The Changing Southeastern Bering Sea Shelf

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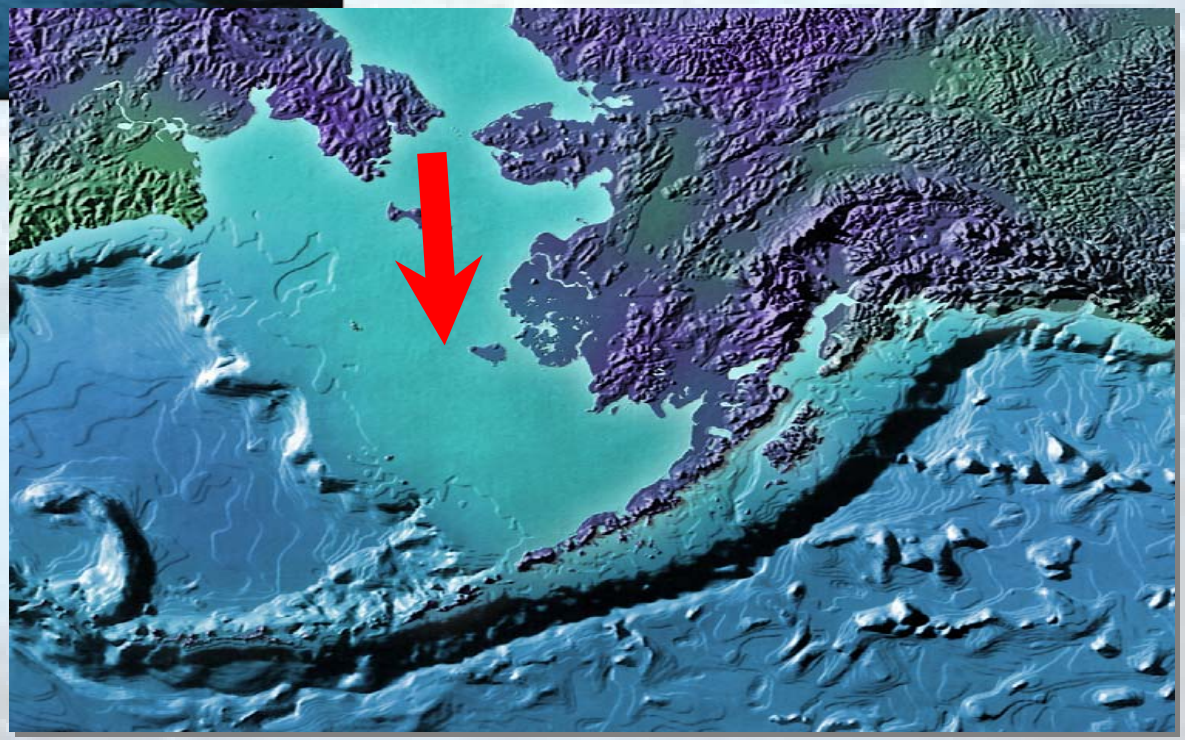
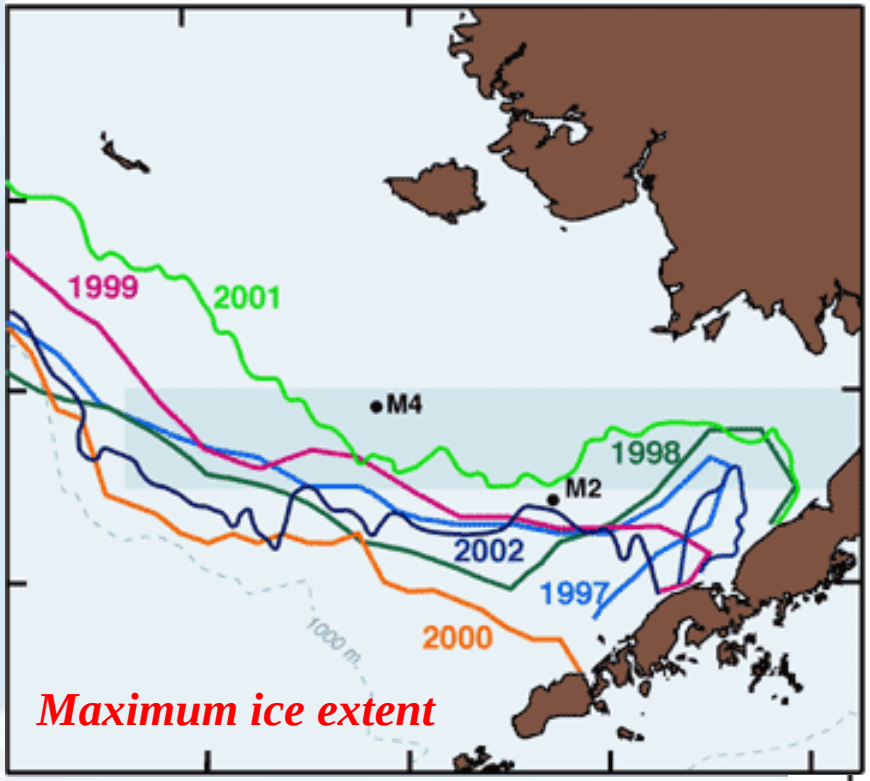
Sea Ice

“Conveyer Belt”

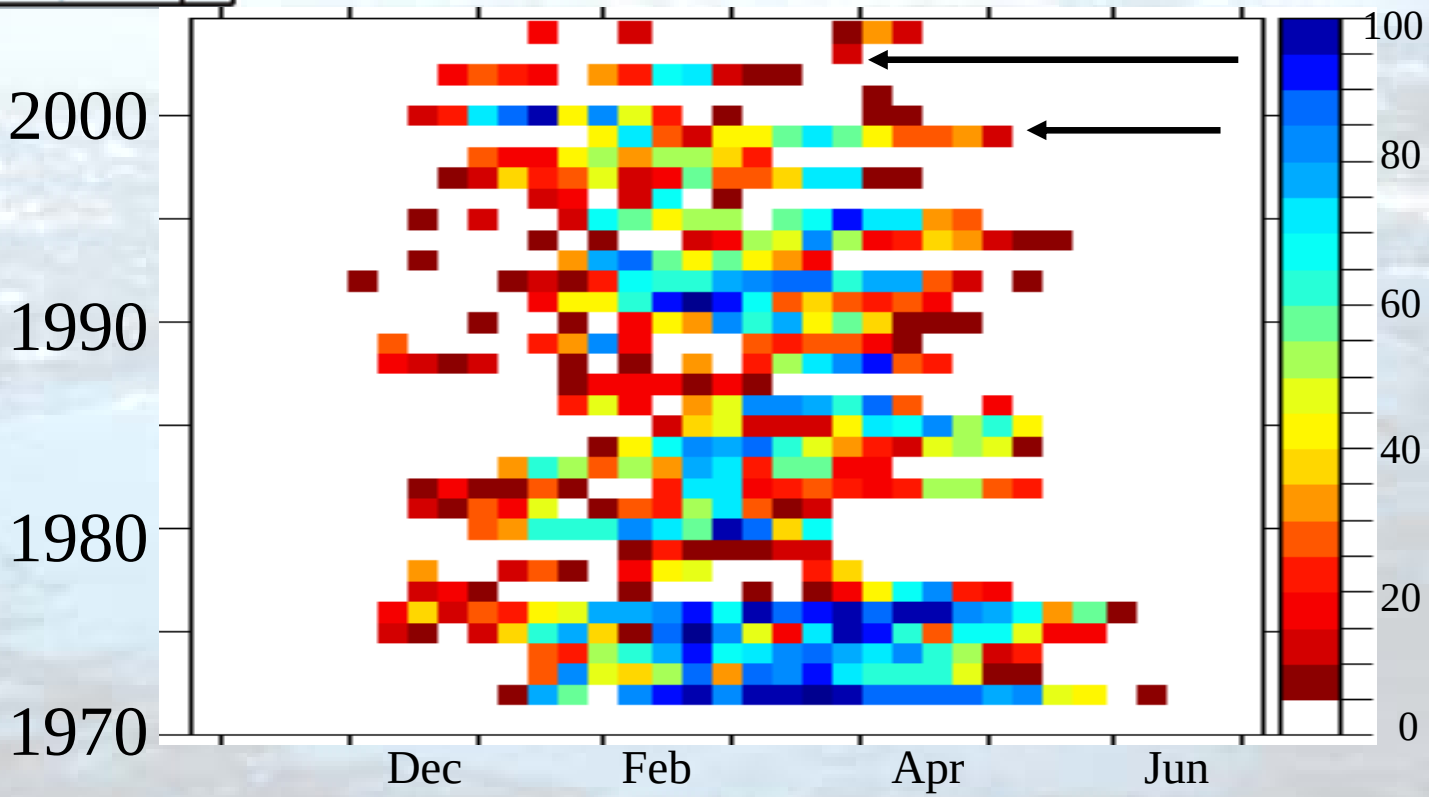


Changing climate: Bering Sea ice has retreated over the last two decades

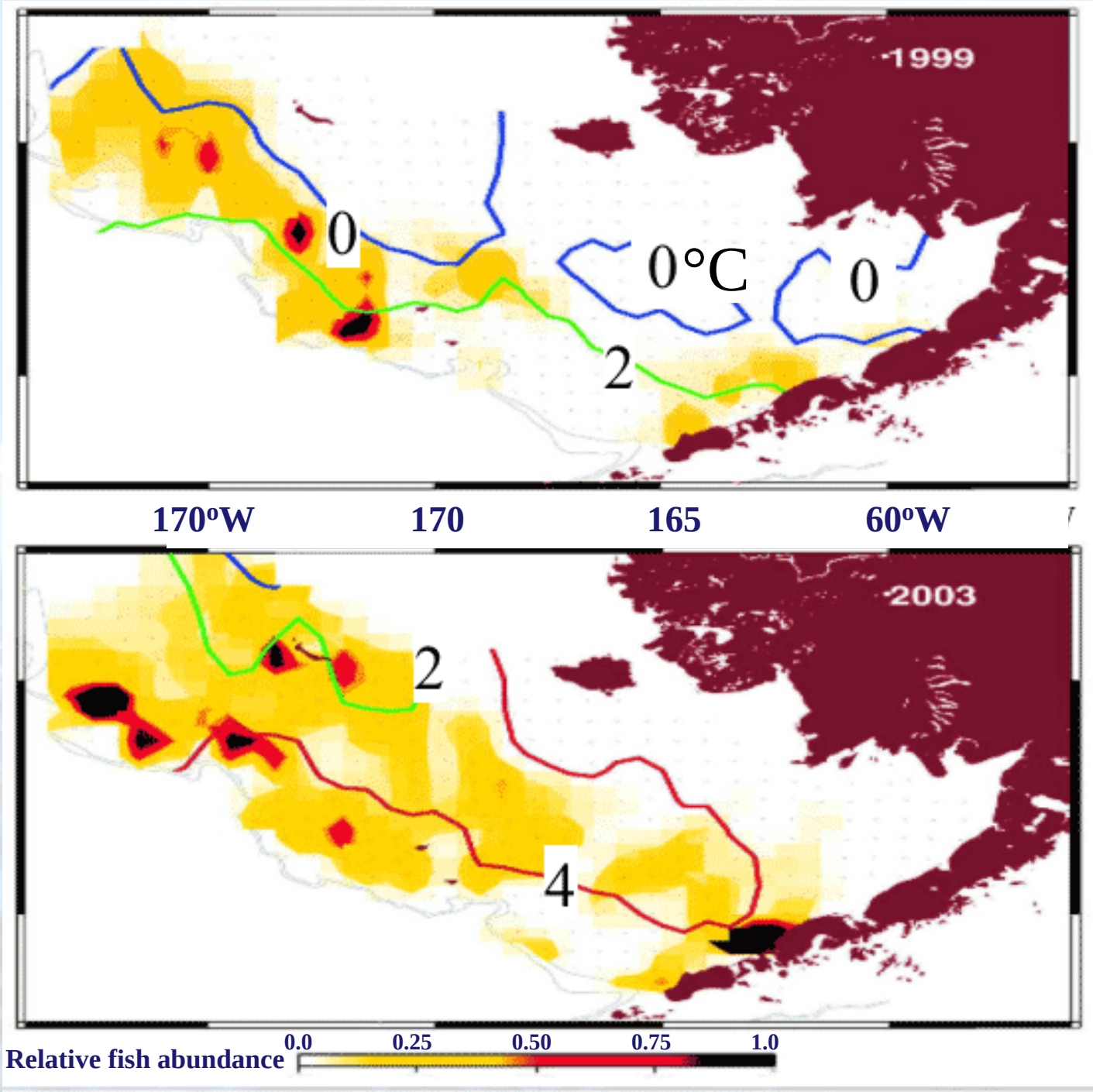


Maximum ice extent

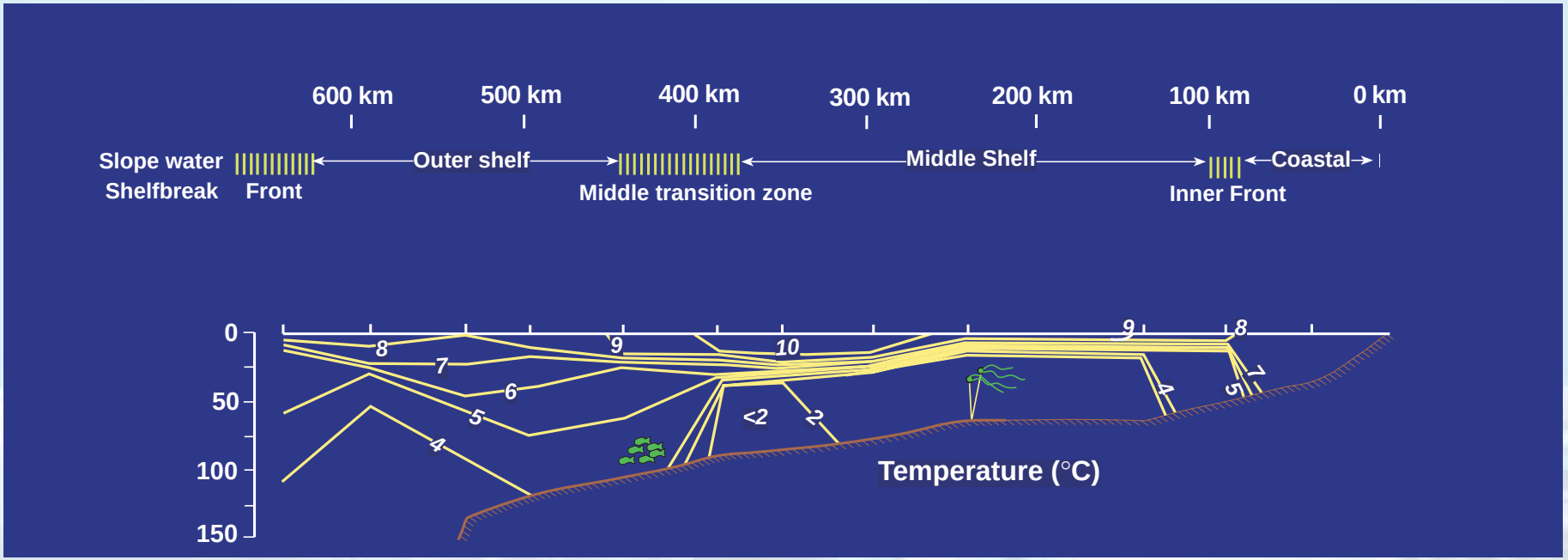
Percent ice coverage in gray box on map above

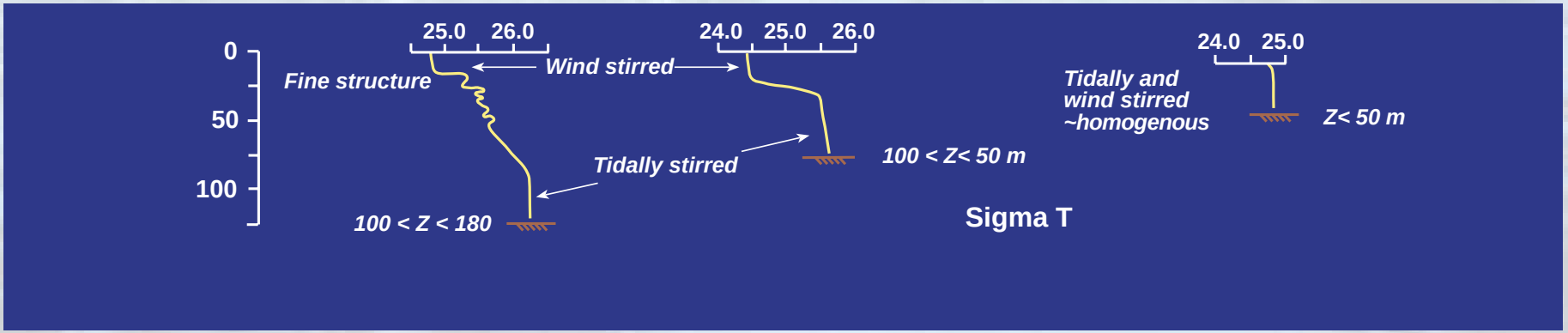


Bottom ocean temperature determines distribution of fish

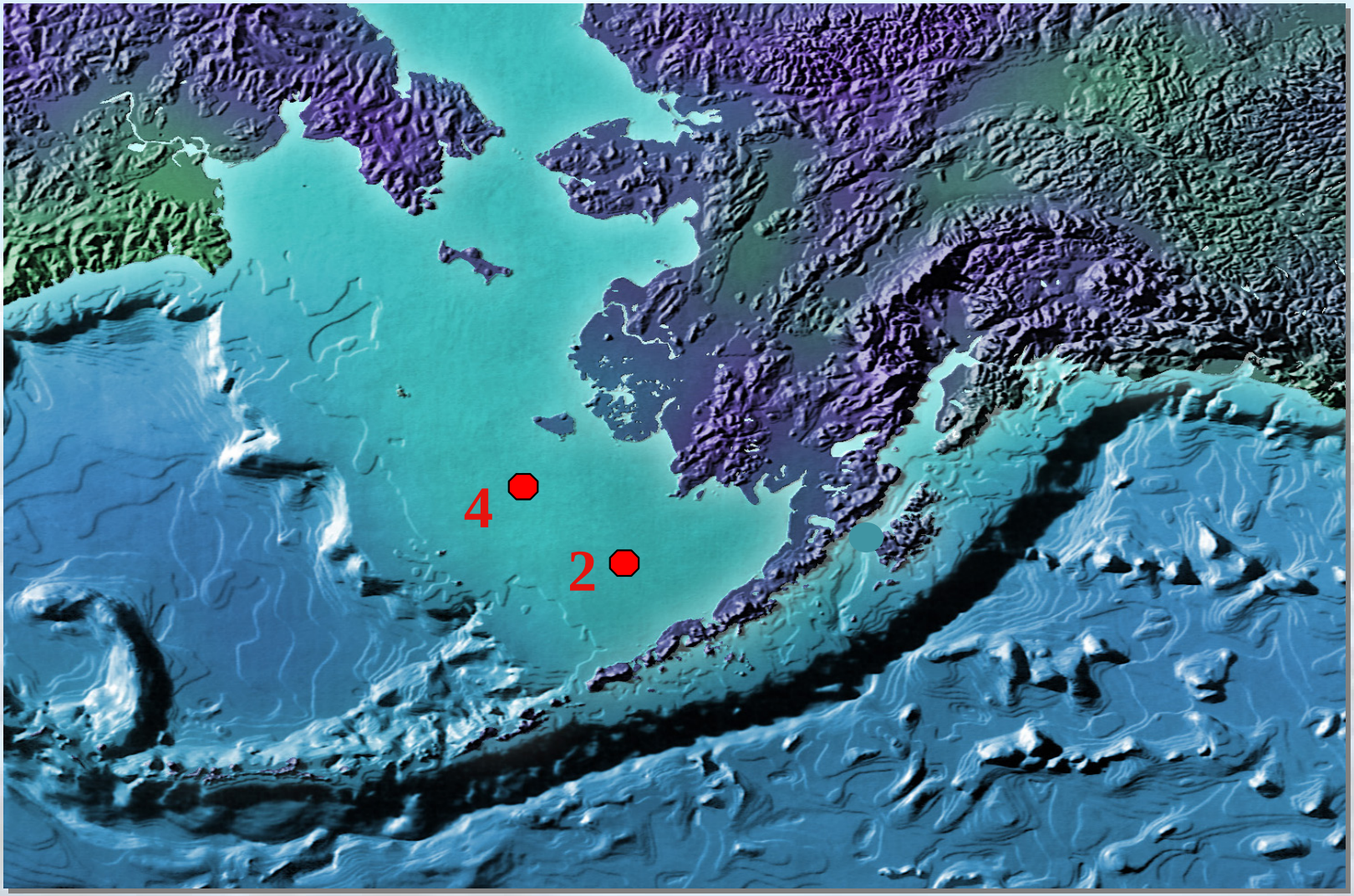


Vertical Cross Shelf Structure

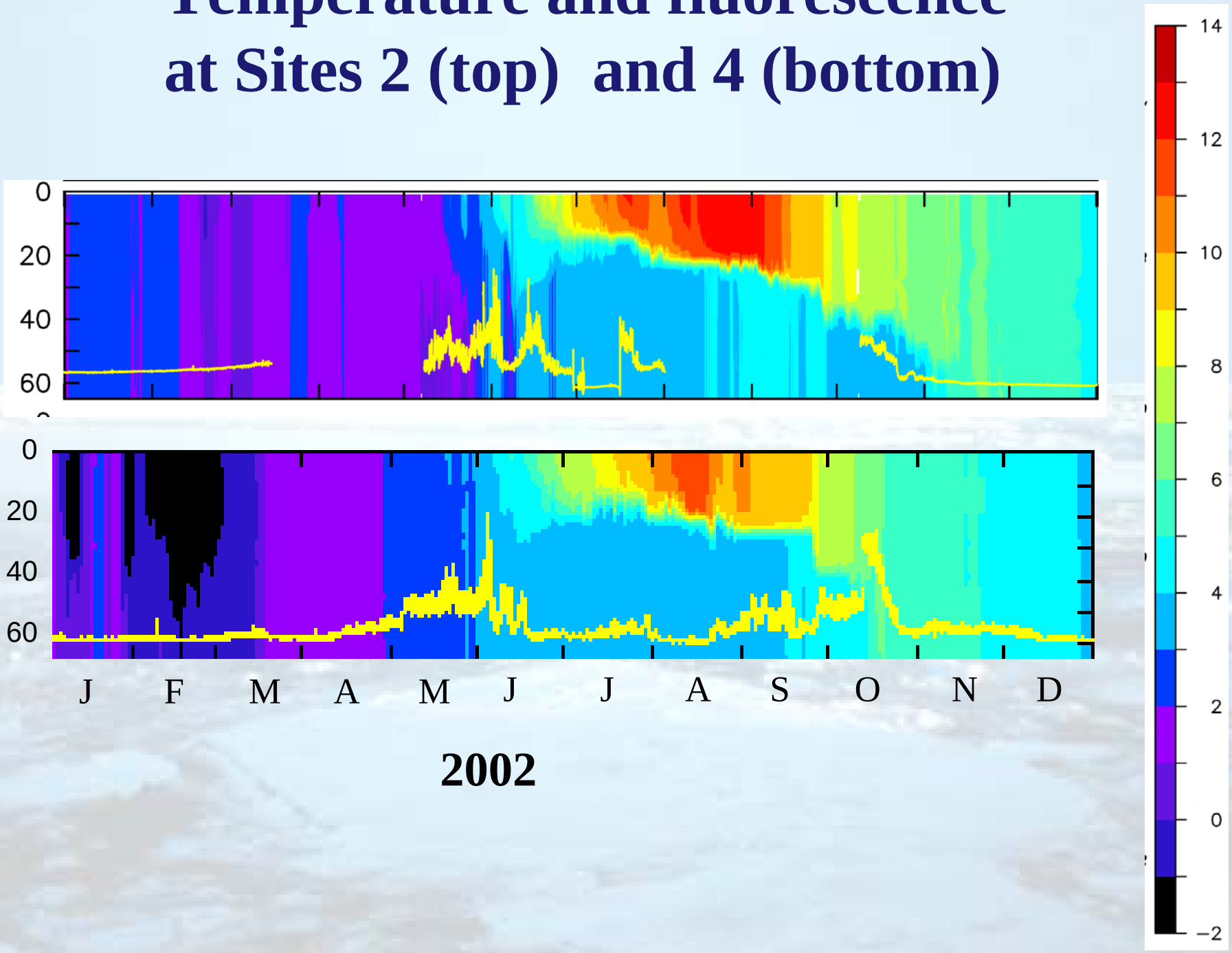




Mooring Sites

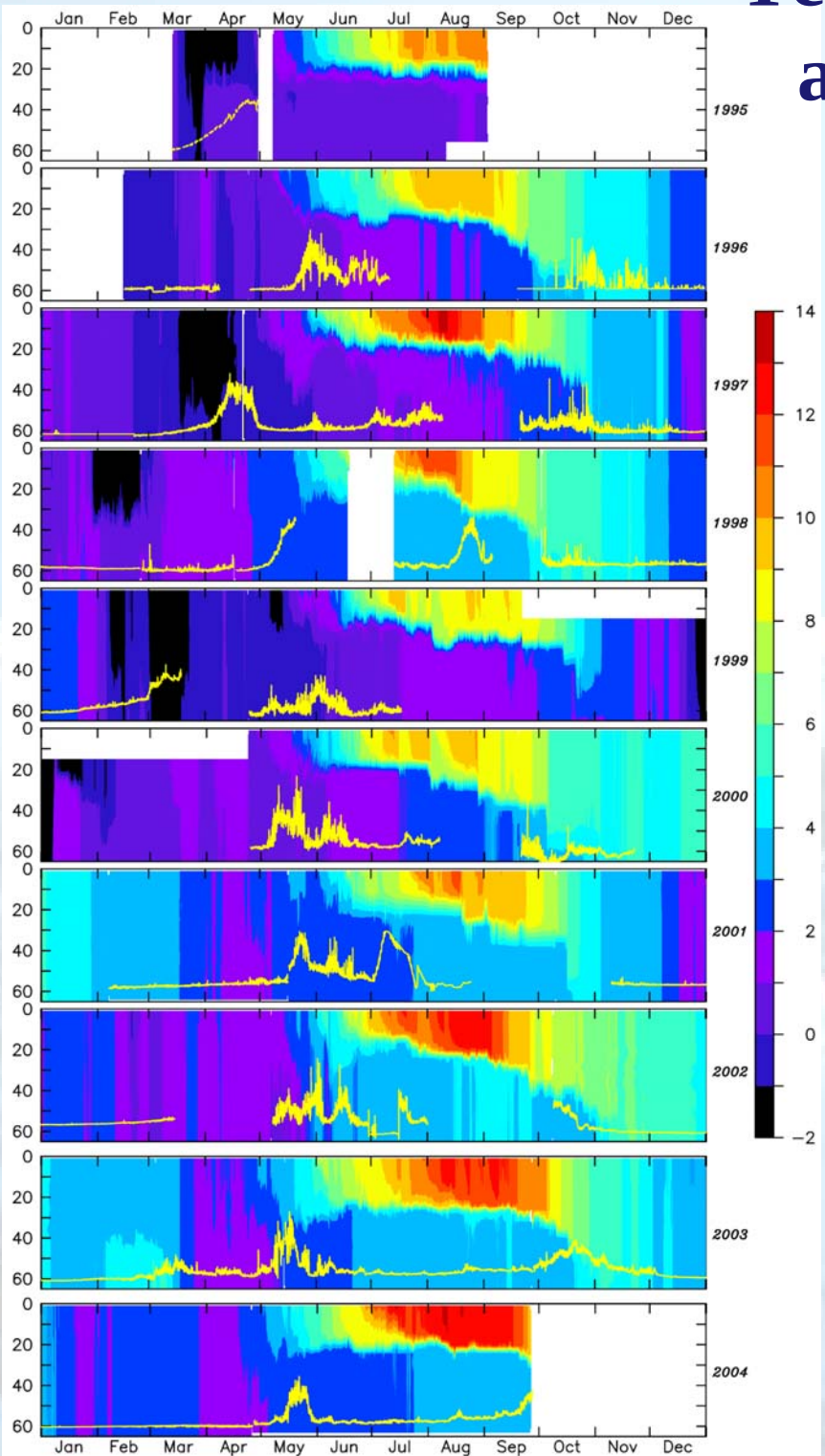


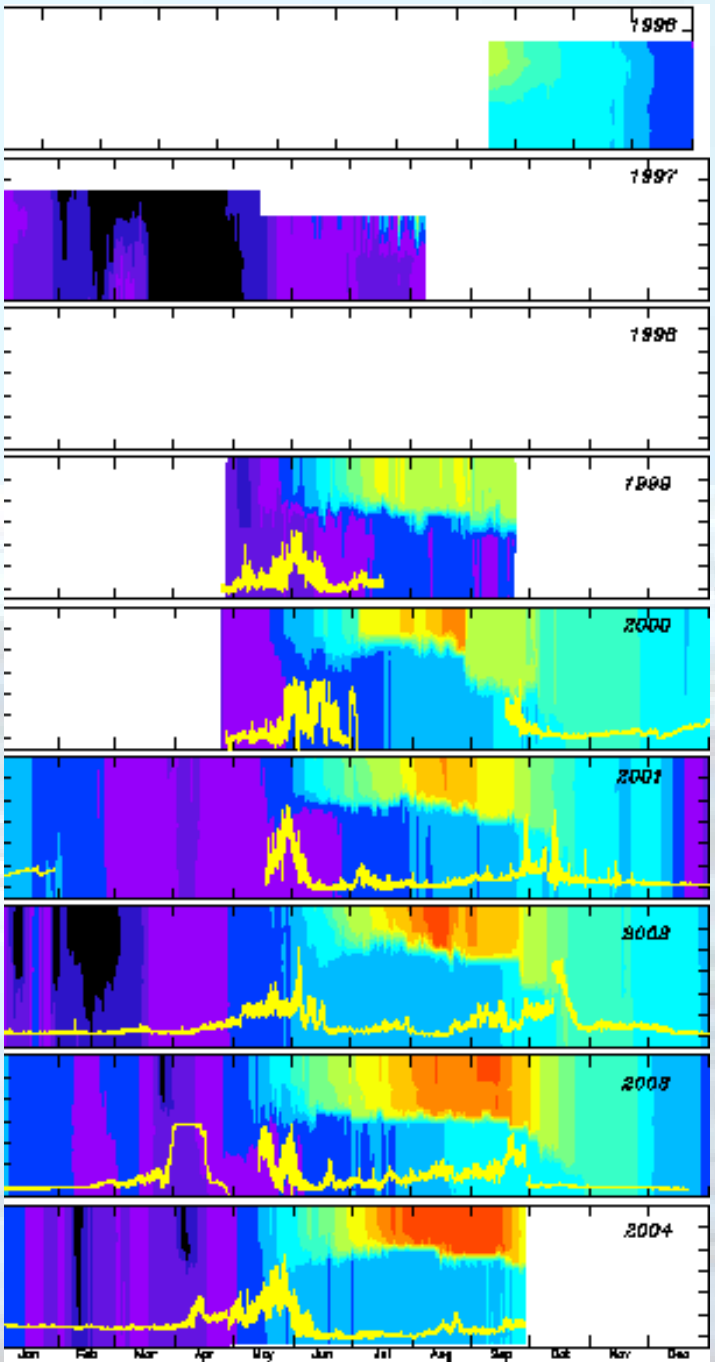
Temperature and fluorescence at Sites 2 (top) and 4 (bottom)



2002

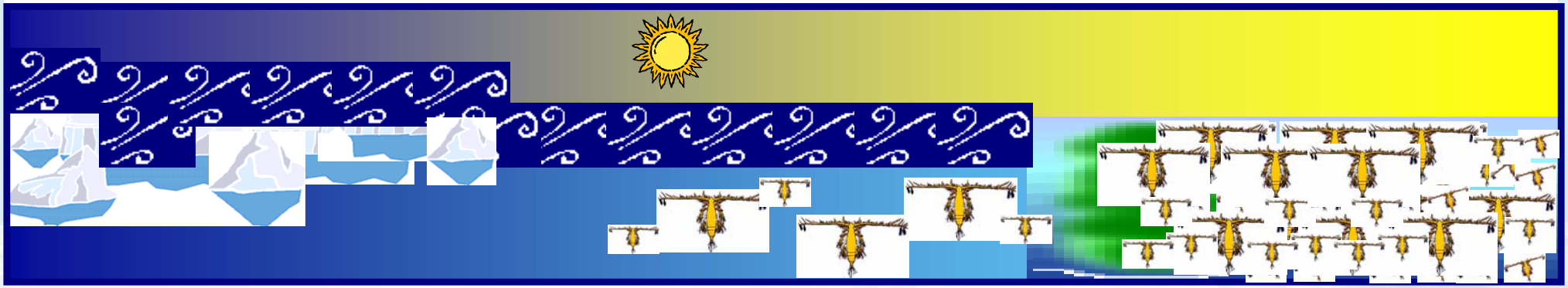
Temperature and fluorescence at Sites 2 (left) and 4 (right)



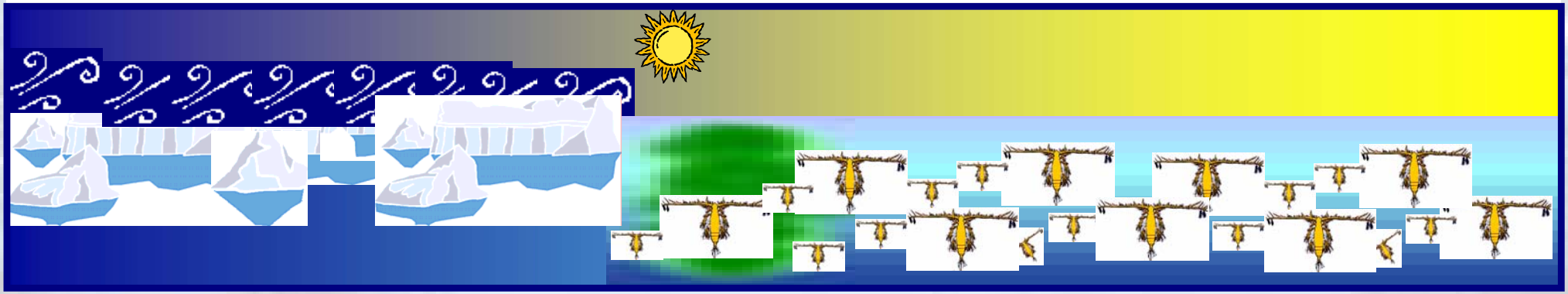


Climate affects the ecosystem through sea ice

Early Ice Retreat ⇨ Late Bloom, Warm Water – Large Copepod Biomass

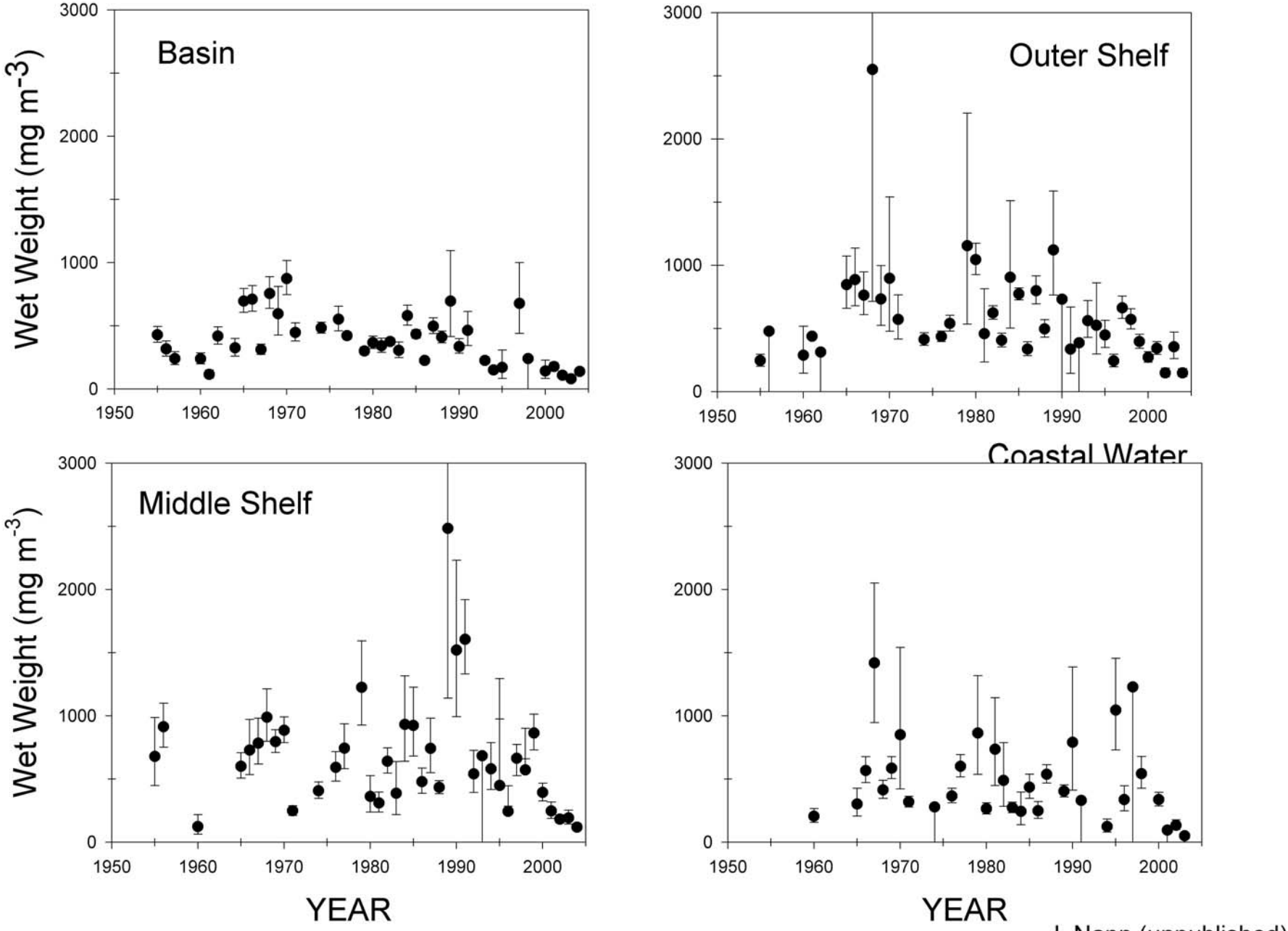


Late Ice Retreat ⇨ Early Bloom, Cold Water – Small Copepod Biomass



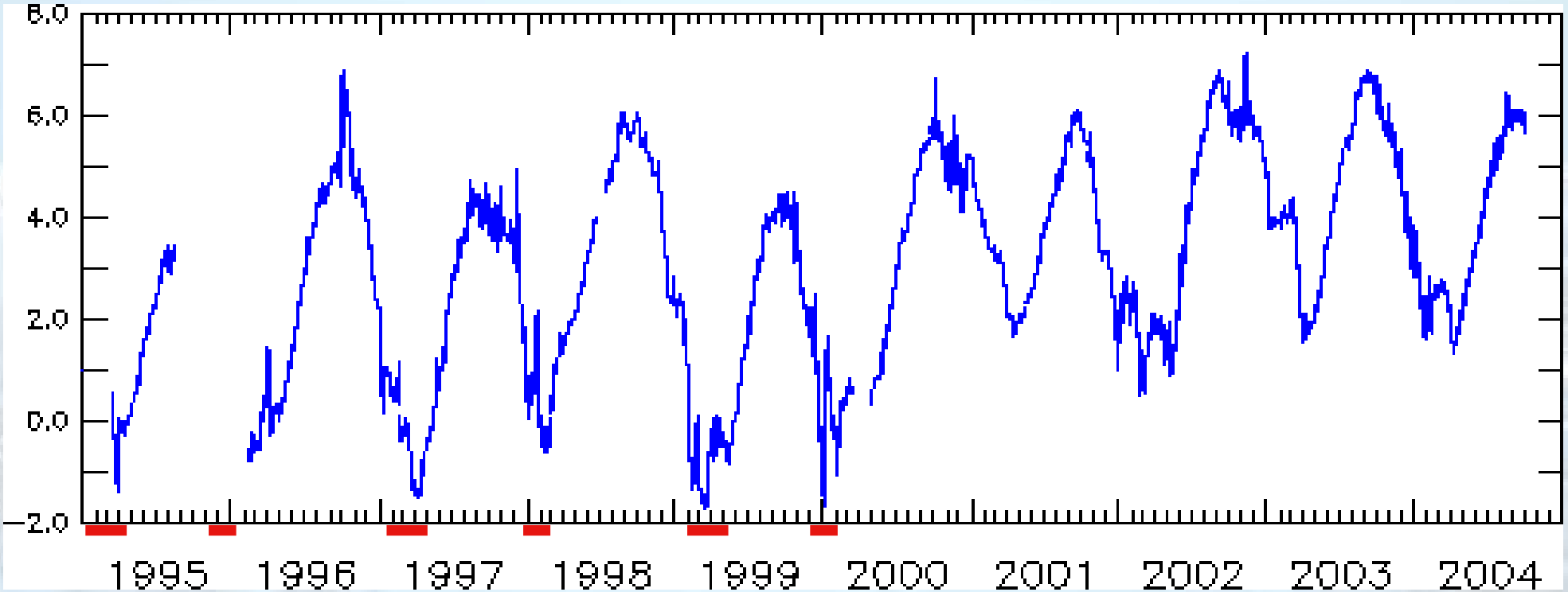
February March April May June

T/S Oshoro Maru Zooplankton Time Series



J. Napp (unpublished)

Vertically Averaged Temperature (°C) at Site 2

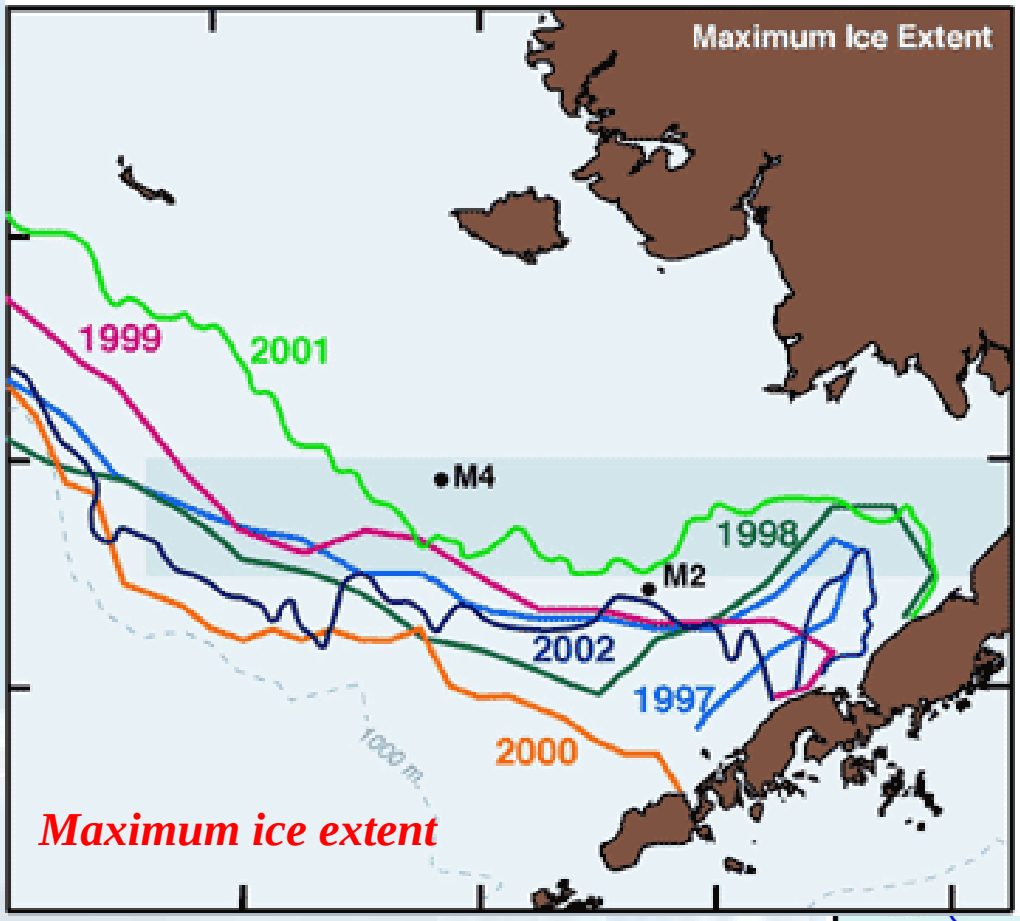


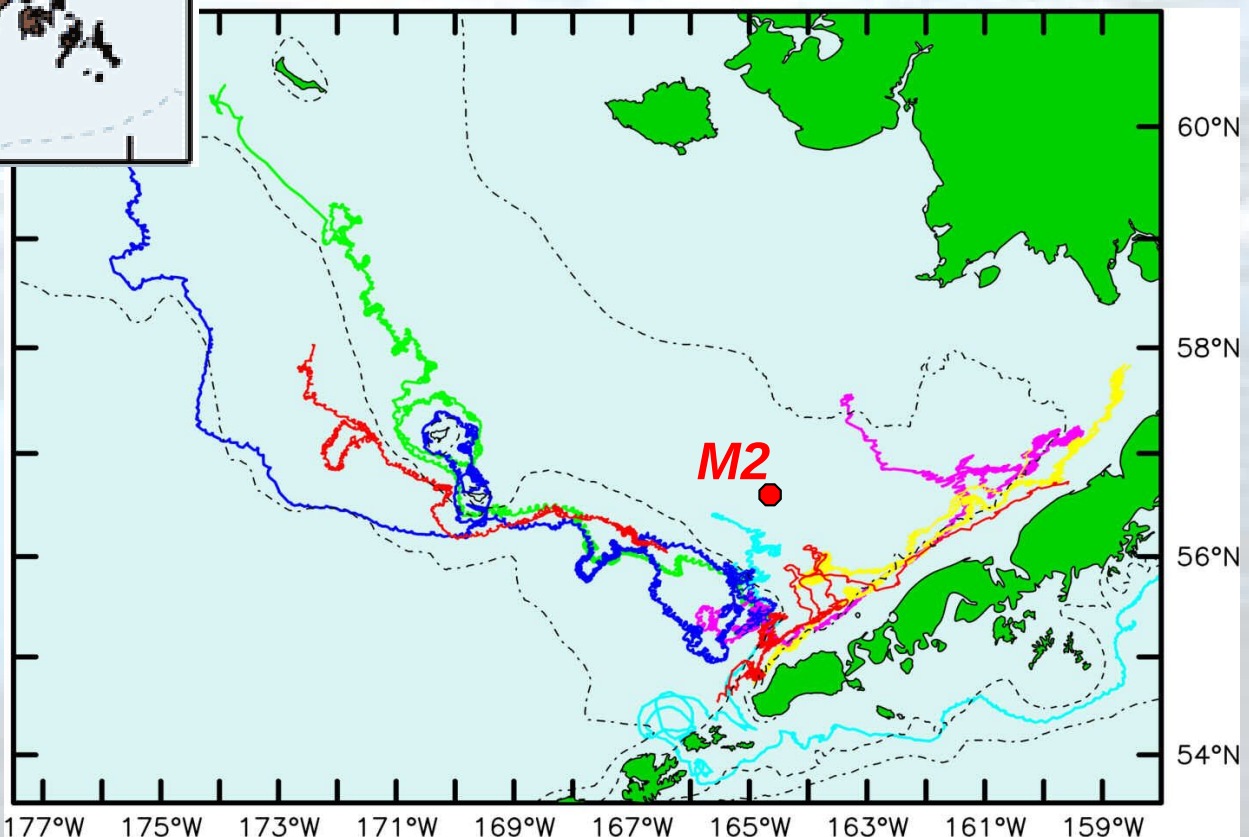
Warming at Site 2 is primarily due to the reduction in sea ice.

Why has there been a marked reduction of ice at Site 2?

- **Later occurrence of ice in the north**
- **Earlier spring transition**
- **Warmer water over the shelf**
- **Change in transport through Unimak Pass**

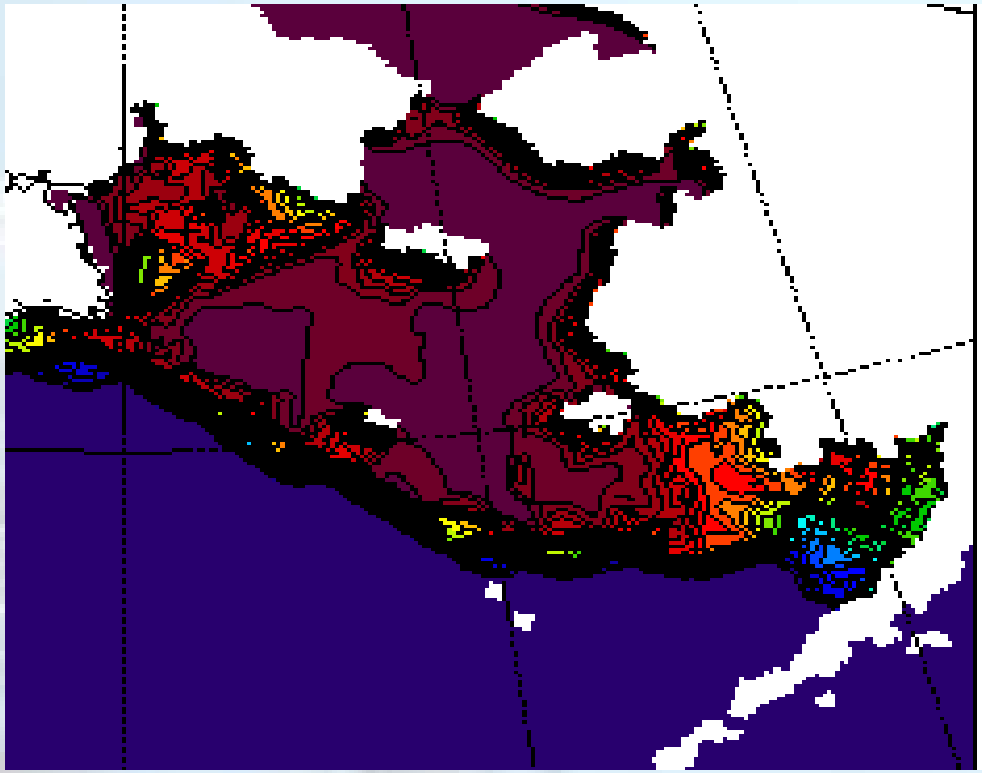
Transport of water through Unimak Pass



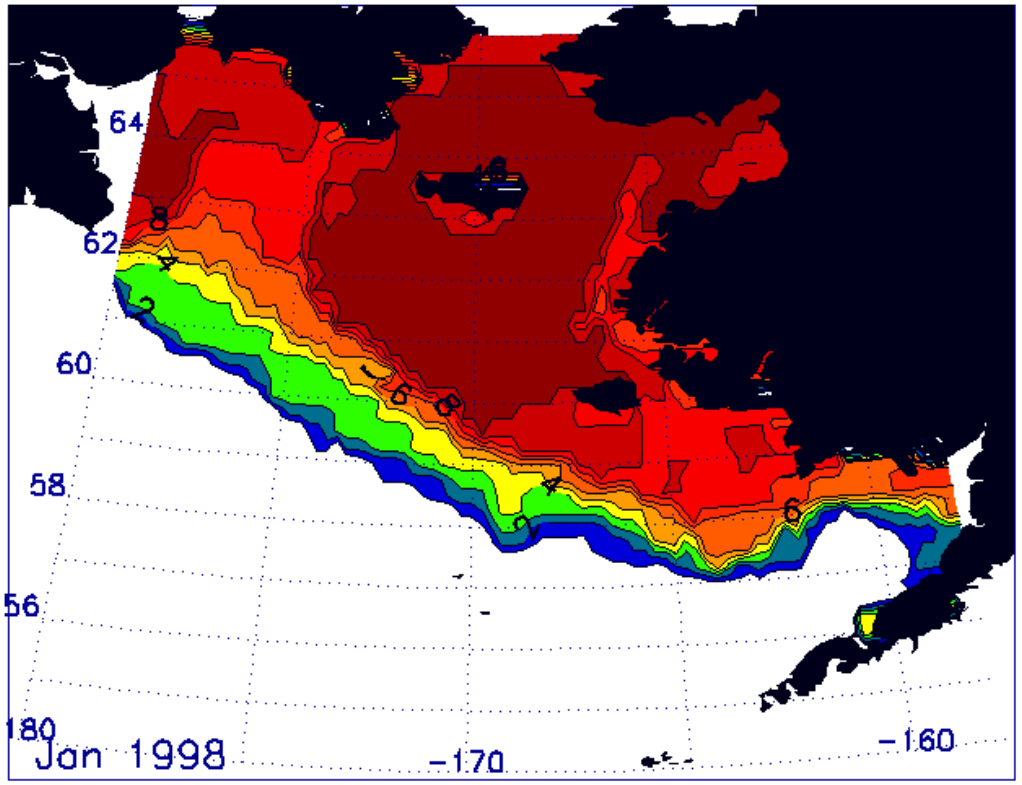


Sea ice concentration: January 1998

Model

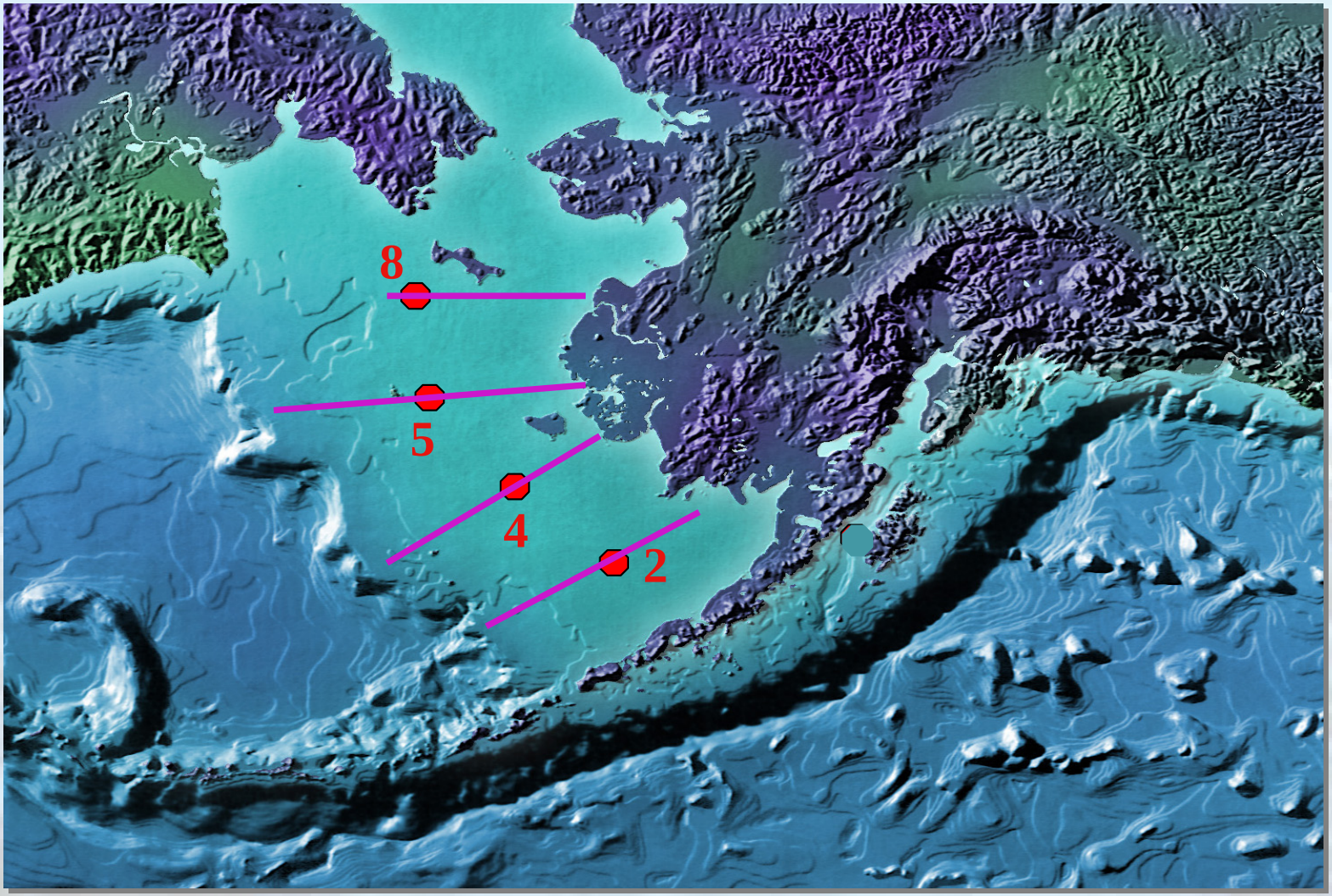


Observed



E. Curchitser, A. Hermann, K. Hedstrom and P. Budgell

Future observations



Summary

- **Marked decrease in the concentration and duration of sea ice over the southeastern Bering Sea shelf**
- **Marked warming (~3°C) of water column temperature at M2 and perhaps at M4**
- **Later spring phytoplankton bloom at M2 (May/June vs. March/April)**
- **Large variability of zooplankton summer abundance, decrease in the last 4 years.**
- **Warming at Site 2 is largely due to reduction in sea ice.**

Reduction in ice is caused by a variety of mechanisms: later fall transition, earlier spring transition, increased flux through Unimak Pass.