

Spatial and Temporal Considerations in Temperature Over the Changing Bering Sea Shelf



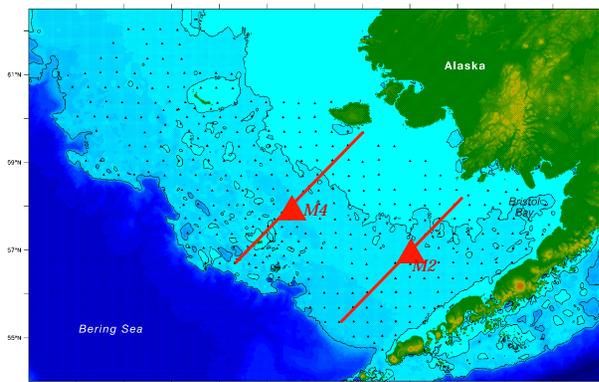
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Abstract:

Oceanographic, climatic, and fisheries data are imperative to delineate and explore the impact of climate change on ecosystems. We use both shipboard collection (spatial) and moorings (temporal) to examine changes on the Bering Sea shelf. Hydrographic data have been collected in June-July over the eastern Bering Sea shelf as part of an annual trawl survey conducted by the Alaska Fisheries Science Center (NOAA/AFSC). A 20x20 nautical mile uniform grid was established when the surveys began in 1971 over the area ranging from 54°N to 63°N. Data have been collected annually since 1979, and have a consistently dense coverage since 1995. These data provide a spatial depiction of temperature gradients on the eastern Bering Sea shelf. 2D cross-shelf, along-shelf and horizontal sections have been prepared showing temperature contours, and allowing us to define cold pool extent and mixed-layer depths across these areas. The longevity of the surveys will allow us to look at patterns and changes over time. Two biophysical oceanographic mooring sites will be used to compare temporal trends within the same region. Mooring M2 has a 10-year record (56.9°N, 164°W). Mooring M4 has a 6-year record (57.9°N, 168.9°W). The Bering Sea appears to be warming. These data sets are crucial to examining the mechanisms of change.

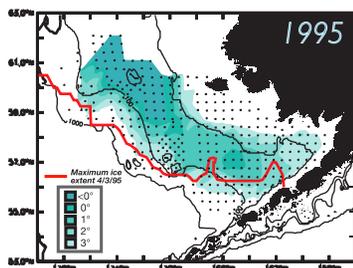
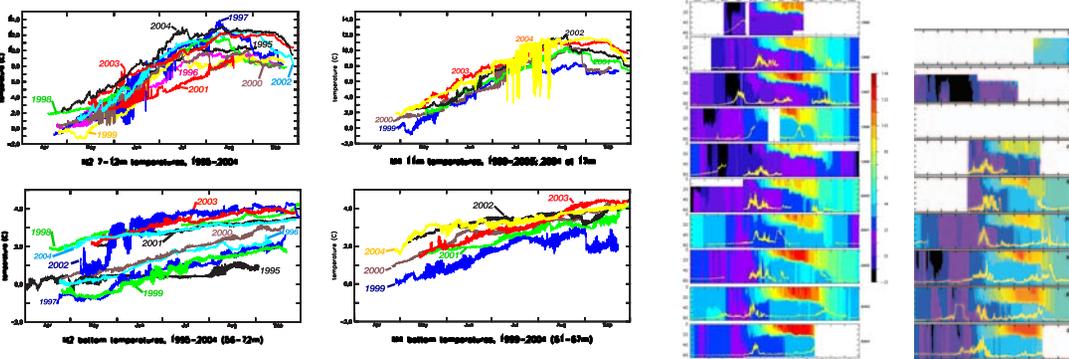


The Eastern Bering Sea shelf. Black triangles are Trawl Survey positions. Red are mooring sites.

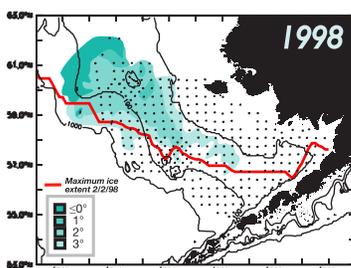
Current Work and Future Direction

We analyze trawl data temperature profiles to obtain estimates of the geometry and interannual variation of the cold (<2°) and cool (2-4°C) pools on the Bering Sea shelf. We focus on three years, 1995, 1998 and 2003. Additionally we use long-term time series data from two FOCI moorings (funded by NOAA, NPRB, Pollock Commission) to look at bottom temperature compared to near-surface (10m) temperatures in a timeframe overlapping trawl data collection. Finally, we compare annual sea ice extent over the Bering Sea shelf, and to visualize their physical relation to the location and extent of cold/cool pools.

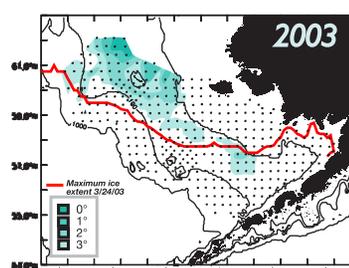
Ultimately we wish to normalize the annual temperature data sets over 10 years and look at the correlations between surface/atmospheric influences in the upper water column, sea ice timing, and mixed layer depth development in order to analyze the influence of surface and upper-layer processes to conditions below the mixed-layer depth.



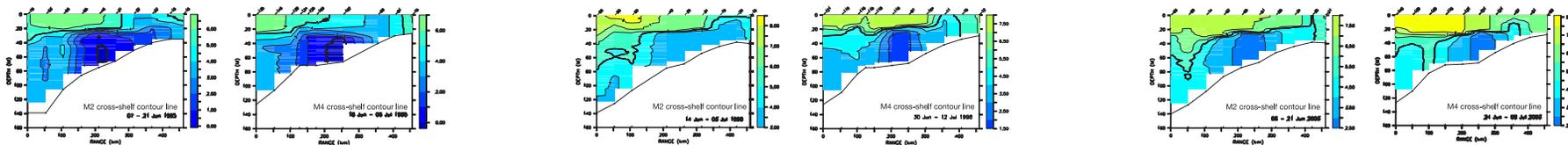
1995 is defined as a cold year. Average sea ice coverage was extensive with a maximum in early April, receding north of the survey area in late May. Note the ice-extent line (red) compared to estimated cold/cool pool temperatures. These data were collected between 6/4 and 8/2/1995.



1998 is a moderately warm year with a strong El Nino in winter '97-98. The Mixed-layer depth deepened as summer progressed. Maximum ice extent reached south of Mooring 2 with a maximum extent in early February and receding out of the survey area in early June. Note the ice-extent line (red) compared to estimated cold/cool pool temperatures. These data were collected between 6/9 and 7/29/1998.



2003 is a notably warm year. Cold/cool pool extent are smaller than 1995 and 1998. Maximum ice extent occurred in late March reaching only as far as the more northerly mooring, M4, and receded out of the survey area in late April. Note the ice-extent line (red) compared to estimated cold/cool pool temperatures. These data were collected between 6/2 and 7/22/1998.



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