

## **Coastal Erosion Since 1950 Along the Southeast Chukchi Sea, Alaska, Based on Both GIS and Field Measurements**

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Coastal environments at high latitudes are experiencing rapid change (e.g., Solomon, 2005; Jorgenson and Brown, 2005; Mars and Houseknecht, 2007). Coastal erosion threatens a variety of nearshore marine, terrestrial, and freshwater habitats, and may be accelerating with Arctic warming. To better understand impacts for national parks in northwestern Alaska, a collaborative study has begun to document coastal change in the southeast Chukchi Sea (Fig. 1). A field-based component includes: repeat photography; mapping and description of sediments and landforms; and periodic ground-truth measurements of shoreline change since 1987 at 27 coastal monitoring sites. A geospatial component began with creation of digital orthoimagery over a large area (>6000 km<sup>2</sup>) at high resolution (1.0 m or better) for three "timeslices": approx. 1950, approx. 1980, and 2003 (Manley et al., 2007). Spatial analysis of bluff retreat was conducted for selected areas near the monitoring sites using the USGS DSAS extension to ArcGIS (Thieler et al., 2005). Results indicate that the GIS-based measurements have acceptably low errors (+/- 0.1 m/yr or better). Transects with 20-m spacing reveal high spatial variability related to coastal morphologies and processes (Figs. 2 and 3). A comparison of the two time intervals suggests temporal variability also. For example, bluff erosion rates appear to have decreased after 1980 for the north-facing coast of Bering Land Bridge National Park (BELA) while increasing after 1980 for the west-facing coast of Cape Krusenstern National Monument (CAKR). In general, most of the >600-km-long coast from Wales to Kivalina has experienced erosion in the past five decades, with long-term average rates of 0 to -3 m/yr. Direct impacts include beach and bluff retreat, overwash deposition, migration or closure of inlets and lagoons, capture of thaw-lake basins, and release of sediment and organic carbon to nearshore waters. Higher temporal resolution is needed, but the coastal ecosystems in the region appear to be sensitive to: the frequency and intensity of storm events, increasing temperatures, permafrost melting, sea-level rise, and the increasing length of the summer ice-free season.

### **REFERENCES:**

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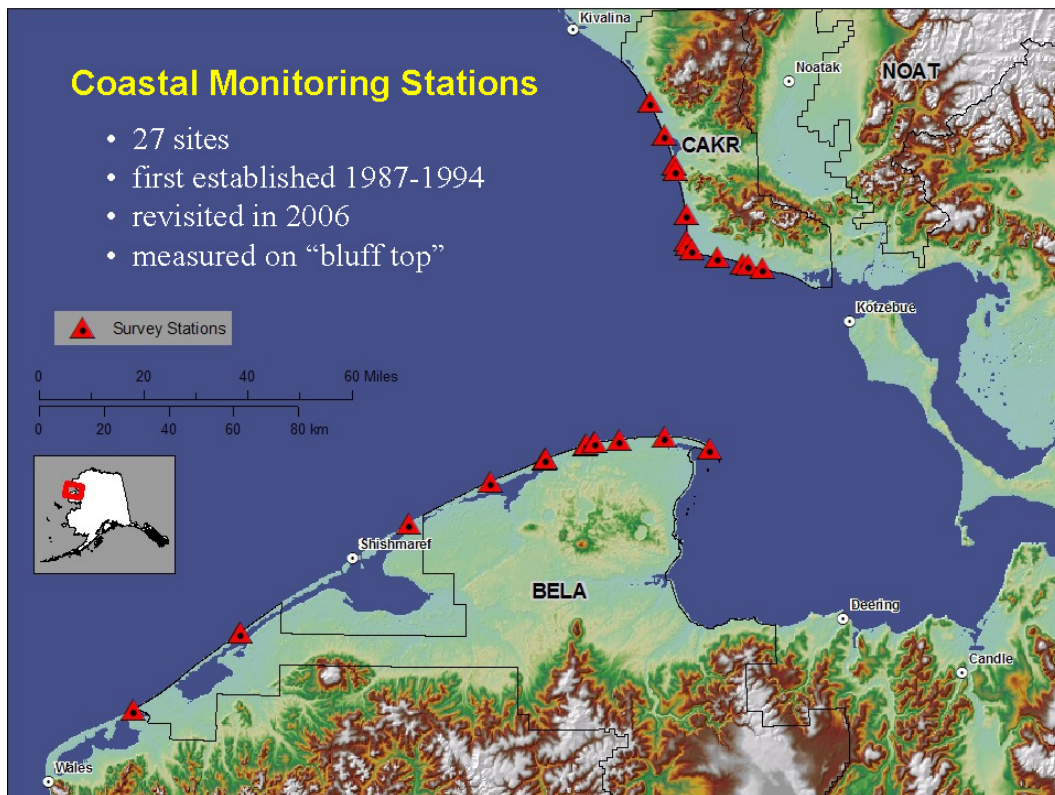


Figure 1. Location of the study area and coastal monitoring stations in northwest Alaska.

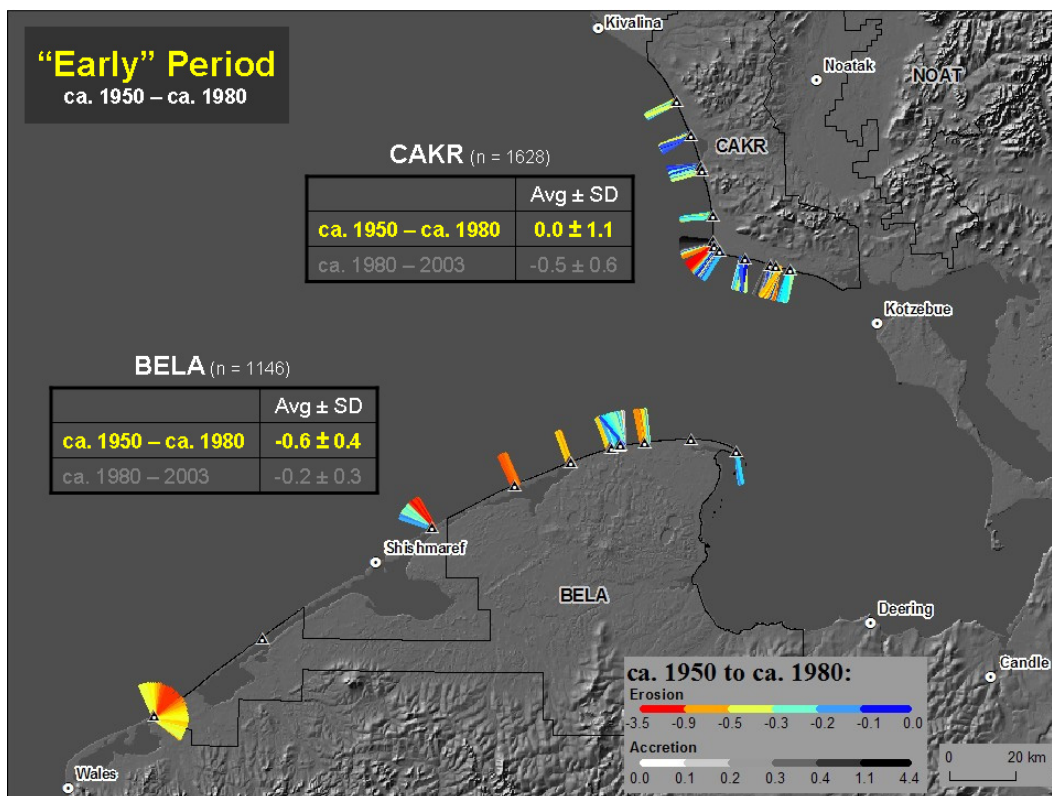


Figure 2. Bluff accretion and erosion near coastal monitoring stations during the "Early" period, from approx. 1950 to approx. 1980 (depending on air photo acquisition dates), in m/yr.

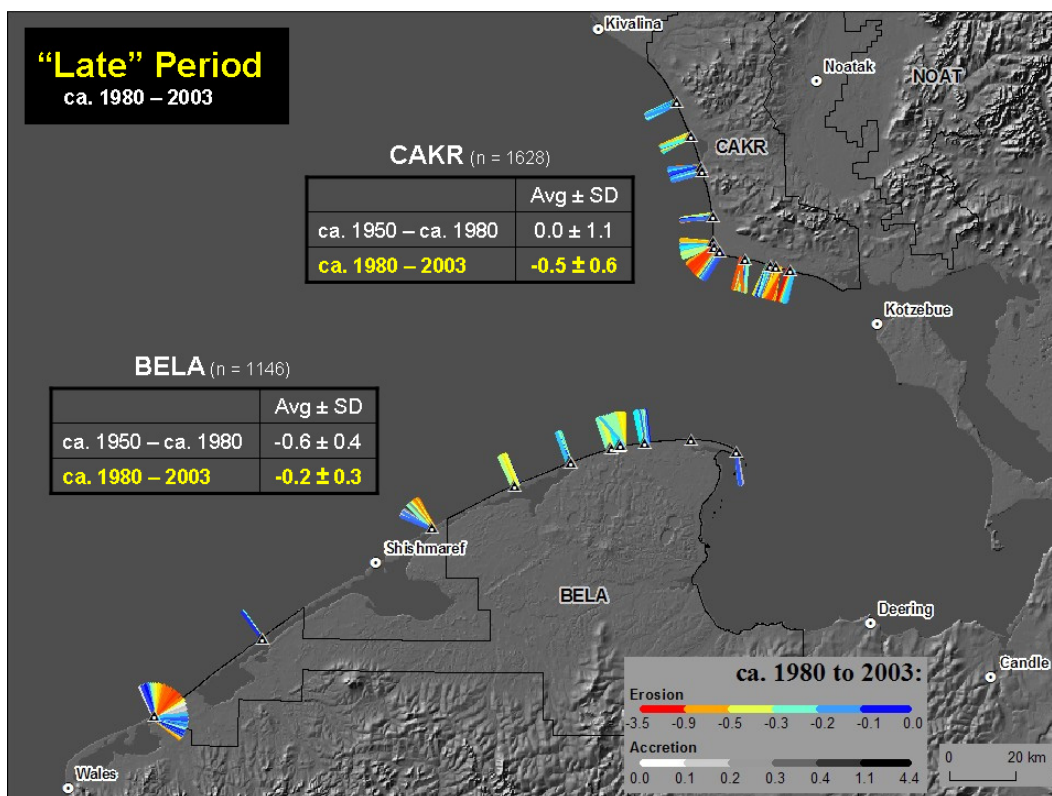


Figure 2. Bluff accretion and erosion during the "Late" period from approx. 1980 to 2003, in m/yr.