Coastal hazards in Alaska:
Threats, trends, and needs

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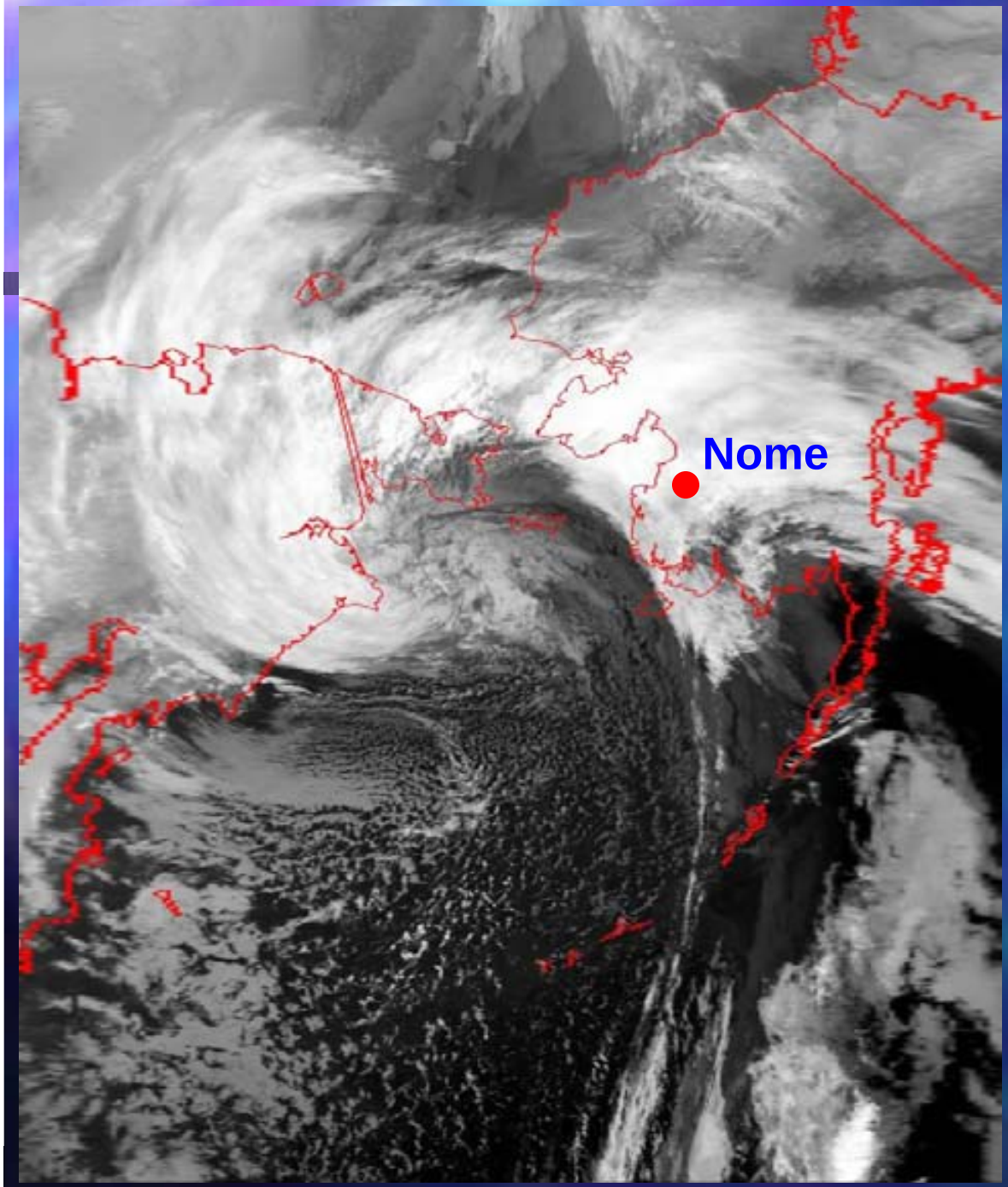
Threats

> Heavy storms regularly hit most coastal regions of Alaska

> Most (~80%) of Alaska is ocean or river coastal

> A lot of people and economic/subsistence activity is at risk

- erosion
- inundation
- shipping accidents



October 19, 2004

Bering Sea storms:

- Are *not* hurricanes
- Do have hurricane strength
  - central pressure
  - winds
  - surges
  - waves
- They tend to loiter
  - cause maximal damage

Tropical vs. “extra-tropical” cyclones

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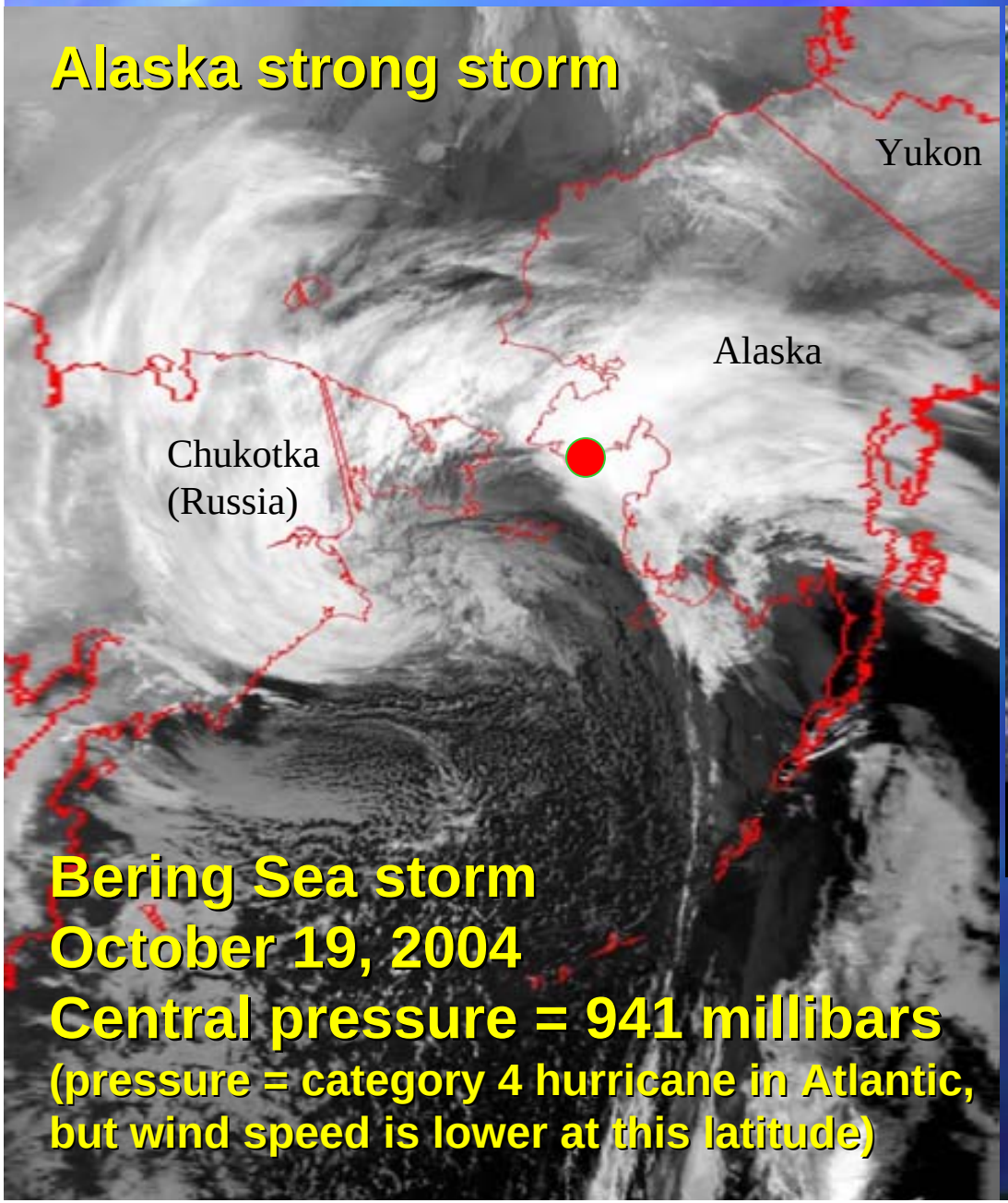

Both systems are “cyclones” in that all storms are cyclones. However tropical cyclones look like Andrew – massive cloud formation, symmetry, a clear eye – WHEREAS “extra-tropical” (meaning outside of the tropics) cyclones look like the Alaska storm – cloud “shields” with dry slots (dark zones with no clouds) , non-symmetric, no eye. Winds always rotate counterclockwise around these features in the northern hemisphere.

A not-unusual Alaska storm situation, late October, 2005:

Three serious storms underway at the same time, affecting all major coastal regions

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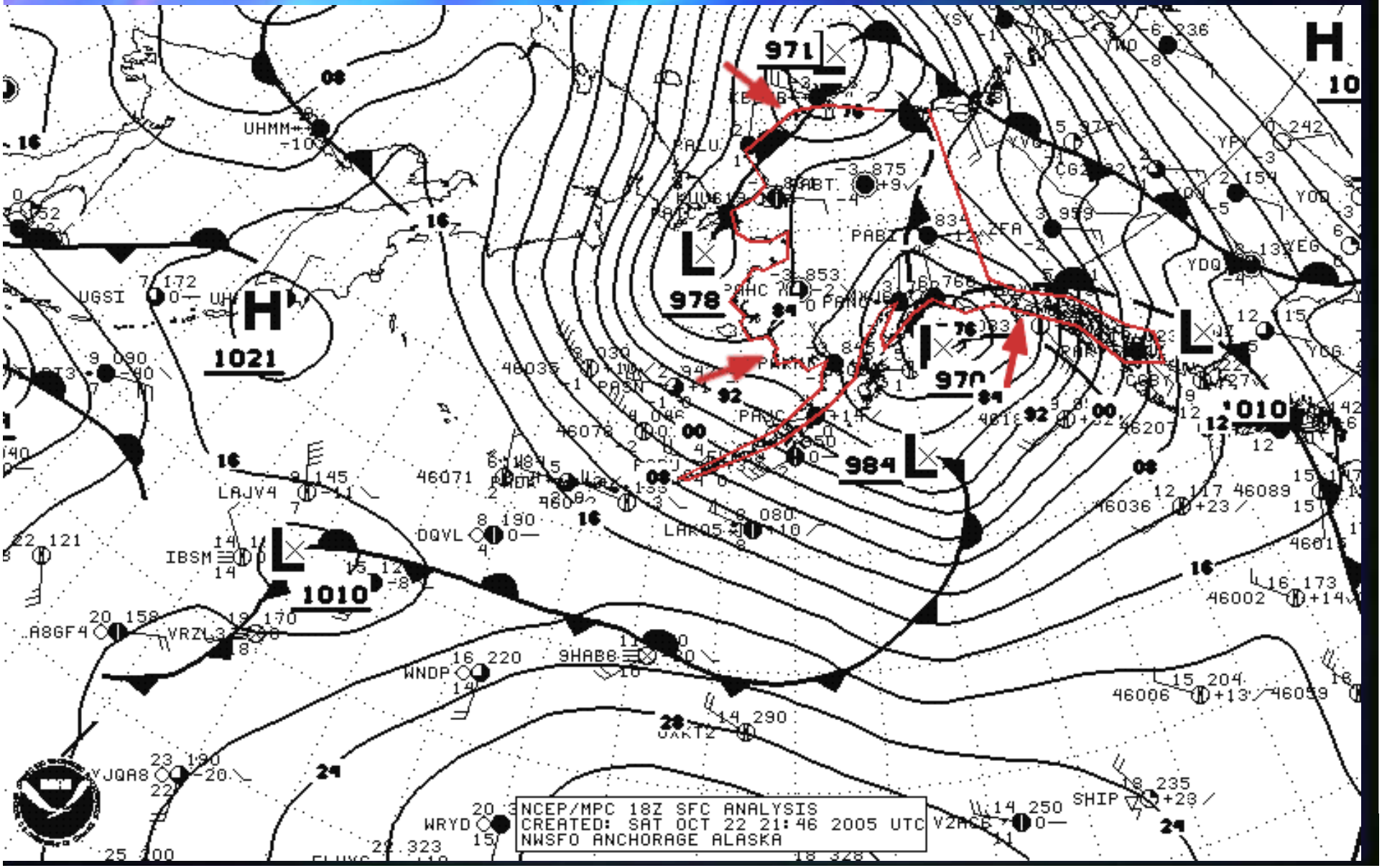
Red arrows indicate wind direction



Threats

Main agents:

- Waves
  - physical/kinetic erosion
- Surges
  - inundation
  - waves attack higher up on bluff – avoid beach zone
  - waves depth limited – surges allow more powerful waves
- melt
  - varies by coast
  - solar radiation/warm temperatures

Shishmaref bluff retreat

… severe erosion caused by

Photos: Tony Weyiouanna Sr.

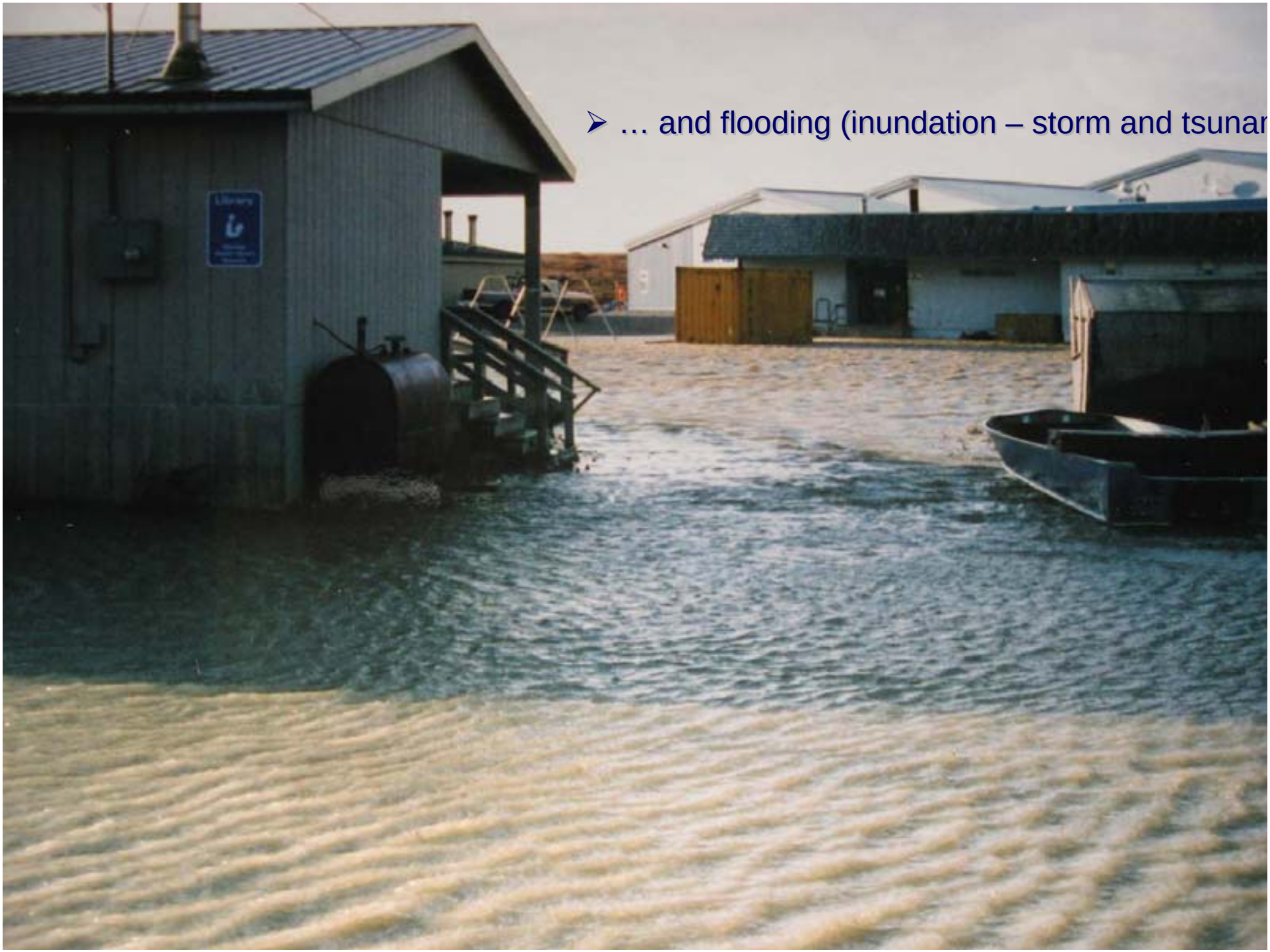
waves

Teller, AK

- Coastal erosion… (October 2004)

- Coastal erosion… (October 2005)

- … and flooding (inundation – storm and tsunami



- … and flooding (inundation – storm and tsunar

Nome, AK – during the storm

Nome, AK – Front Street (where the Iditarod finishes)

S. Solomon, Cdn Beaufort

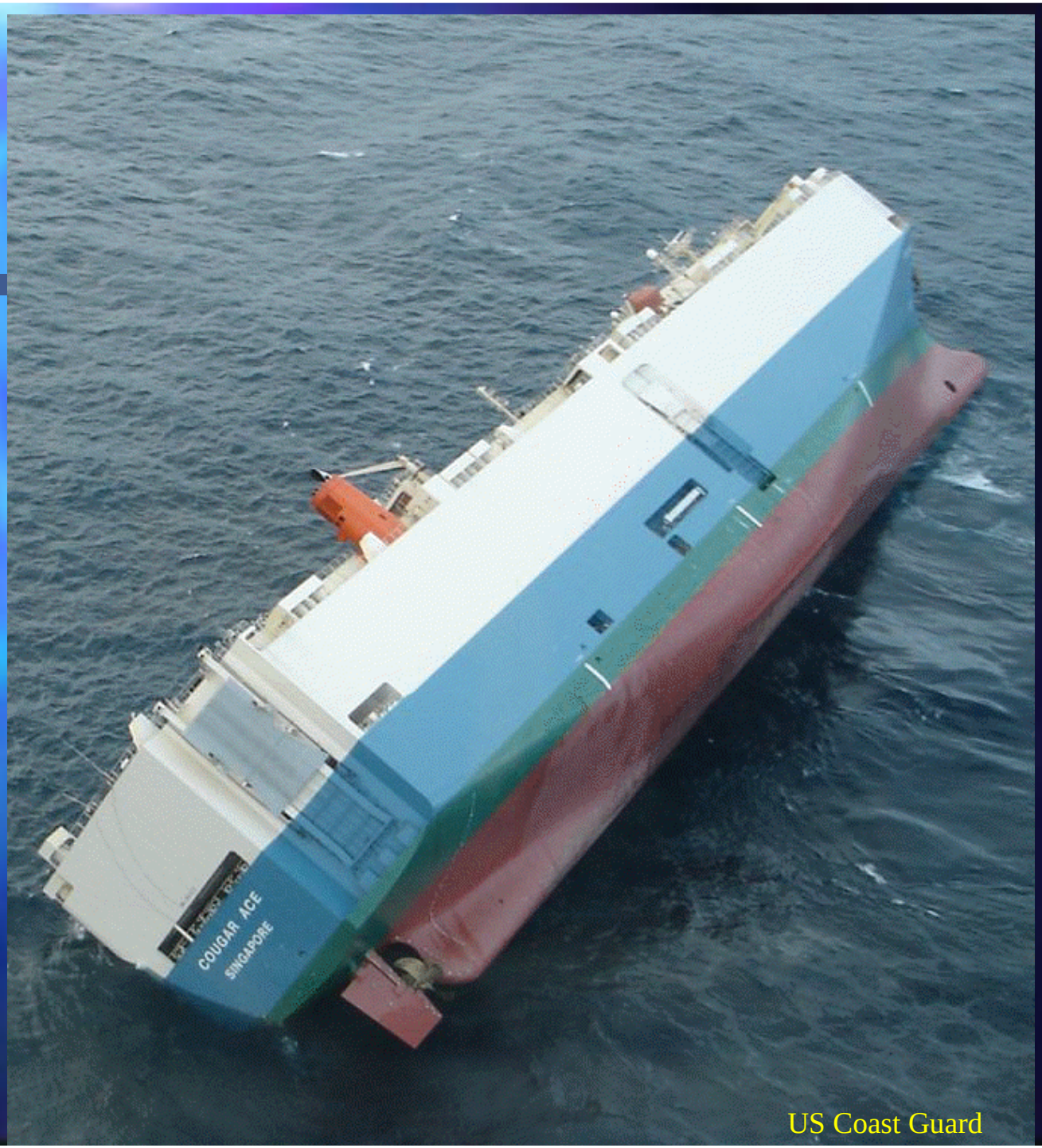
S. Ogorodov, Barents

BARROW ARCTIC
BASC
SCIENCE CONSORTIUM
Coastal Protection
Picture obtained from NSB Wildlife
6 2:25 PM

by Ned Rozell, May 2006

M/V Cougar Ace

Summer 2006



US Coast Guard

M/V Selendang Ayu

December 2004

US Coast Guard

Trends

Climate change trends that dominate coastal susceptibility :

1) **Loss of sea ice**
   - Increased storm exposure
   - shipping
2) **Melting of permafrost**
   - Weakened coastal zones

(both of these also pose problems for subsistence)

Storm frequency? – hard to demonstrate strong trends in coastal zones

Sea level rise? – not the primary player for AK in the short term

Needs

Improve forecast capacity

- Storm lead time
- More detailed waves, surges for coastal communities
- Storm-level erosion predictions ultimately
- National Oceanic and Atmospheric Administration, major partner for this
  - NOAA's National Weather Service responsible for atm. and sea-state forecast

Improve process understanding at a systems level

- Site-processes extrapolated to larger area,
  - eg "generic" erosion model primary need
- Improve understanding of coastal system as an integrated whole

Improve science relevance for end-users, including impacts assessment

- What is needed, how it is needed, when it is needed
- Time frames:
  - Very short – emergency
  - Short – hunting, fishing
  - Longer - planning

Needs

Continue forging partnerships (expertise and jurisdictional needs)

- Other federal (USACE, EPA, USDA, AOOS, others)
- Denali Commission
- State
- Borough/tribal/local
- UA system, ARSC
- Commercial – TeckCominco, Foss
- International experience (Russia, Canada)
  - Arctic Coastal Dynamics project

Implement state-run community information system

- State-level holding logical
- System can be built with external/leveraged funds and transferred to state control
- Expand upon existing ACD database

Instrumentation

- Need more datasets for model verification
  - ocean state – waves, currents, swells
  - on surface and at depth – important physically and biologically

Needs

Coastal zone education and awareness

- Schools – basic AK coastal context and education
- Planning – know where to build

Engineered solutions "manual"

- Conduct controlled experiment of solutions
  - Have set of solutions at hand when problems arise

Example of instrument needs and industry partnership:

Year-round wave observation deployment: Chukchi Sea

No observed wave data during heavy, late-fall storms

- Bottom sensor in 20m water to avoid sea ice
- support wave/swell modeling in this region
- helps to complete circum-Arctic wave observing network
- Important industry collaboration – TechCominco Mines will deploy

Aanderaa Instruments
Recording Doppler Current Profiler

Successful deployment July 2007

– Major industry collaboration from TeckCominco and Foss Maritime

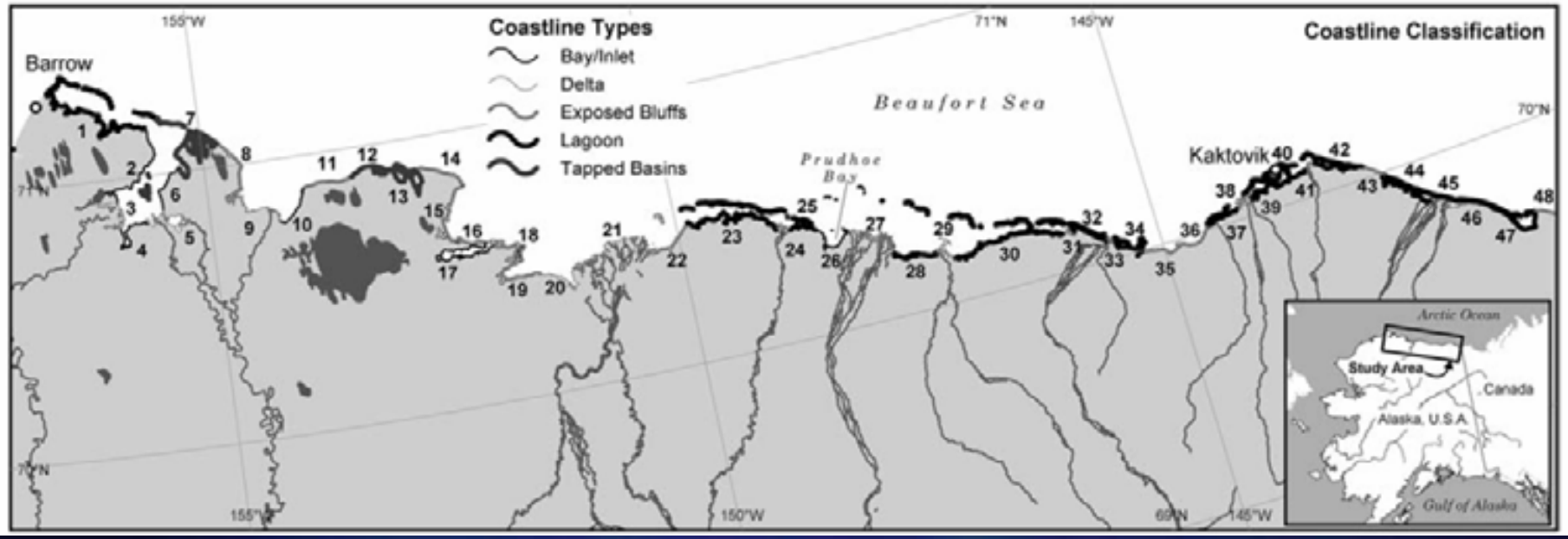
ACD Coastal segmentation and database

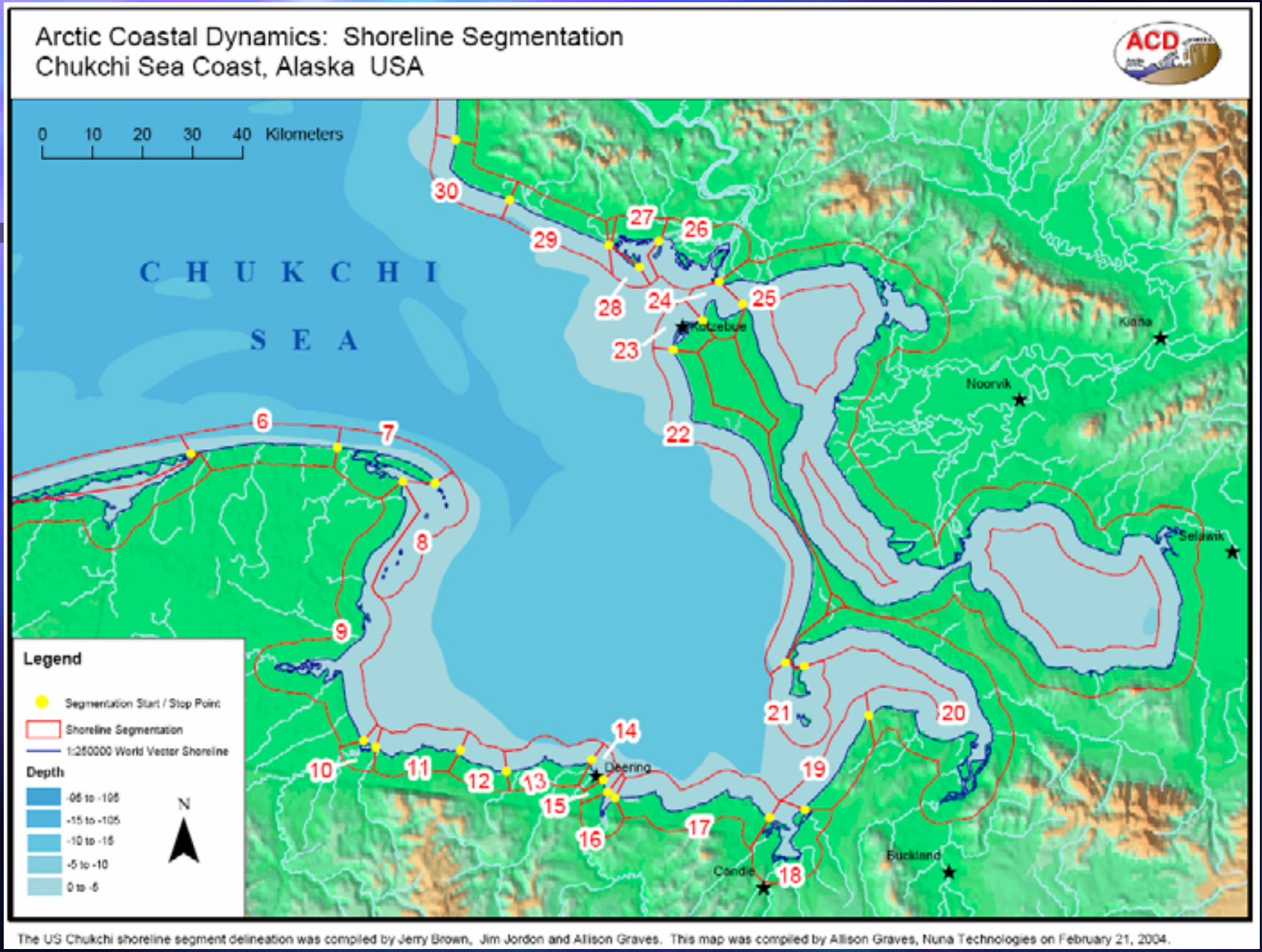
Geo-Mar Lett (2005) 25: 69–80
DOI 10.1007/s00367-004-0188-8

ORIGINAL

M. T. Jorgenson · J. Brown

Classification of the Alaskan Beaufort Sea Coast and estimation of carbon and sediment inputs from coastal erosion





The US Chukchi shoreline segment delineation was compiled by Jerry Brown, Jim Jordon and Allison Graves. This map was compiled by Allison Graves, Nuna Technologies on February 21, 2004.

Compilation: Brown, Jordan and Graves

Needs

Final need – paradigm shift

Ultimately – the coast is an inherently interdisciplinary, interagency entity. Its proper management and understanding requires an approach with that perspective in mind.

Thank you