COASTAL PROCESSES IN THE SOUTHEAST CHUKCHI SEA, ALASKA: LANDSCAPE HISTORY AND THE FUTURE

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The coasts and marginal lowlands of the southeast Chukchi Sea are geologically diverse and record a wide range of responses to Holocene climate and sea level change. The rich human history of this region spans the last 5000 years and provides a long-term view of human-environment interactions in the Arctic. Sea level has been slowly rising throughout this period (Jordan and Mason 1999; Mason and Jordan 1993) but coastal geologic features and the distribution of archaeological sites indicate that this trend has been modulated by shifts in climate that have influenced both marine and terrestrial systems (e.g. sea ice regime, wave dynamics, permafrost table, shoreline erosion rates, sediment mobility).

Long-term monitoring of coastal change is facilitated by an irregularly-spaced network of 26 shoreline change monitoring stations established between Cape Prince of Wales on Bering Strait and the village of Kivalina, between Kotzebue and Point Hope. Station data collected within the boundaries of Bering Land Bridge National Preserve (BELA) and Cape Krusenstern National Monument (CAKR) indicate that shoreline erosion is active along more than 80% of the shoreline. Retreat rates average less than 1.75 m yr^{-1} in the monumented reaches, but vary at several temporal and spatial scales depending on exposure, lithology, and importantly, the presence or absence of development or infrastructure. The rates and economic severity of coastal retreat are greatest at present at the village of Shishmaref, where late summer and fall storms have destroyed a 15 year-old seawall and have undercut several structures. The magnitude and frequency of these storms appear to exceed those calculated from historic data: 1.5 – 2.0 m event every 8 to 10 years (Jordan 1990). Present research focuses on developing an index of coastal change sensitivity (Pethick and Crooks 2000) for reaches in the southeast Chukchi Sea, establishing key coastal monitoring stations (one each in BELA and CAKR, see Fig. 1) and increasing the density of sector monitoring stations, and refining the record of eustatic and relative sea level change through field-based investigation of coastal environments. The integration of this effort with data from historical sources and community input will be critical for rational and sustainable economic development in the region.

Two key sites for monitoring coastal environmental change, one each in BELA and CAKR, have been designated BELA Site 1 and CAKR Site 1 and are shown in Fig. 1.

CAKR Site 1: Lat. 67° 03'/ Long. 163 ° 18' BELA Site 1: Lat. 66 ° 21'/ Long. 165 ° 40'

References

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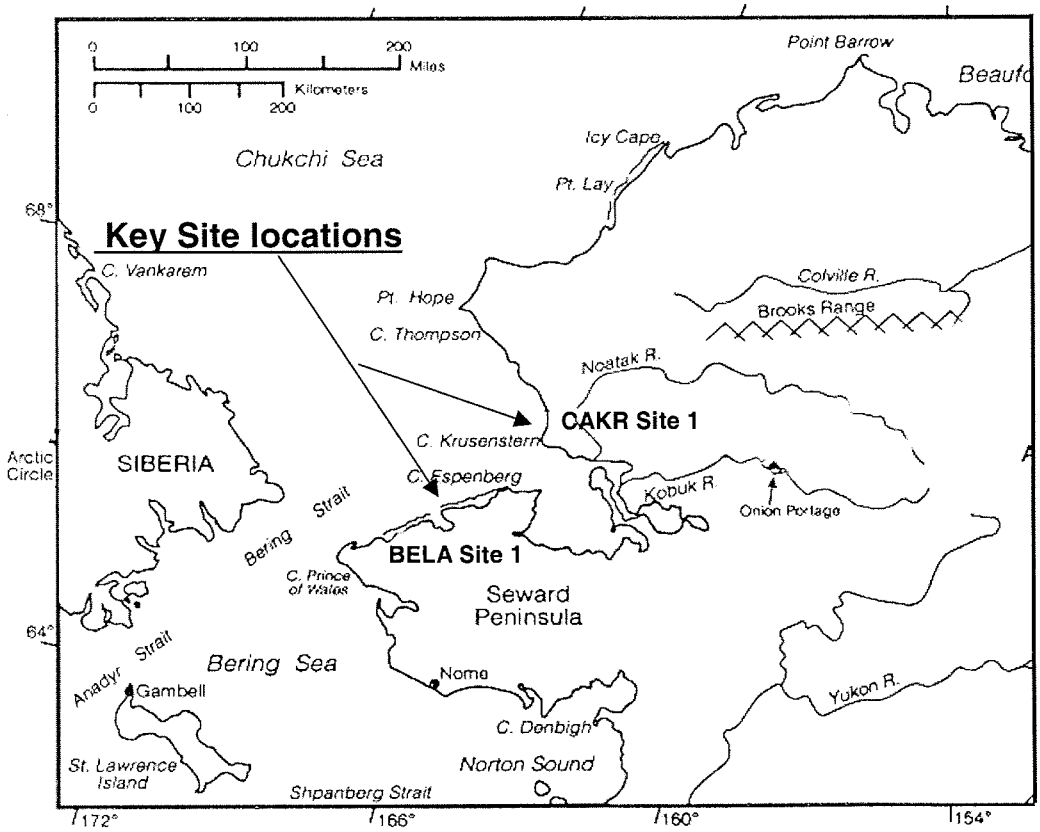

Figure 1. Southeast Chukchi Sea, showing location of key coastal monitoring sites.