Environmental Conditions and Their Variability in the Gulf of Alaska and Bering Sea

or

1st understand regional climate and climate change before studying consequences

People Involved:

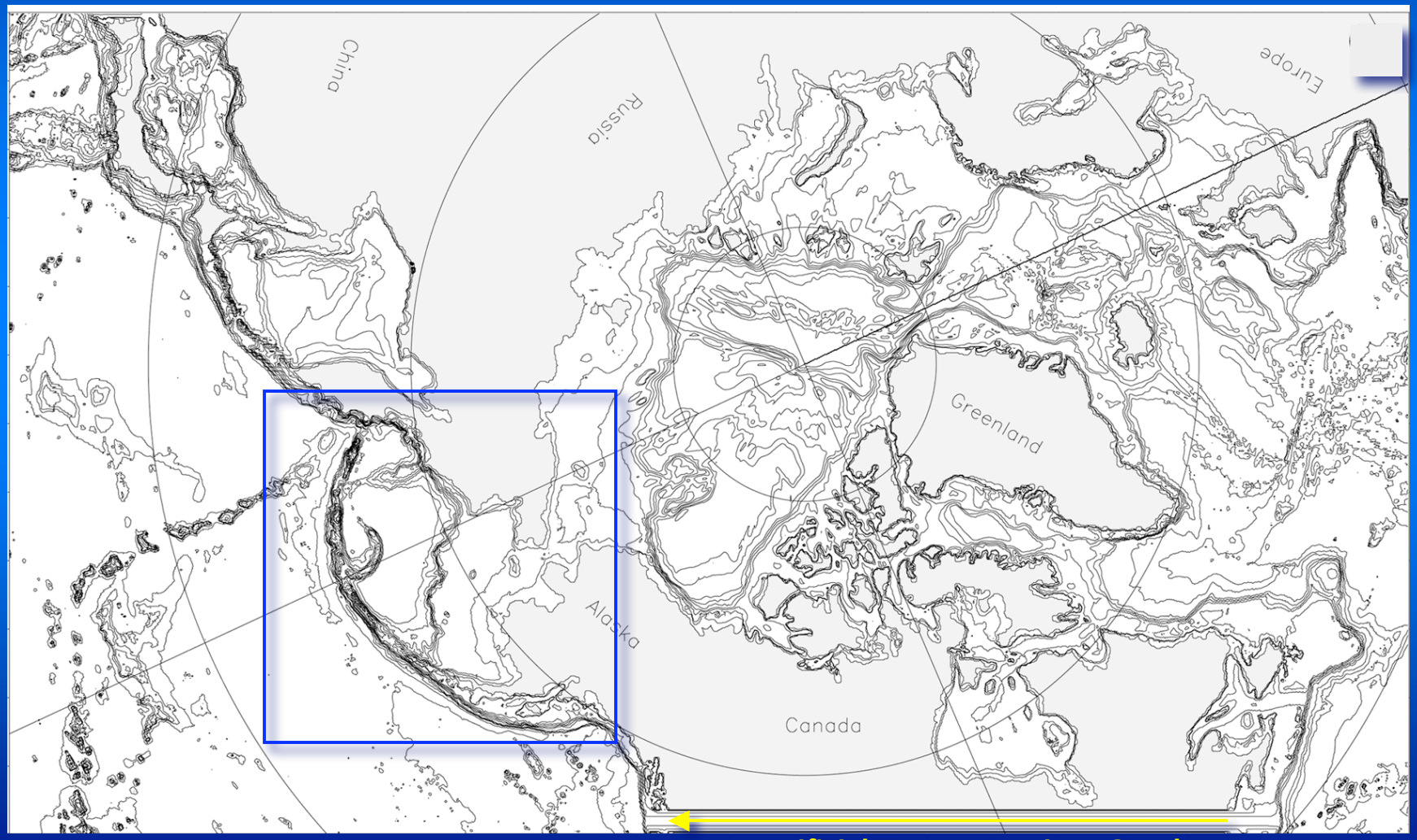
W. Maslowski, Naval Postgraduate School

S. Okkonen, University of Alaska Fairbanks

T. Whitledge, University of Alaska Fairbanks

Bering Sea Ecosystem Study)BEST) Workshop - Seattle, WA, March 17-19, 2003

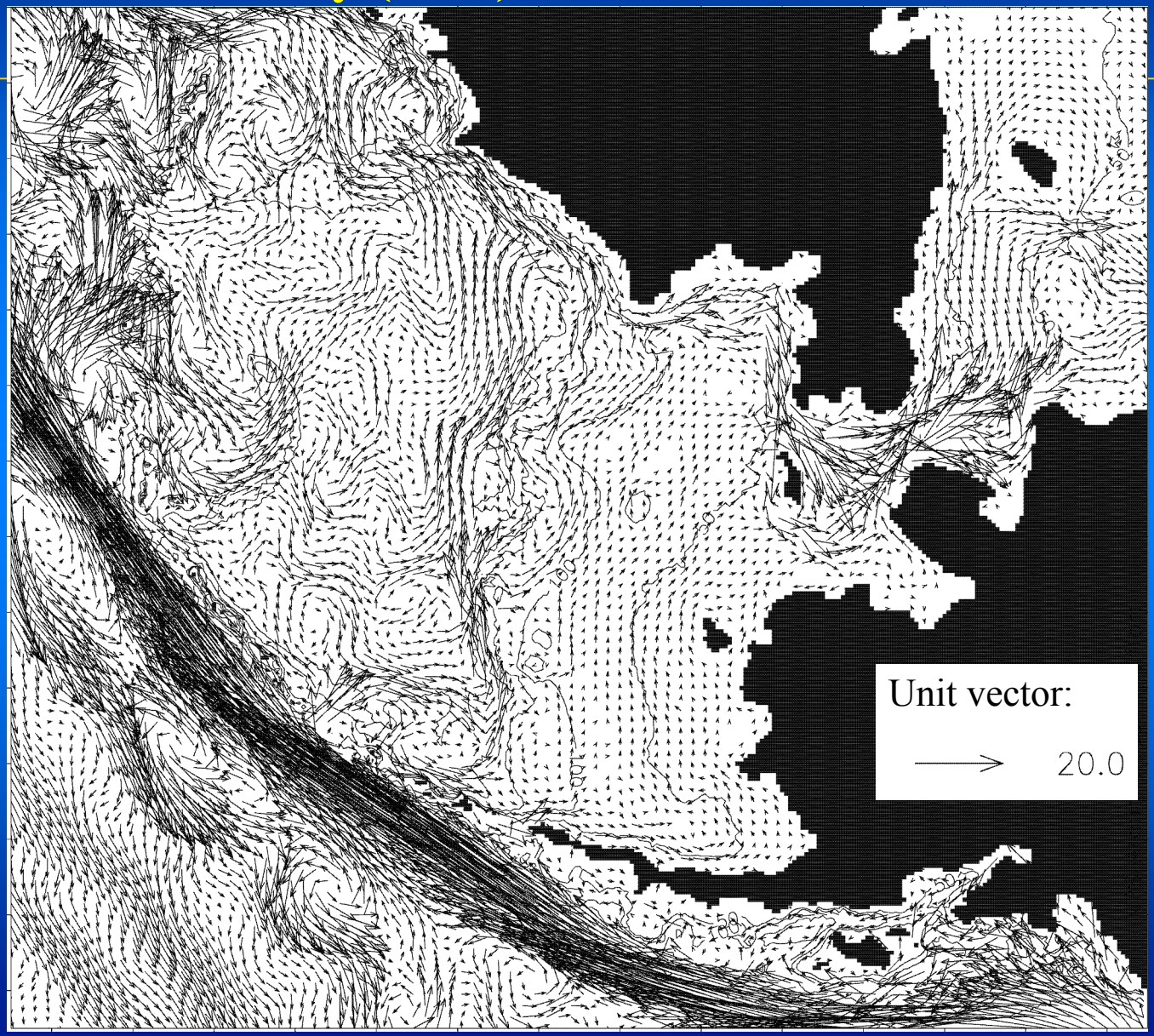
- 9-km model domain and bathymetry
- completed 1979-2001 interannual r
- Conclusions/Discussion



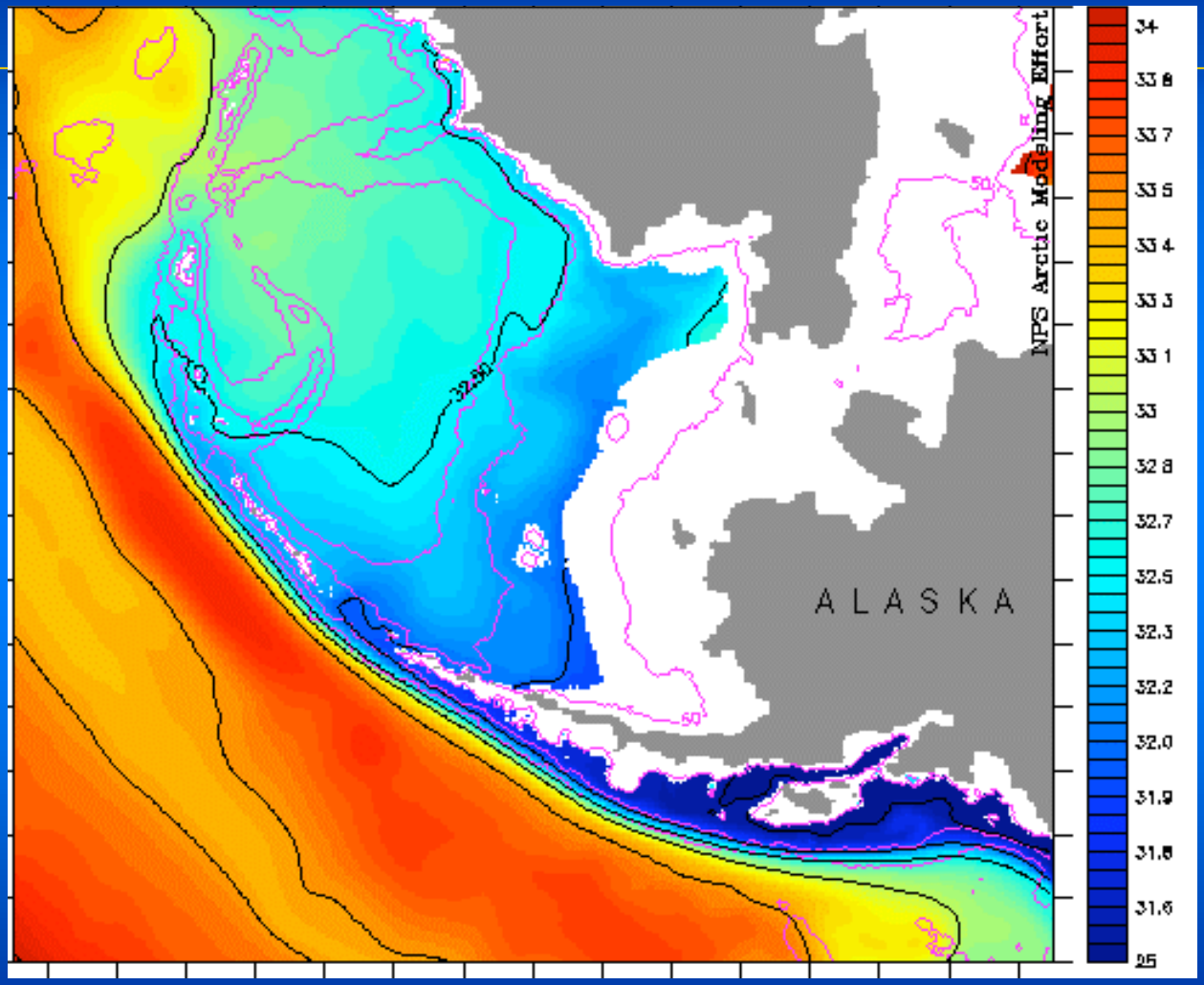
<www.oc.nps.navy.mil/~pips3>

Artificial Trans-American Canal

15-year mean (1979-1993) vertically averaged (0-53m) ocean velocity (cm/s). 6% of all vectors shown.

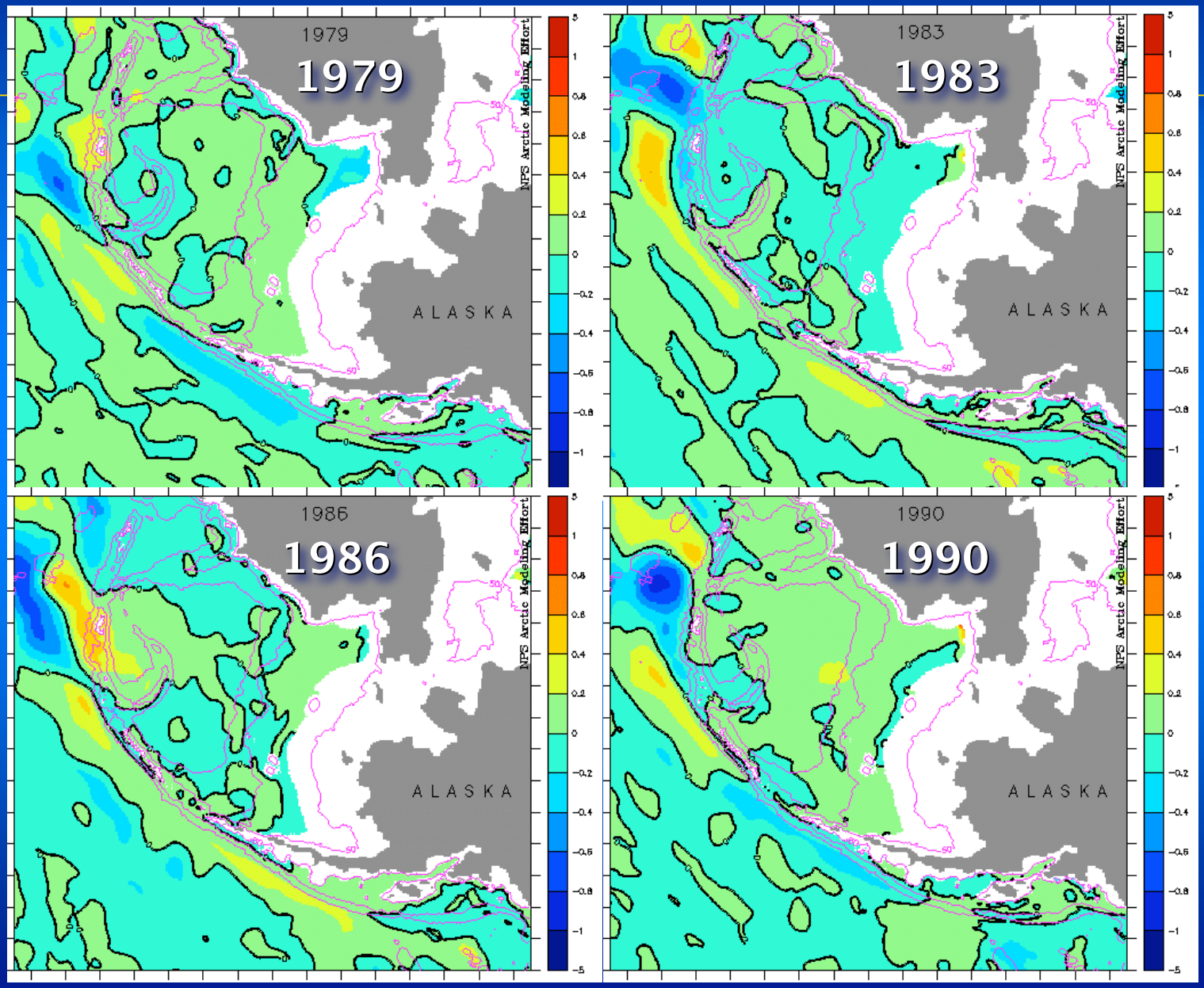


15-year Mean (1979-1993) Salinity (ppt) at depth 65-80 m



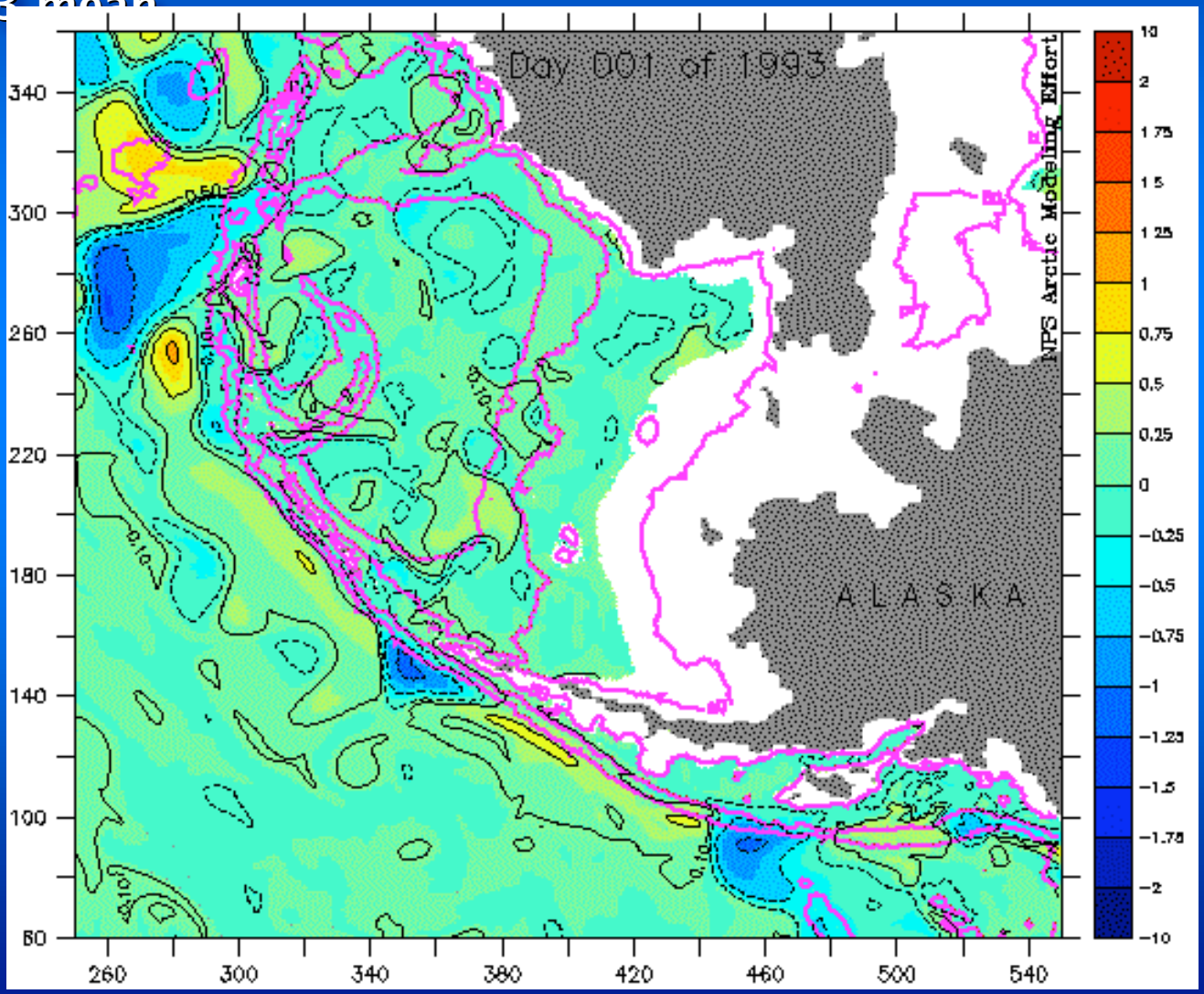
Assume salinity represents nutrients,
i.e. higher salinity ~ higher nutrient concentrations
and remove the mean to calculate salinity

Annual Mean Salinity Anomaly (ppt) at depth 65-80 m



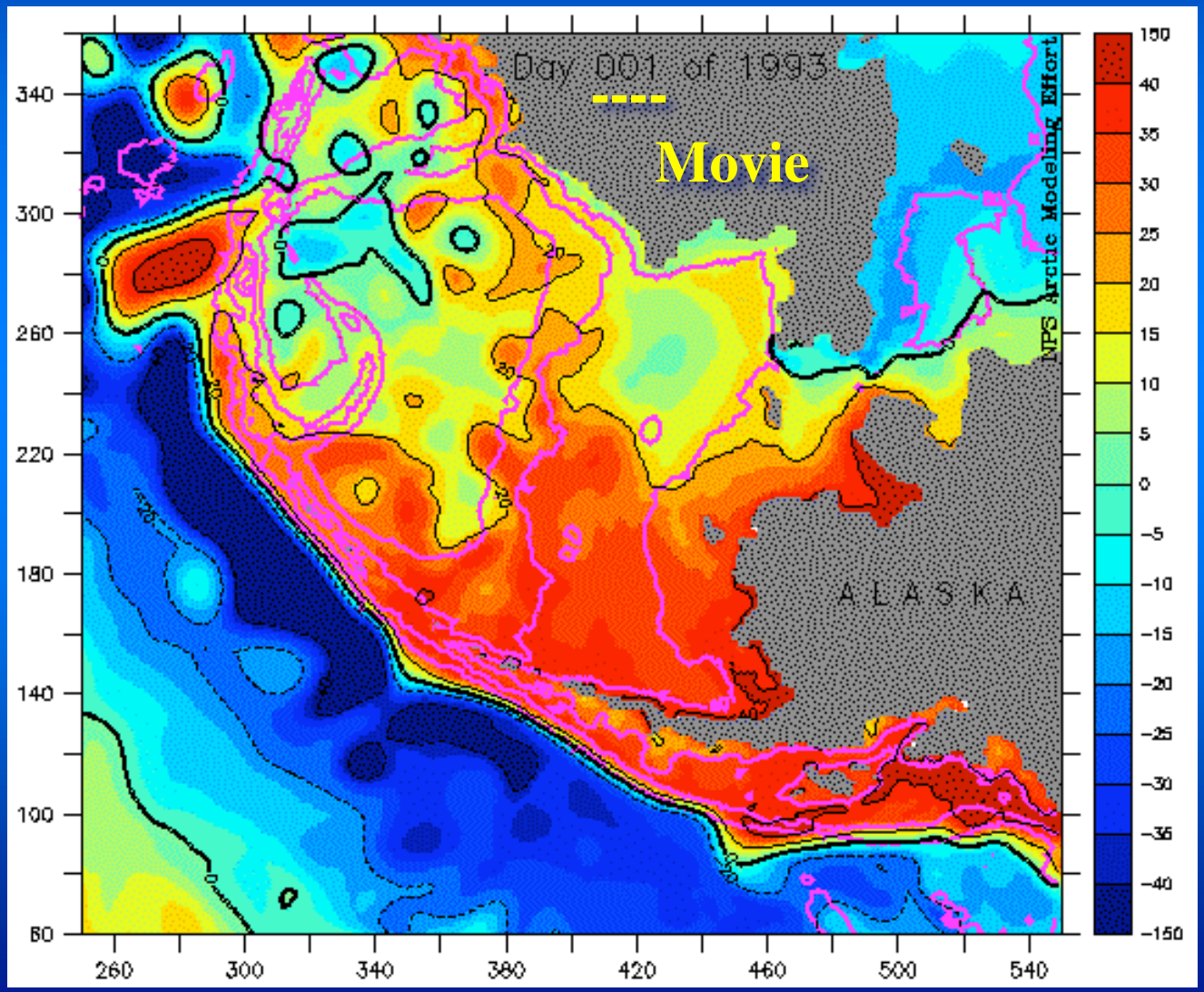
Daily snapshots of 1993 salinity anomaly (ppt) at depth 65-80 m

Assume salinity represents nutrients, i.e. higher salinity ~ higher nutrient concentrations and calculate salinity anomaly by removing 1979-93 mean

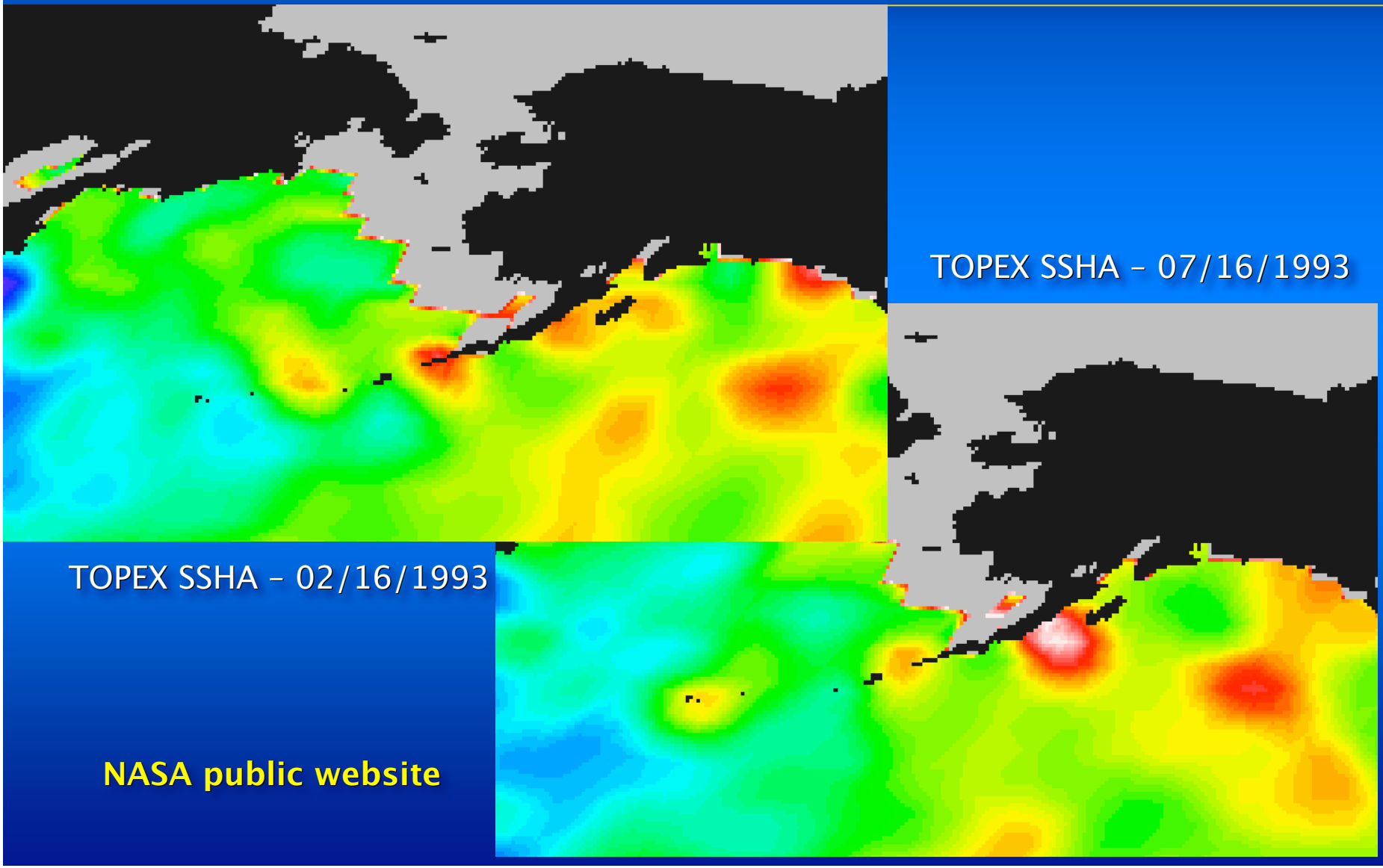


Movie

1993 daily snapshots of sea surface height anomaly (cm) - a comparison with SSHA altimeter data indicates that spatial scales down to 0(100 km) are properly resolved

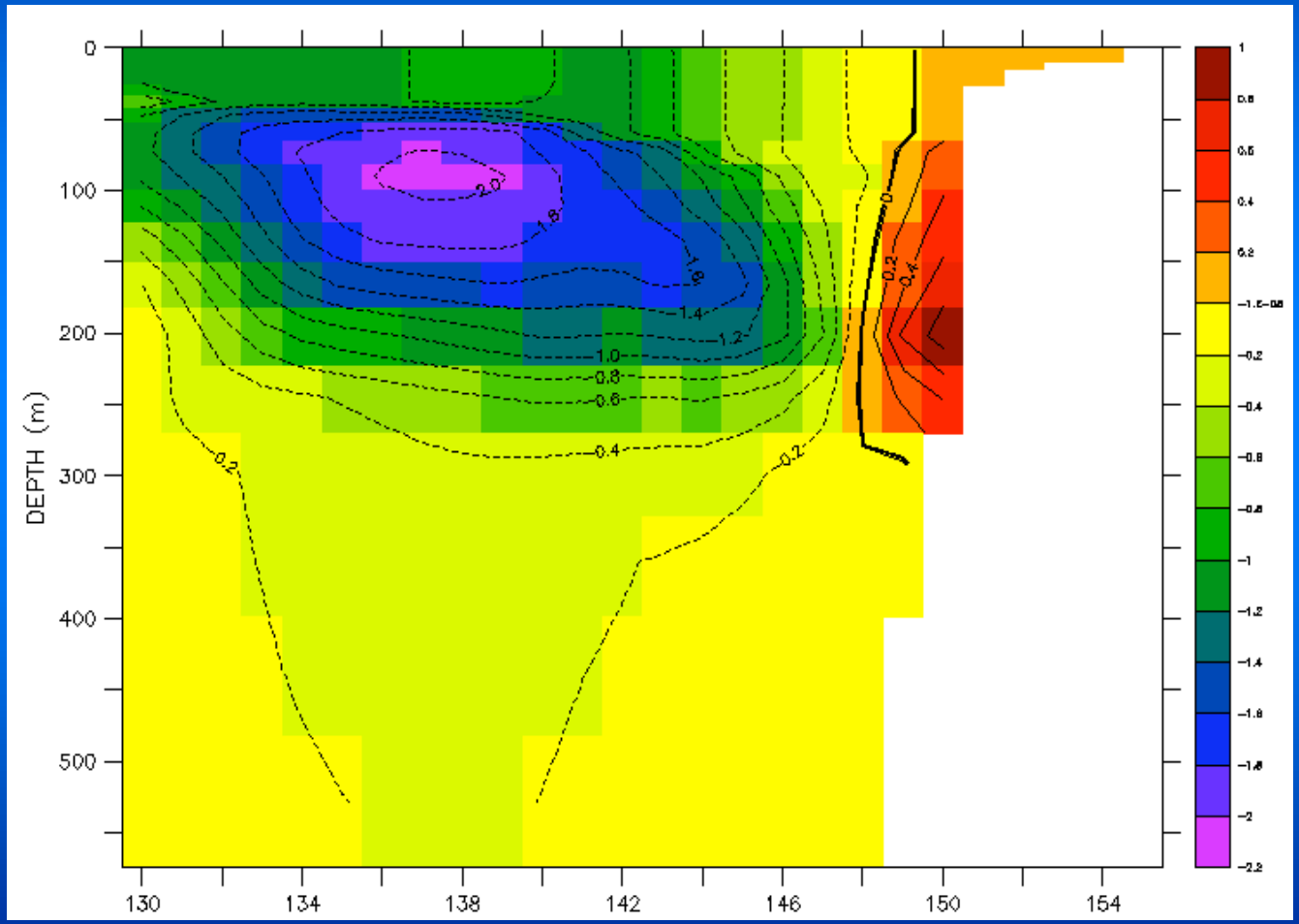


TOPEX-derived SSH Anomalies



NASA public website

Salinity difference (ppt) along the section: S(Mar/80: eddy present) – S(Jan/80: no eddy)



– high potential for biophysical coupling (up-slope upwelling of nutrient-rich waters along the path of eddy propagation) – need data for model validation

Main Conclusions:

1. High spatial and temporal variability of oceanic conditions in the Northeast Pacific and Bering Sea
2. Mesoscale eddies such as propagating along the Alaskan Stream or Bering Slope Current may play a critical role (including biological controls) in shelf-basin and inter-basin communication

Challenges:

1. A proper representation of ocean circulation and its seasonal to decadal variability in the region requires realistic prediction of water exchanges across the Aleutians and Bering Strait
2. Alaskan Coastal Current and small-scale eddies of order 0(10km) require model resolution of order 0(1km)
3. Long time series data sets (atm., sea ice, ocean) are critical for model forcing, validation and future improvements
4. Other (e.g. tides, biological coupling)

THE END