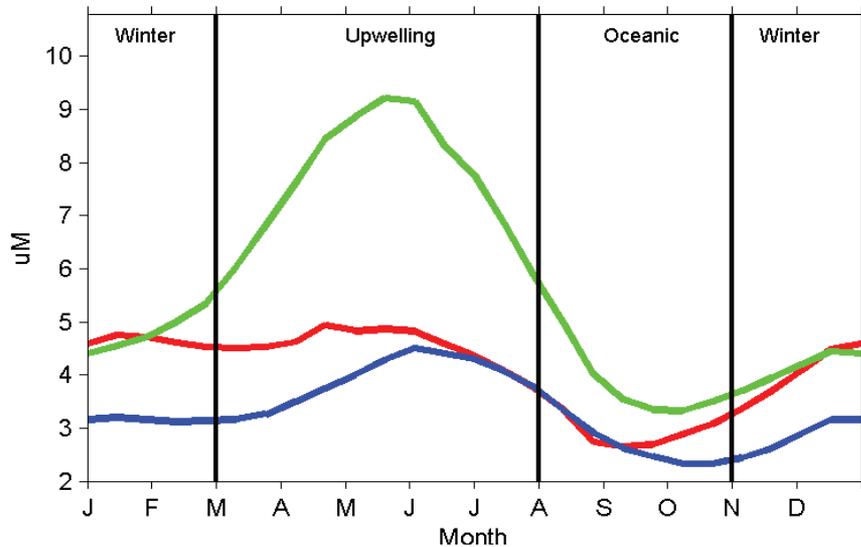


Monterey Bay Mean Annual Cycle

C. Mixed Layer Depth

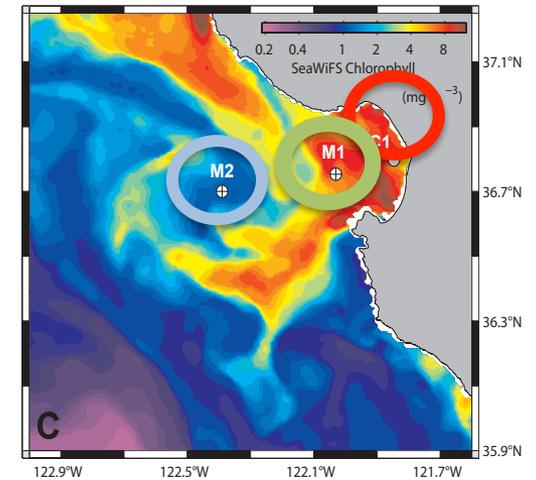
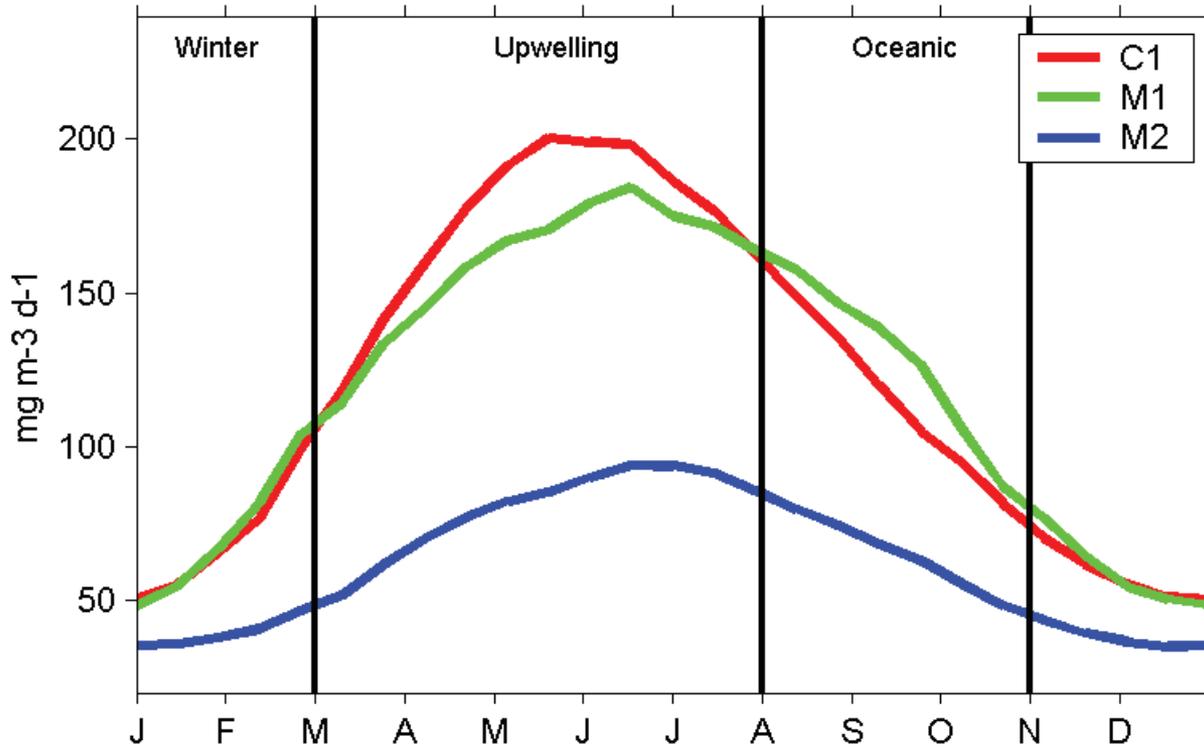


D. Nitrate



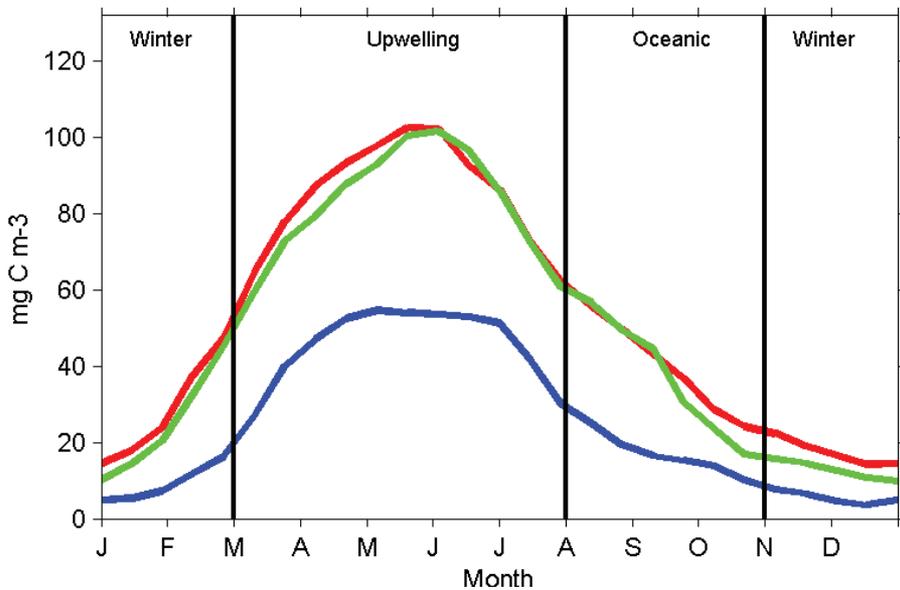
Monterey Bay Mean Annual Cycle

G. Primary Production

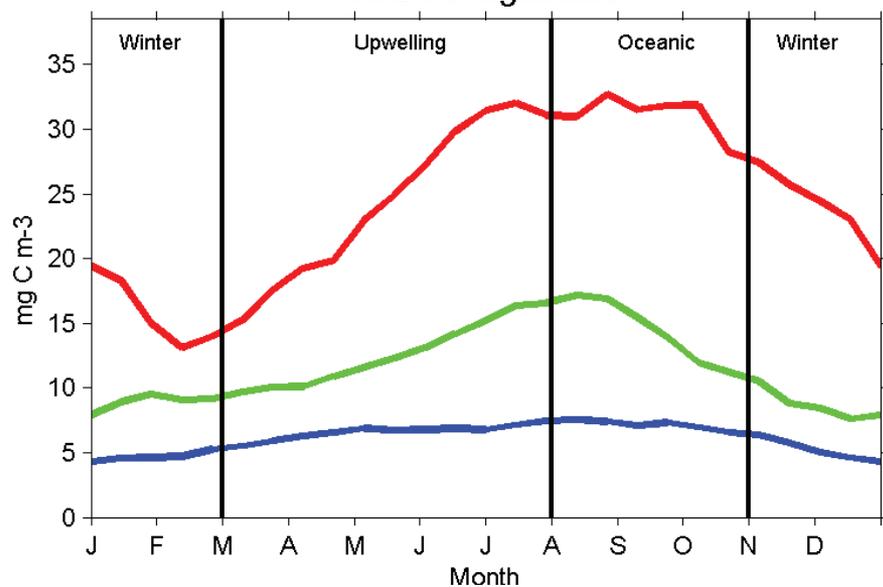


— C1 **In bay**
— M1 **Upwelling jet**
— M2 **Offshore**

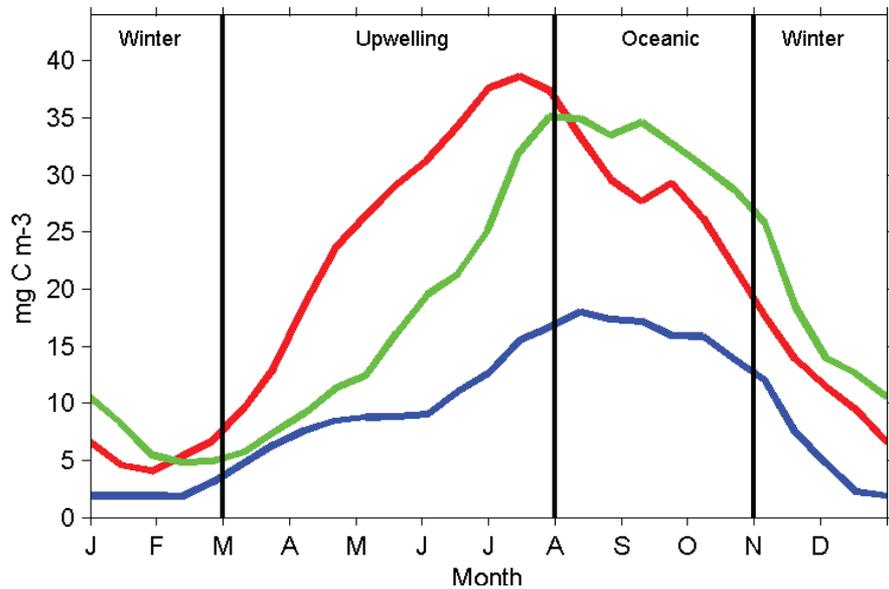
I. Centric Diatoms



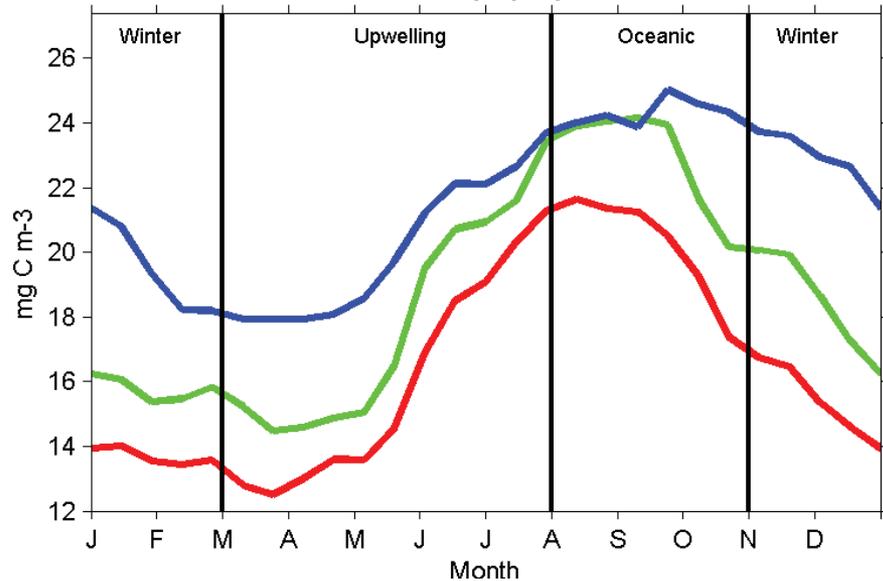
K. Dinoflagellates



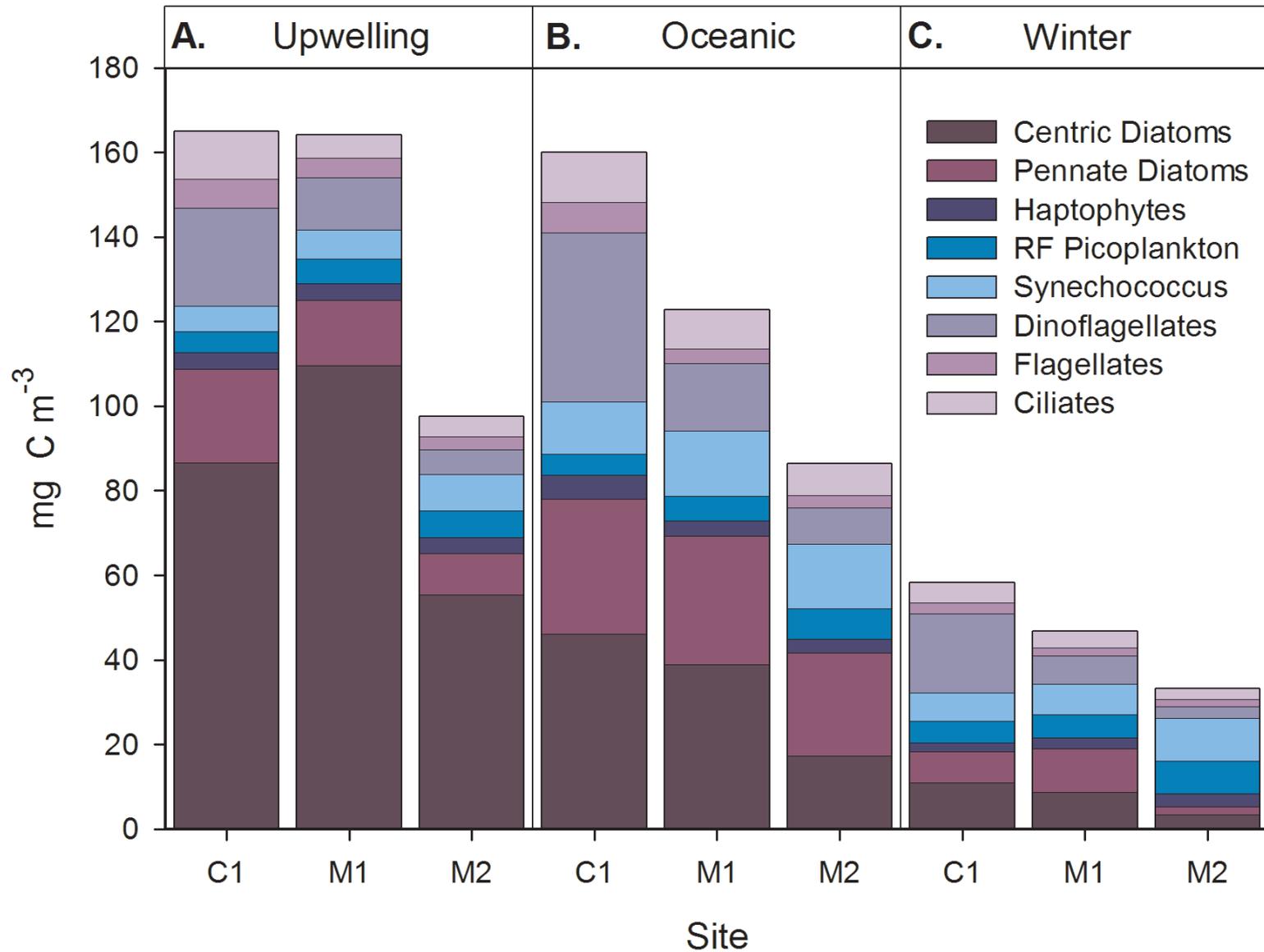
J. Pennate Diatoms



L. EFM Picophytoplankton

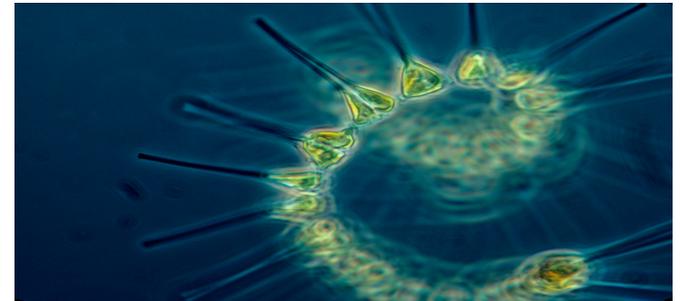


Taxonomic Composition

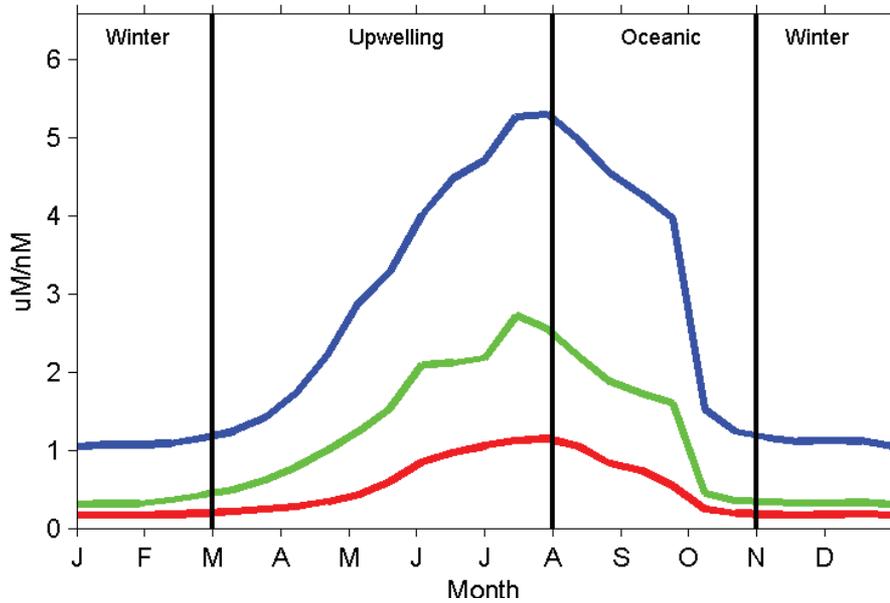


General Trends in the Phytoplankton

- Carbon dominated by phytoplankton year – round.
- Upwelling
 - Peak phytoplankton carbon (centric diatoms)
- Oceanic
 - Peak pennate diatom and flagellate carbon
- Winter
 - Low biomass
 - Downwelling/Deep Mixing



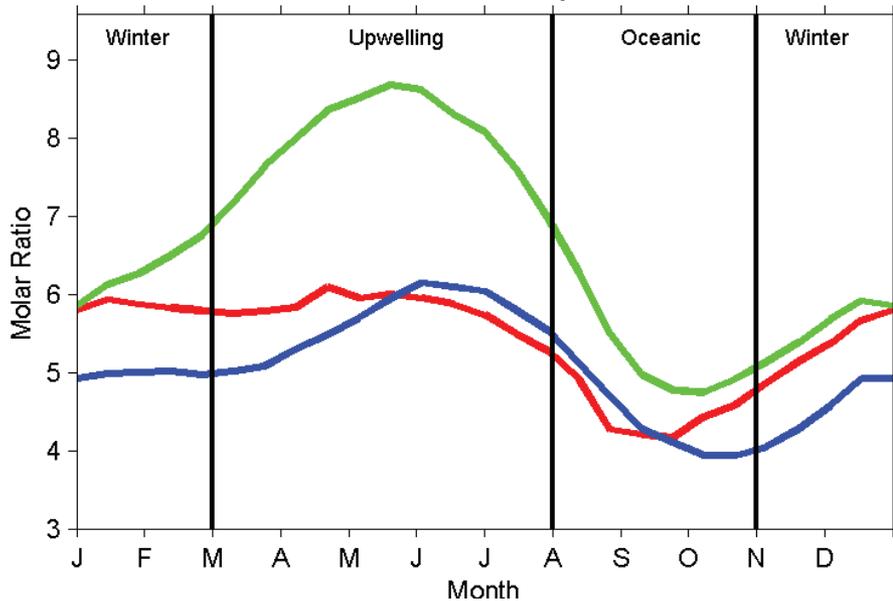
D. Nitrate/Dissolvable Iron



- C1 In bay
- M1 Upwelling jet
- M2 Offshore

What role do nutrients play in limiting phytoplankton growth?

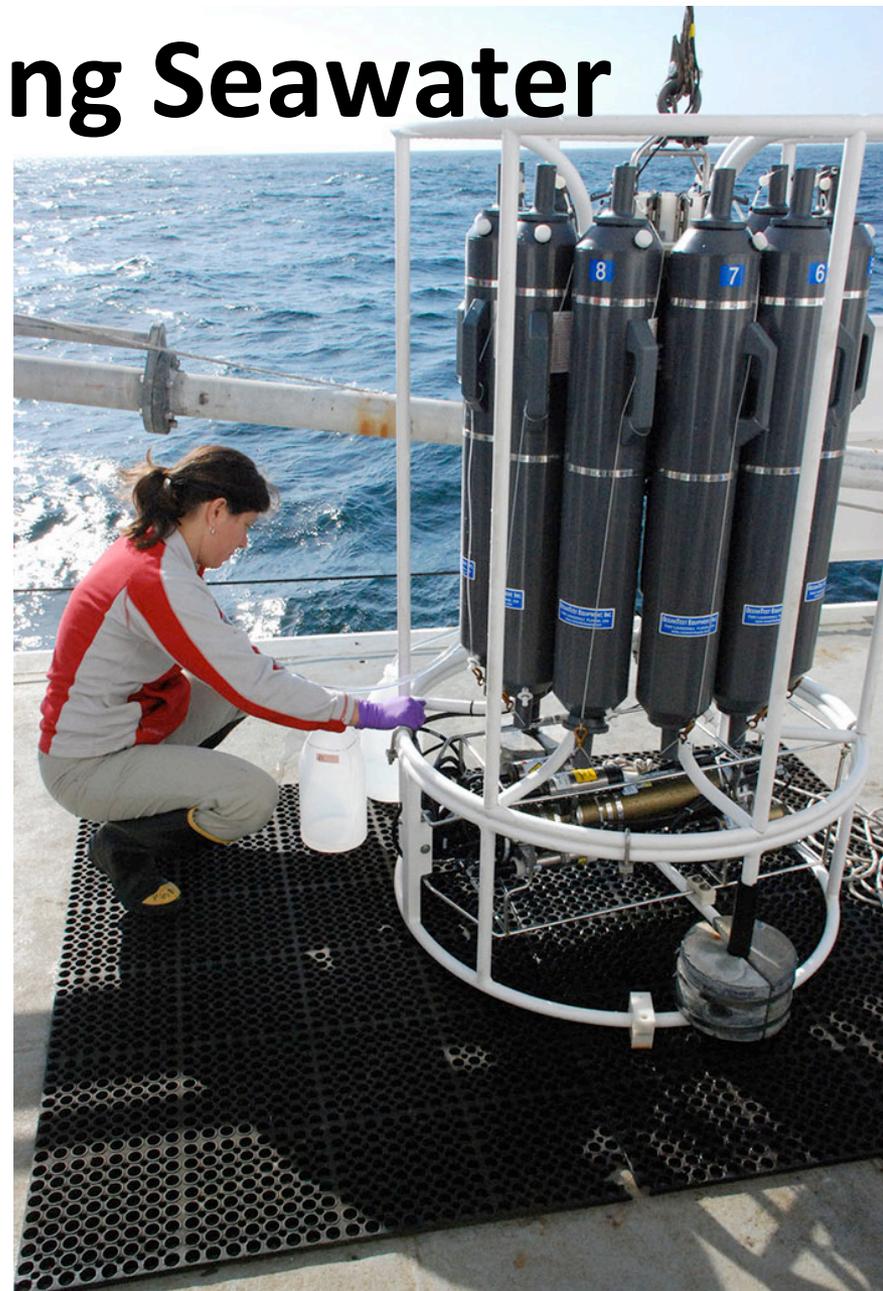
E. Nitrate/Phosphate



Cruise: Collecting Seawater

CTD Sampling

- Nutrients
- Chlorophyll a



Cruise: Filtering Seawater

Filtering

- Dissolved Nutrients
- Chlorophyll a

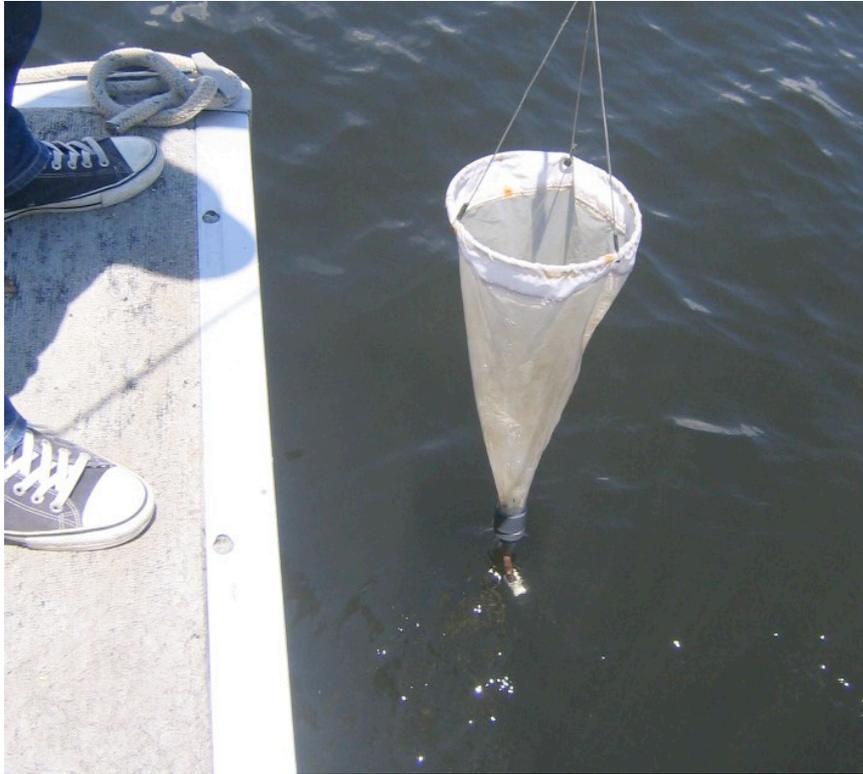


Cruise: Plankton Tow

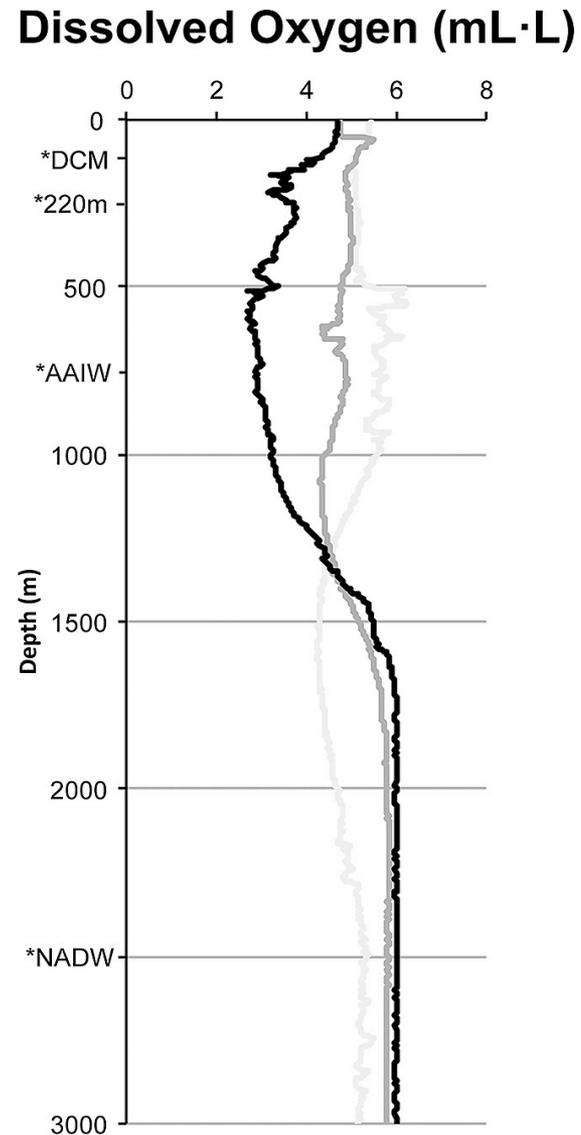
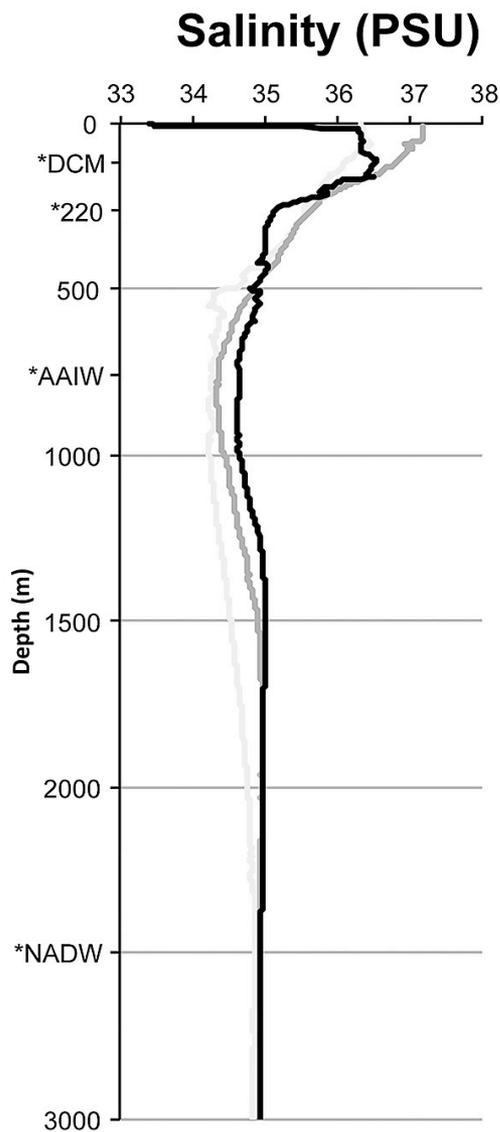
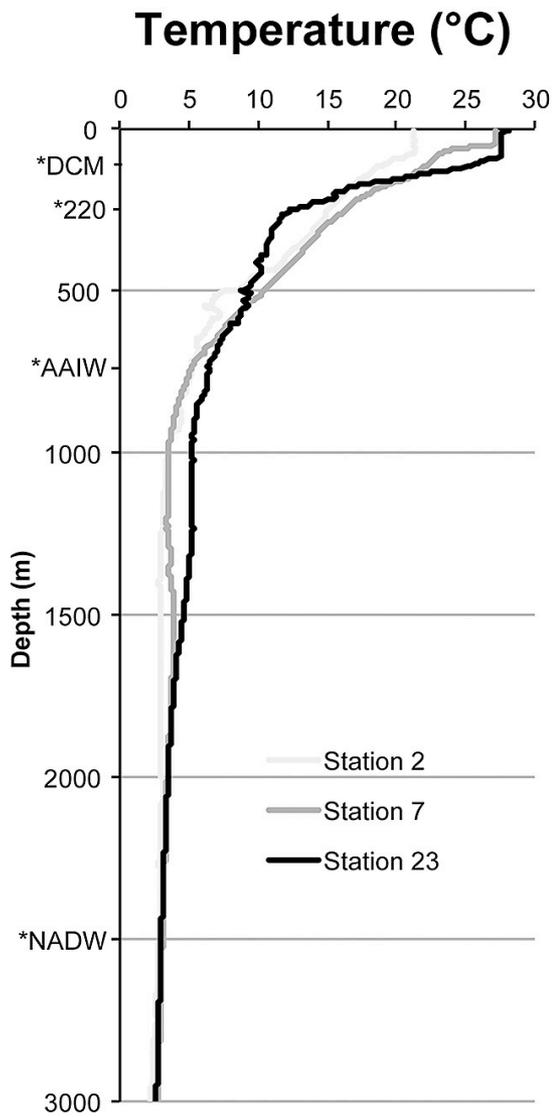
Front view



Cruise: Collecting Plankton!



In Situ Profiles from CTD

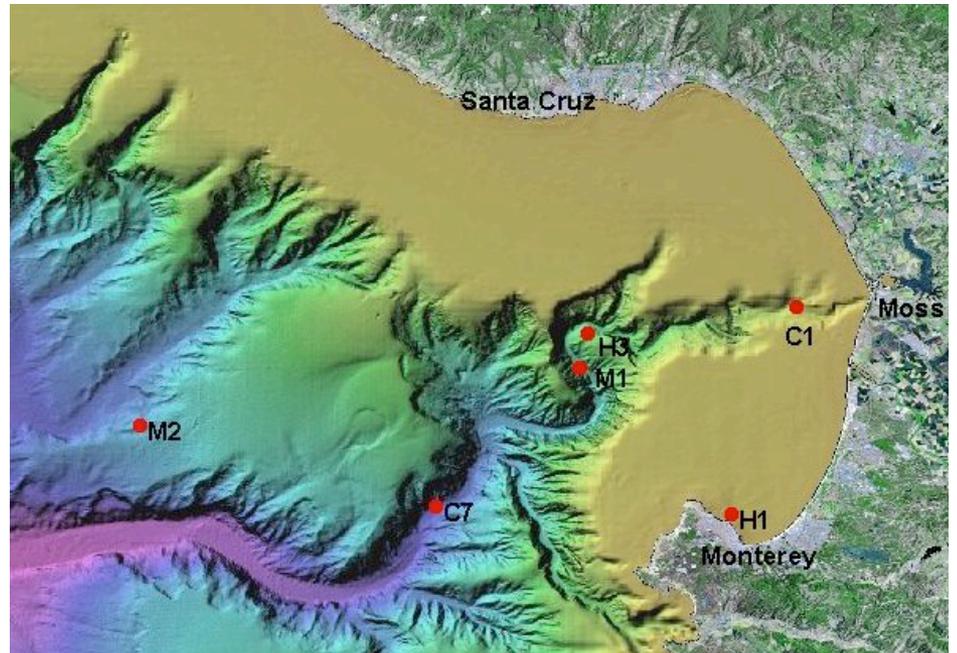
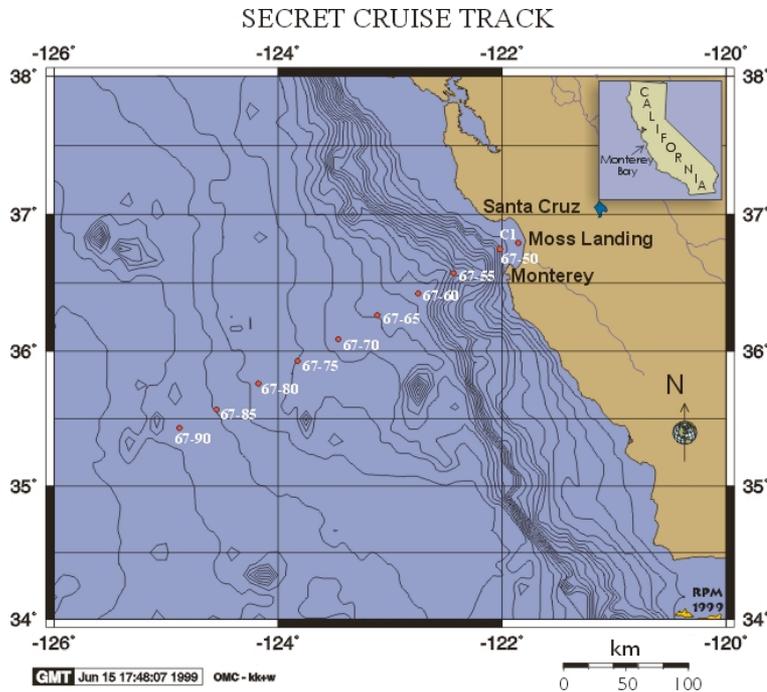


Observing





HISTORICAL DATA

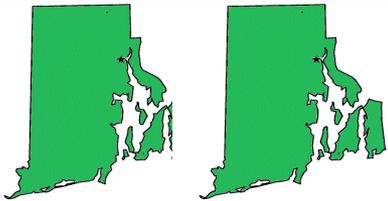


[Monterey Bay Climatologies](#)
[Monterey Bay Archive Data \(CTD, MOORINGS\)](#)

RESOURCES

- [Data! Monterey Bay](#)
- [Monterey Bay Satellite Temperature, Chlorophyll, Surface current overlays](#)
- [Monterey Bay Real Time Data](#)
- [Monterey Bay Phytoplankton Identification](#)
- [Monterey Bay Phytoplankton Monitoring](#)
- [ROV and Towed Sled Videos of the benthos](#)
- [Background](#)

How many people live within 50 miles of the coast of Monterey Bay?



Coupled Human-Natural Systems

- Commercial Fisheries
- Commercial shipping
- Harbors
- Agriculture
- Military Bases
- Tourism/Recreation
 - Boating
 - Fishing
 - Diving
 - Intertidal collecting
 - Surfing
 - Nature/Ecotourism