

# Determining the influence of climate change on the ecosystem

*Relating declines of Steller sea lion populations to their physical environment*

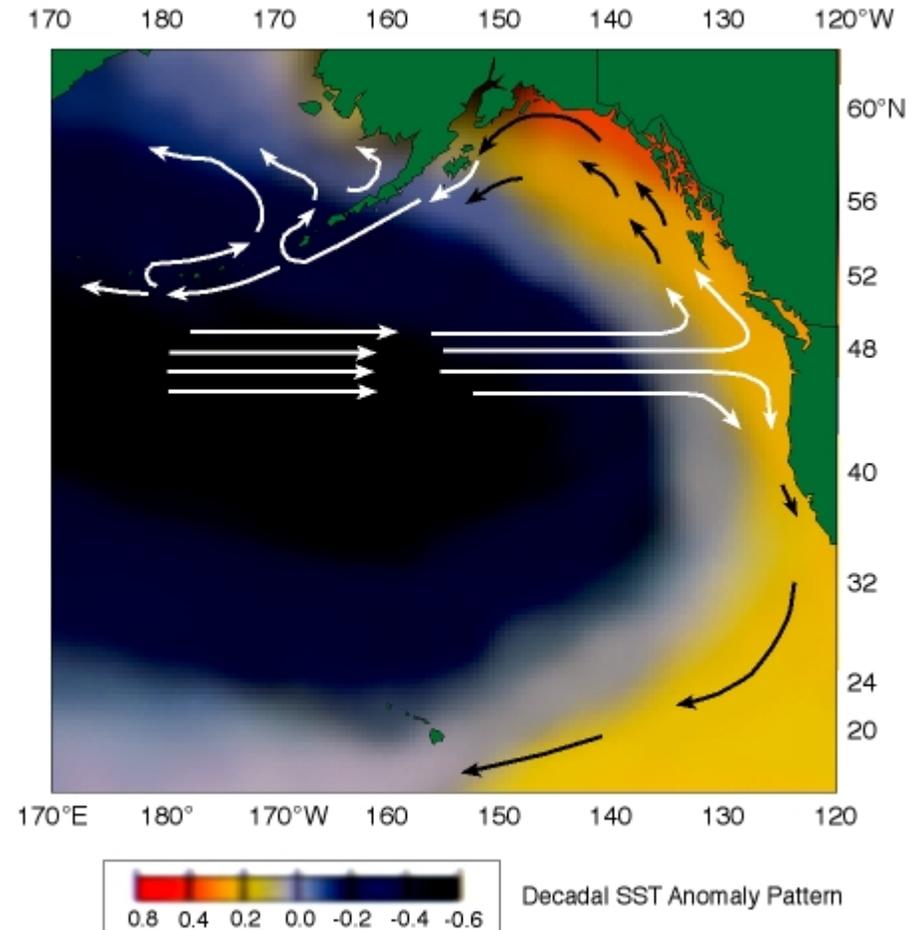
- Basin scale (PDO)
- Regional scale (Alaskan Stream and subarctic gyre)
- Local scale (Aleutian Passes and Kodiak Island rookeries)



## Basin-scale climate variability

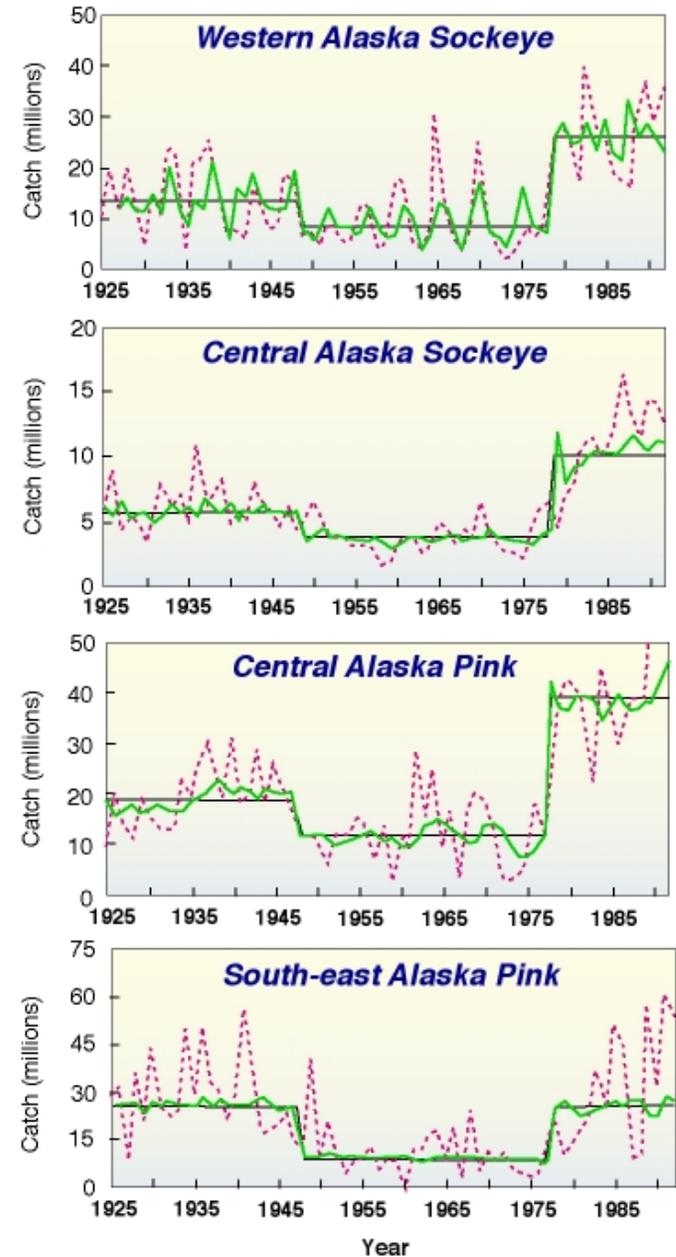
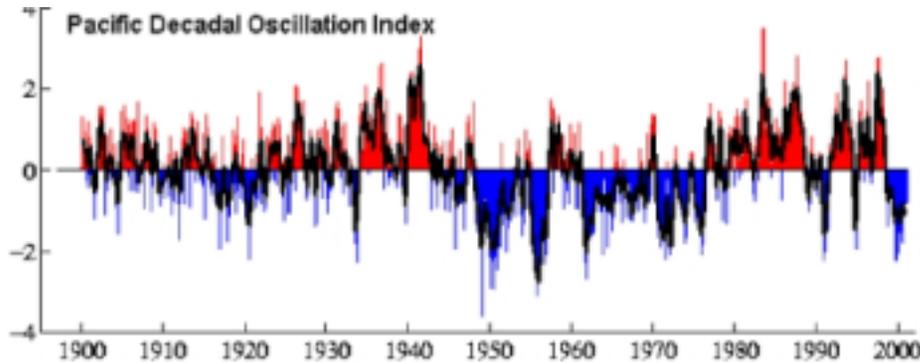
Changes in climate impact the ecosystems of the North Pacific and Bering Sea.

- The Pacific Decadal Oscillation (PDO) is an index of climate variability derived from sea surface temperature anomalies.
- Arrows indicate the mean circulation patterns that respond to climate change.

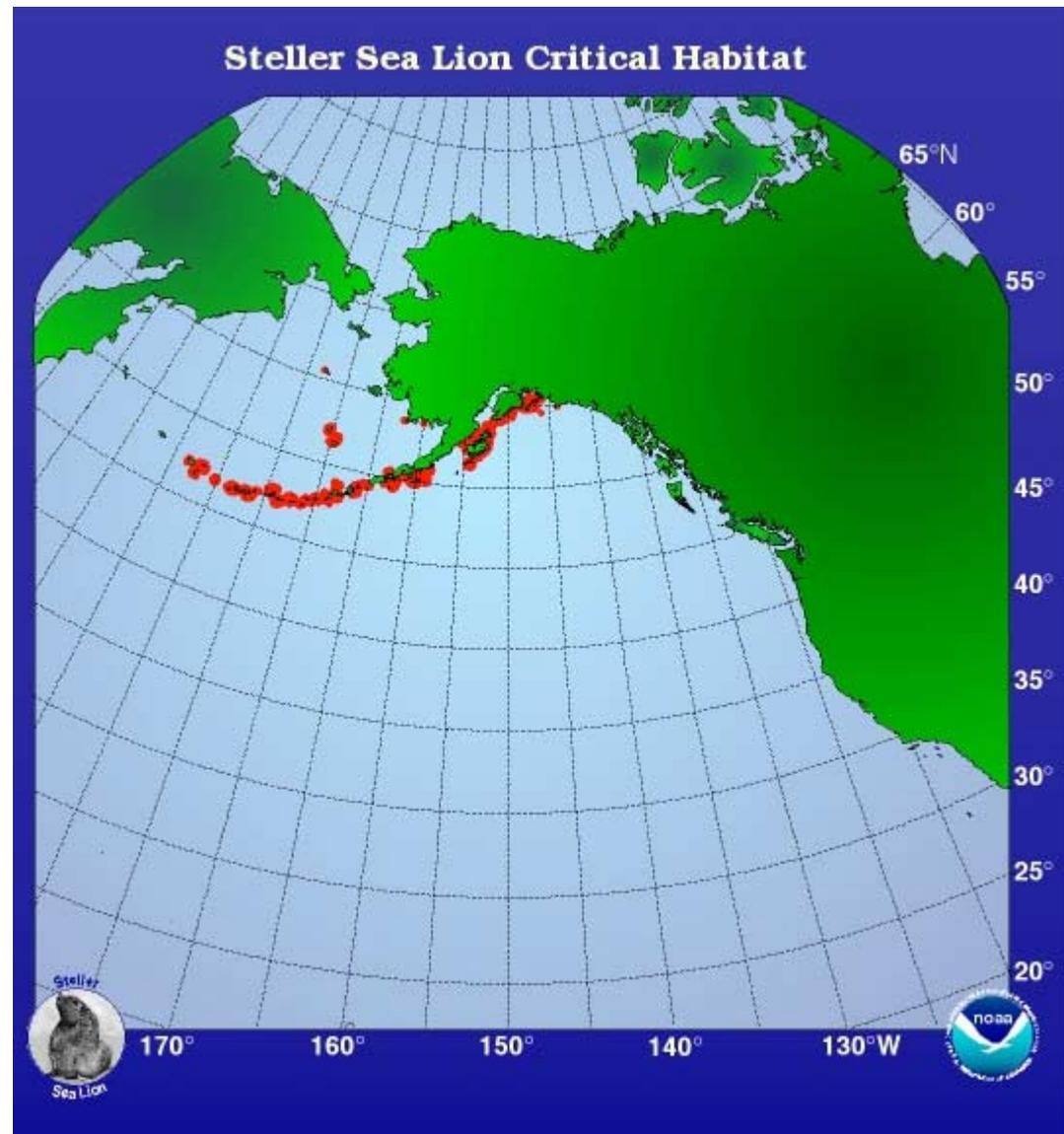


# Temporal Variability

Time history of PDO index (below) and associated changes in biological populations (right)



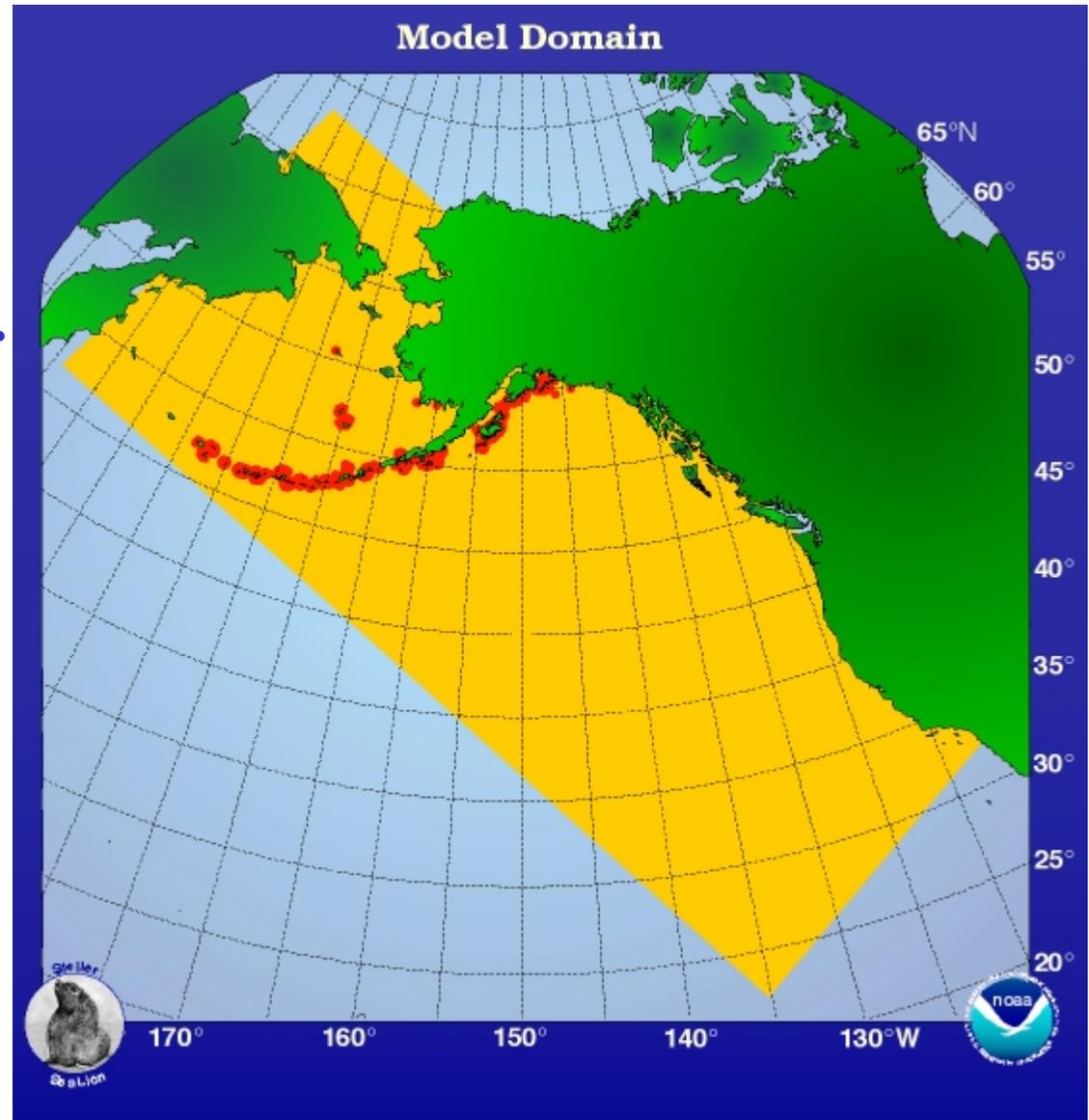
**Critical habitat for Steller sea lions is the coastal regions of the Bering Sea, Aleutian Islands and the Gulf of Alaska.**



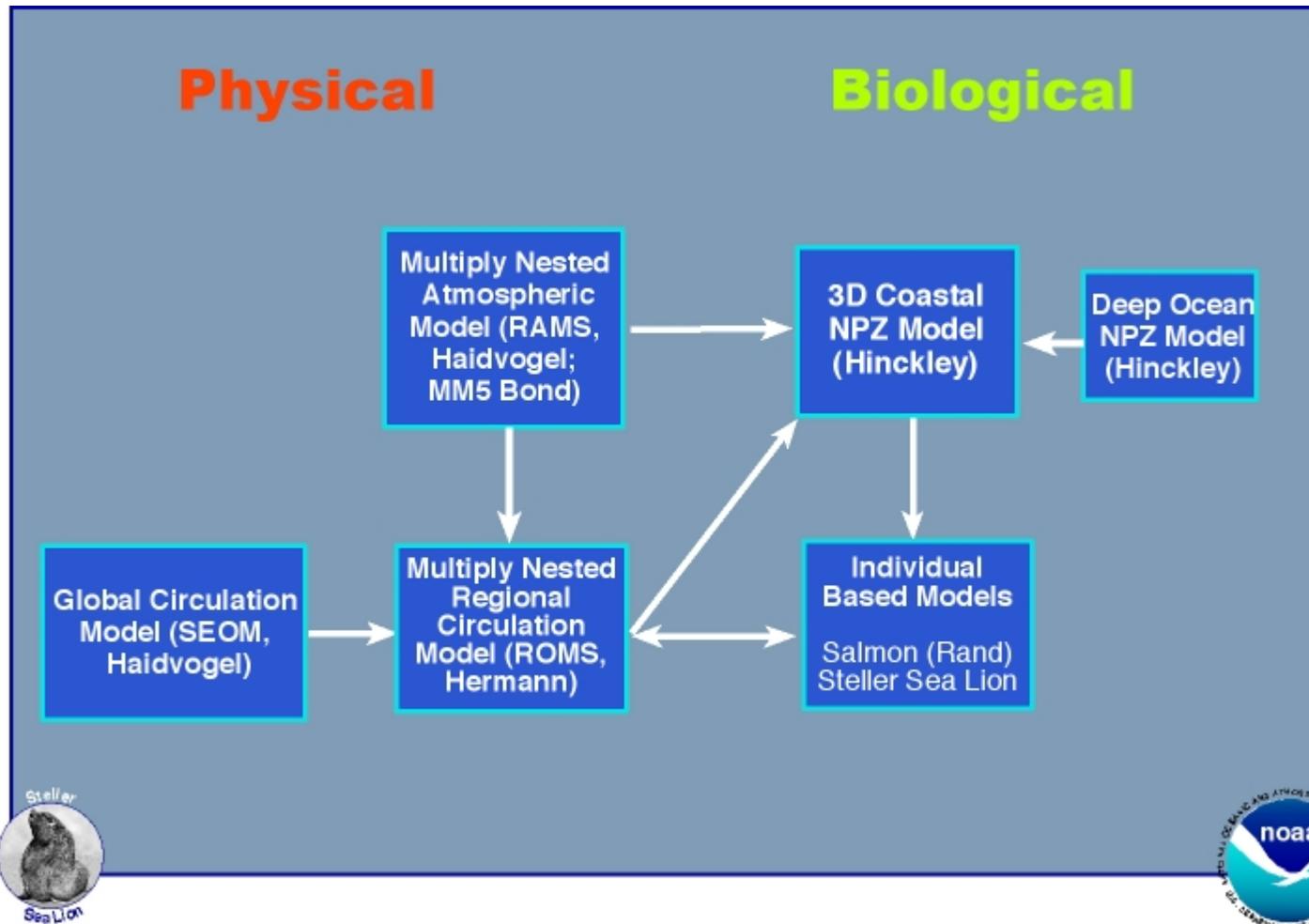
# Modeling

PMEL has developed biophysical models of the N. Pacific and Bering Sea.

- Model domain (yellow) includes critical Steller sea lion habitat (red)
- Models enable examination of climate change on ecosystems associated with sea lions



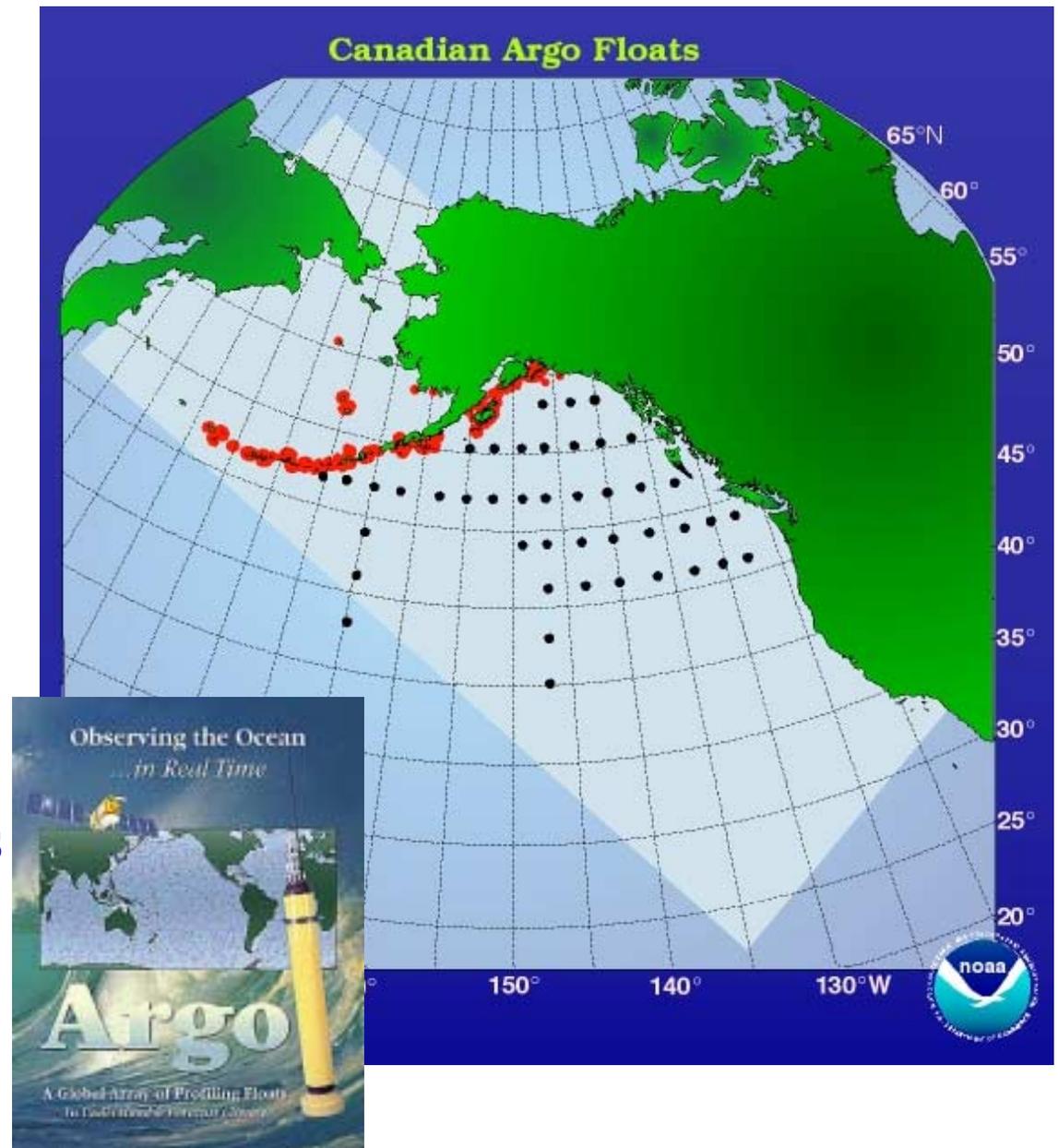
## Collaboration: Existing GLOBEC models



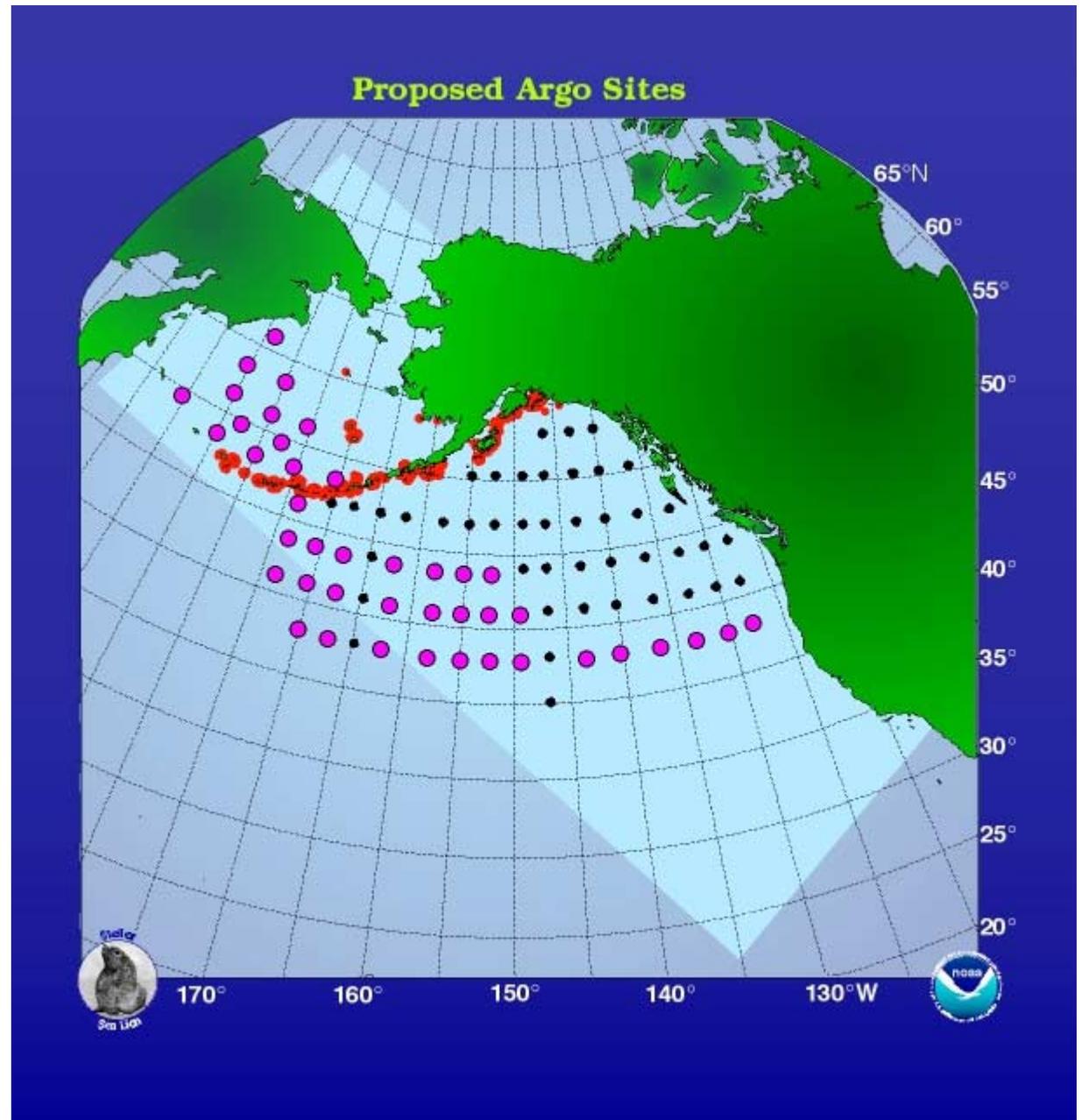
## Collaboration

Floats will be deployed in 2001 (black dots).

- Conduct temperature and salinity profiles
- Transmit data to shore
- Provide information on vertical structure and its spatial variability
- Furnish input for models
- Last four years

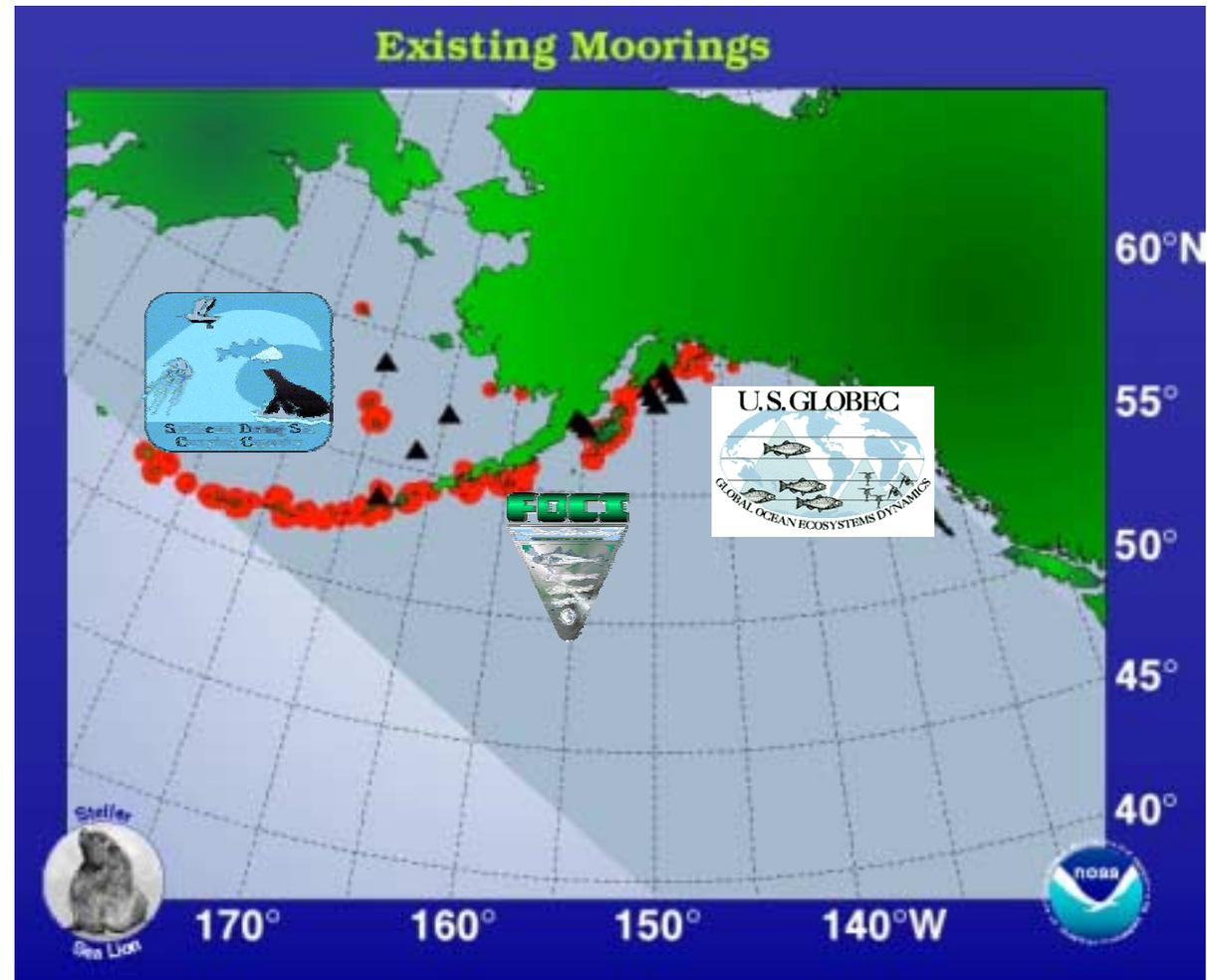


We will expand the grid in the N. Pacific and extend it into the Bering Sea.



## Collaboration

In 2001, biophysical moorings will be deployed in the Bering Sea and North Pacific by GLOBEC, SEBSCC and FOCI. These programs also will conduct inter-disciplinary cruises.

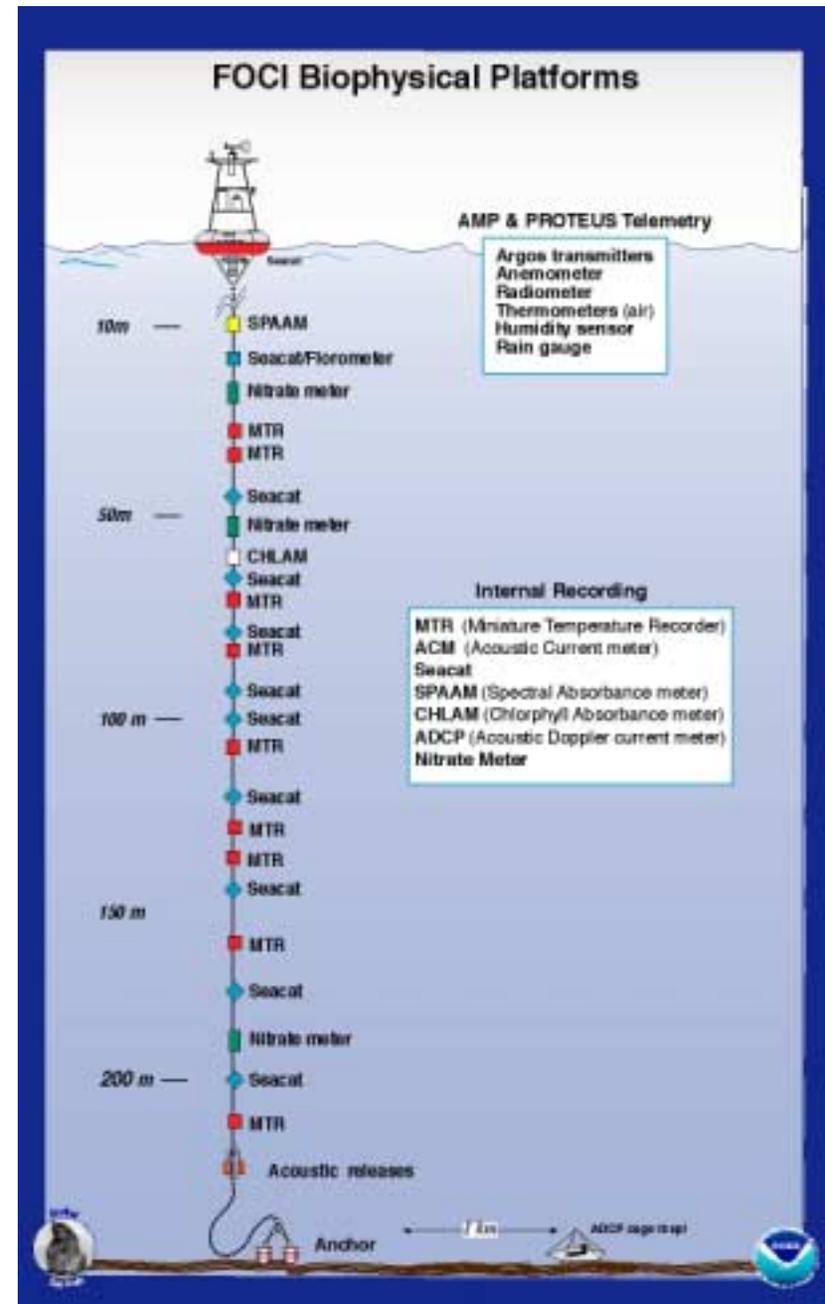


# Moored Observations

PMEL has deployed bio-physical moorings since 1991 in the northern Gulf of Alaska and Bering Sea.

Biological and physical sensors

- measure critical aspects of the ecosystem
- provide necessary time series to examine temporal variability of ecosystem.

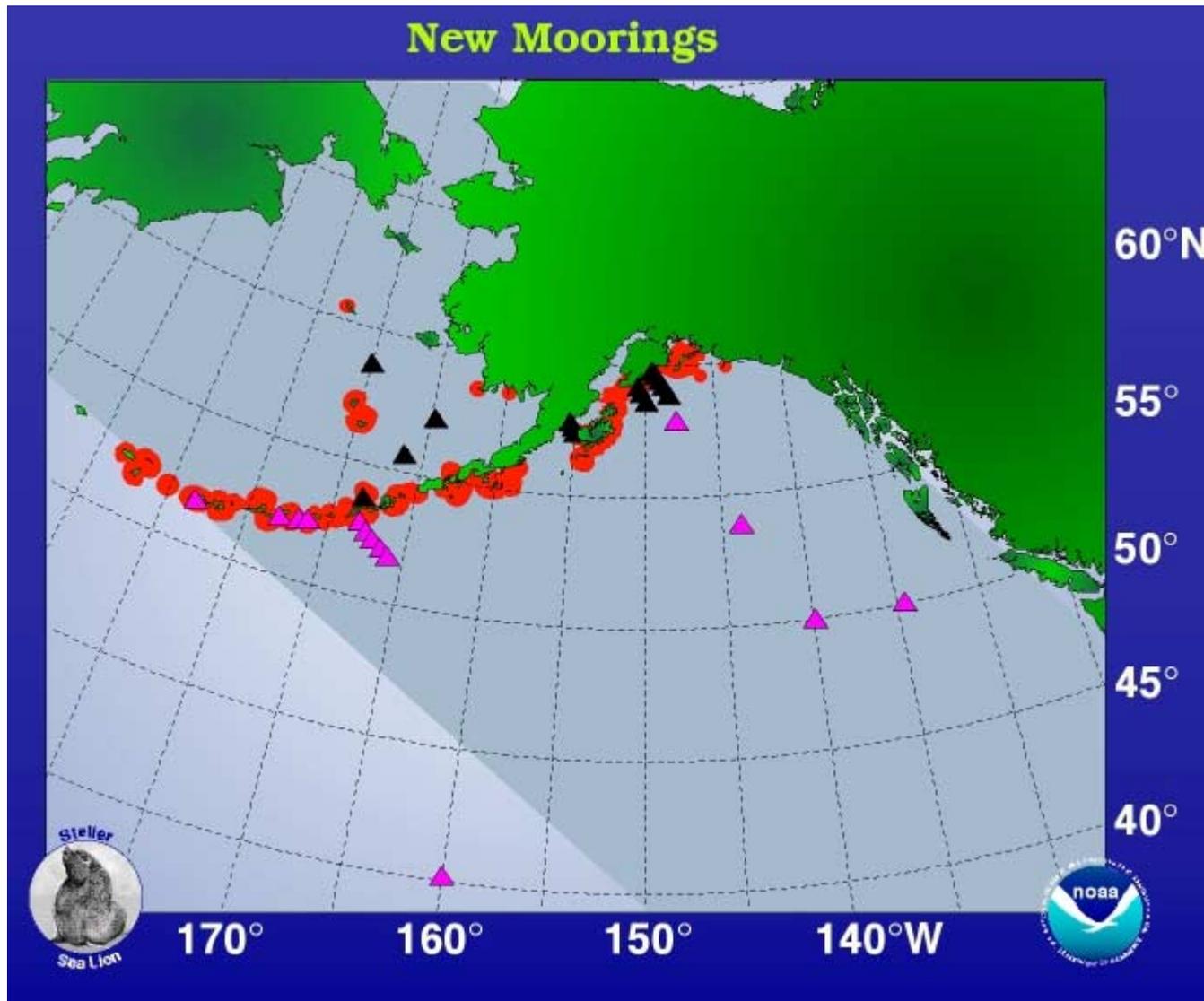


Local Scale

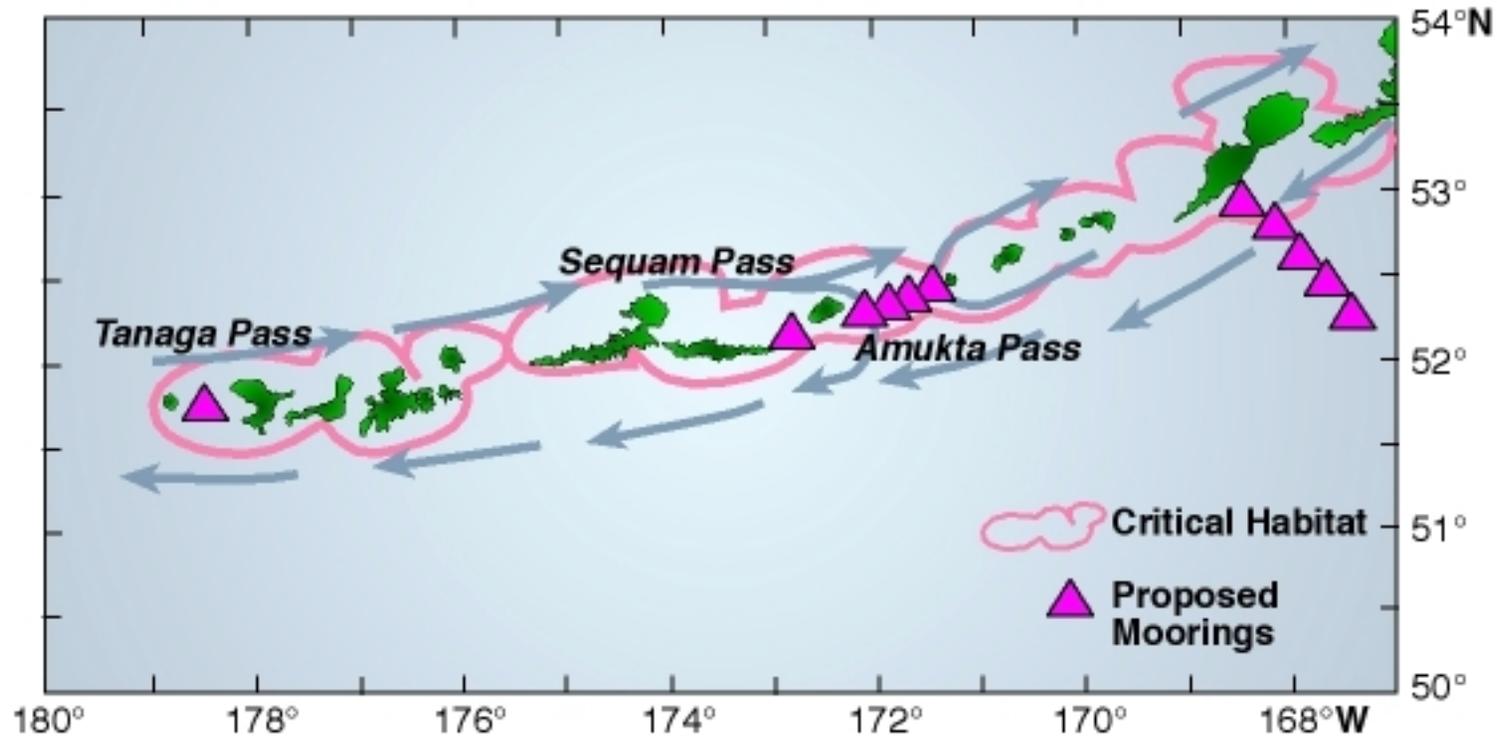
Regional Scale

Basin Scale

## PMEL will deploy biophysical moorings in the N. Pacific.



**Aleutian Islands:** We propose a study of climate impact on the local ecosystem of the Aleutian Islands. This will be conducted in collaboration with studies of Atka mackerel (NMFS) and Steller sea lions (NMML). The study will include measurements of currents, water properties, nutrients, primary production, zooplankton, fish, seabirds and sea lions.



# Integrated Observational Network

The integrated North Pacific observational grid consists of moored biophysical platforms (triangles) and Argo floats (circles). Sites to be added by our proposed research (pink) will relate climate change to Steller sea lion ecology.

