



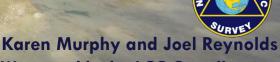






Relative Sea Level Trends in Alaska

NGS – Alaska Regional Advisor



Western Alaska LCC Coordinators

Western Alaska LCC

May 3, 2016

Sea-Level Rise Summit: Connected Futures from Alaska to Florida | Ft Lauderdale, FL

Alaska's Extensive Coastline



VS.



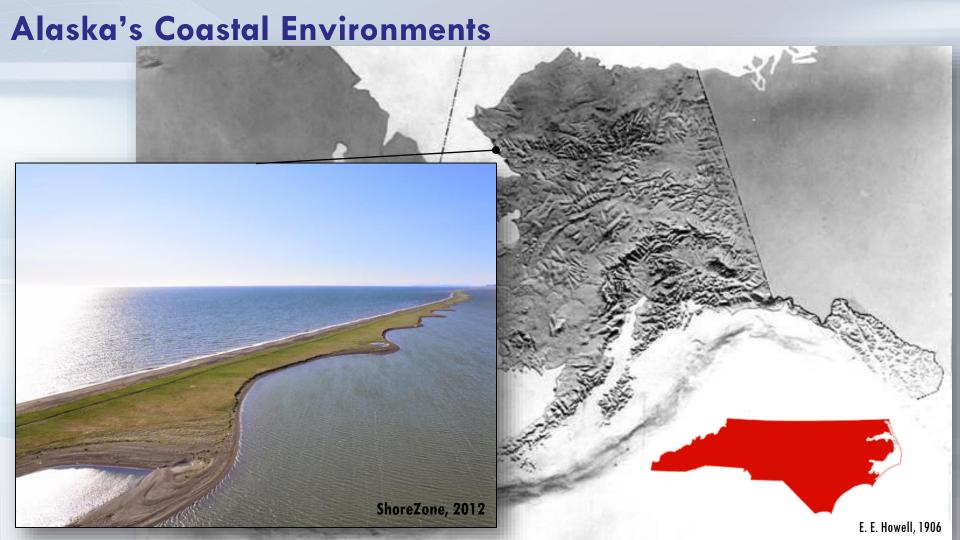
(www.oceanlight.com)

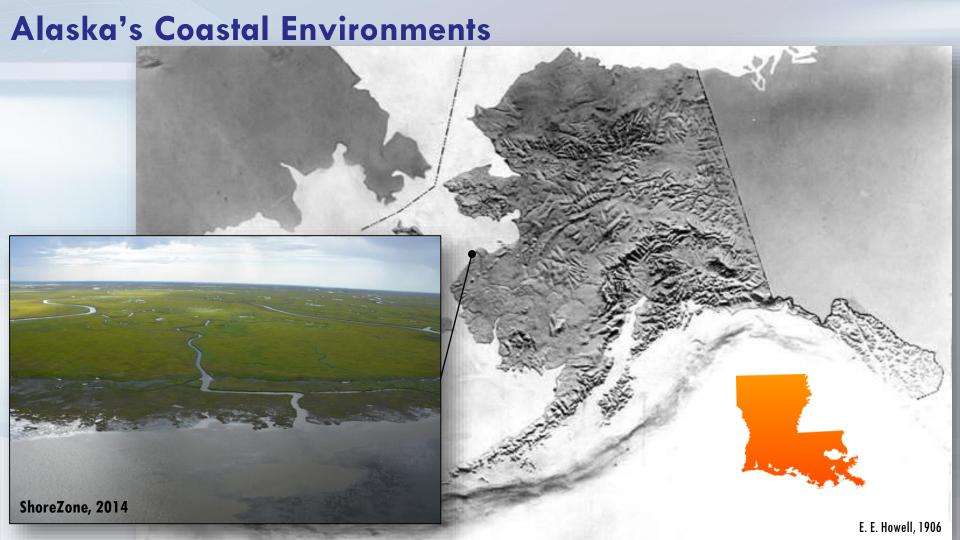
64% of Alaska residents live in coastal communities Arctic coastal processes Unique coastal cultures and socio-economic settings compared to the "lower 48" Emerging infrastructure requirements

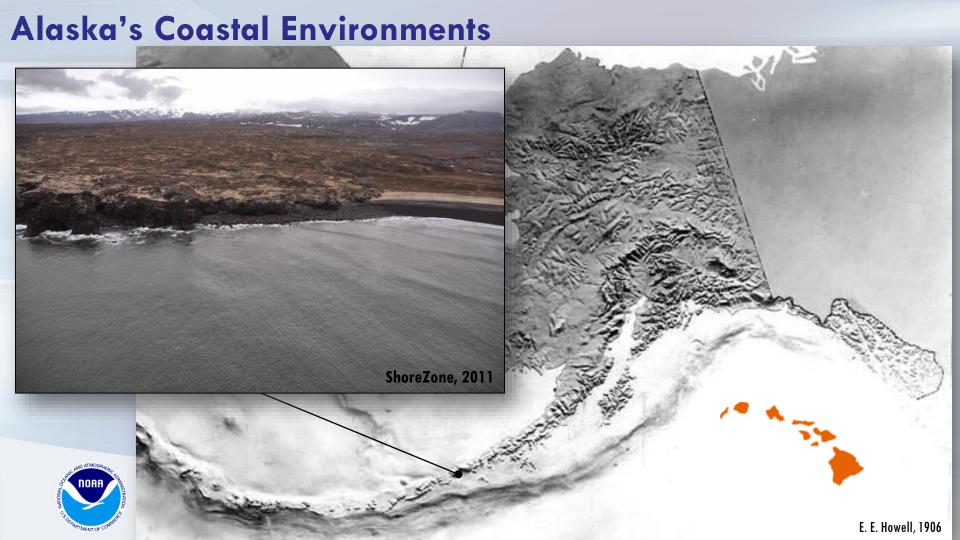
Alaska no longer participates in the Coastal Zone Management Program 12% of communities do not participate in the National Flood Insurance Program Alaska's coastline is data-limited



Alaska's Coastal Environments E. E. Howell, 1906





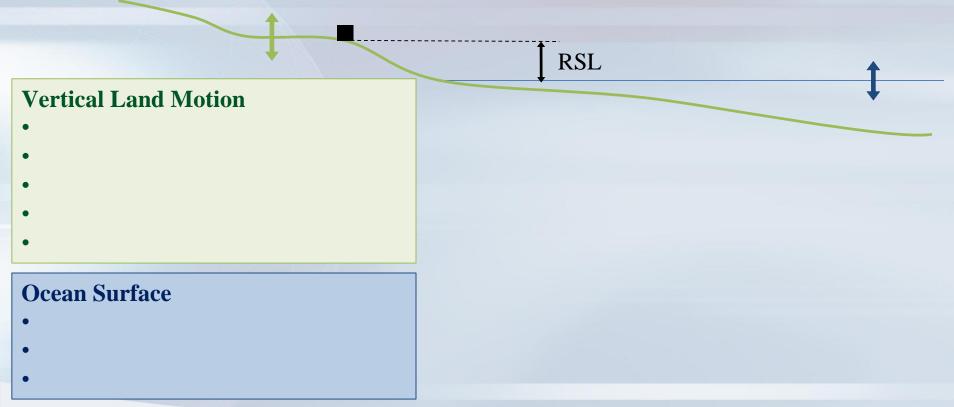


Alaska's Coastal Environments ShoreZone, 2009 E. E. Howell, 1906

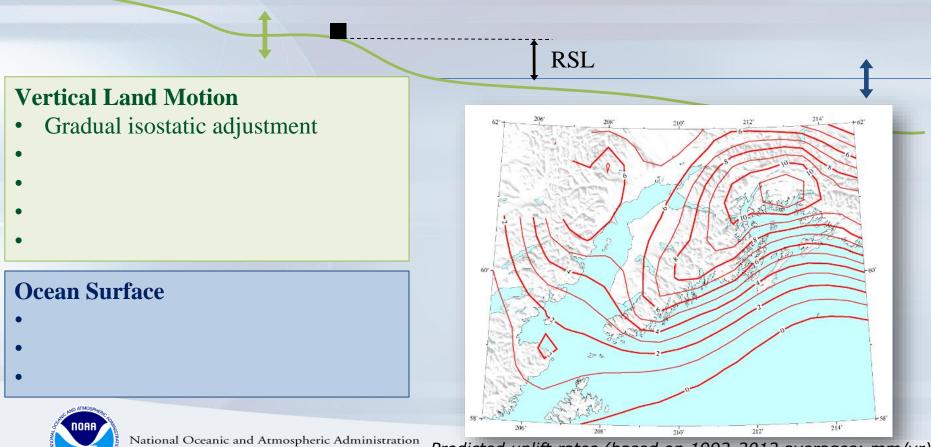
Alaska's Coastal Environments ShoreZone, 2007 E. E. Howell, 1906

The Rising Sea Level Narrative









Predicted uplift rates (based on 1992-2012 averages; mm/yr) due to GIA around Columbia Glacier (Freymueller, 2013)

Vertical Land Motion

- Gradual isostatic adjustment
- Rapid tectonic changes
- •
- •
- •

Ocean Surface

- •
- •
- •



National Oceanic and Atmospheric Administration



USGS Professional Paper 531-I

Vertical Land Motion

- Gradual isostatic adjustment
- Rapid tectonic changes
- Loading subsidence (sedimentation)
- •
- **Ocean Surface**
- •
- •
- •





Yukon Delta (Landsat 7, 2002, NASA Goddard Space Flight Center/USGS)

RSL

Vertical Land Motion

- Gradual isostatic adjustment
- Rapid tectonic changes
- Loading subsidence
- Sub-surface extraction (oil/water)

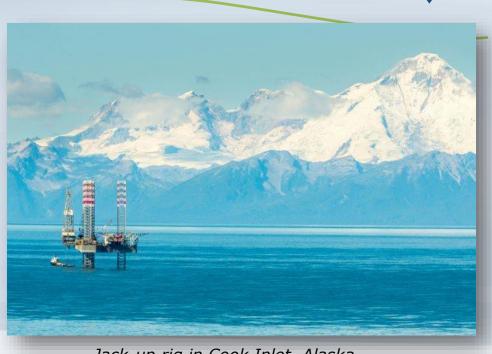
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Ocean Surface

- •
- •
- •



National Oceanic and Atmospheric Administration



Jack-up rig in Cook Inlet, Alaska (Photo by Loren Holmes, Alaska Daily News)

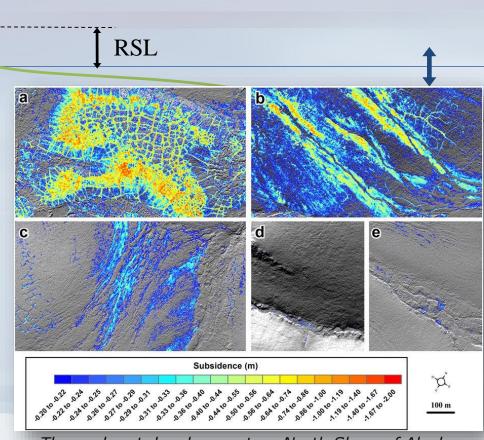
Vertical Land Motion

- Gradual isostatic adjustment
- Rapid tectonic changes
- Loading subsidence
- Sub-surface extraction
- Permafrost degradation

Ocean Surface

- •
- •
- •





Thermokarst development on North Slope of Alaska following tundra wildfires (Jones et al., Nature, 2015)

Vertical Land Motion

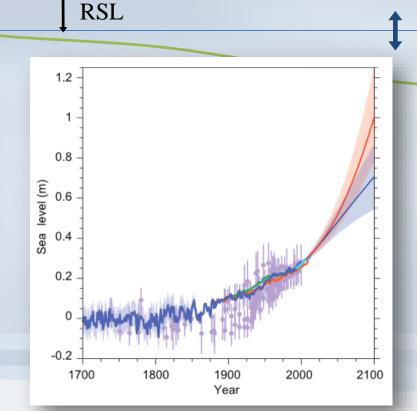
- Gradual isostatic adjustment
- Rapid tectonic changes
- Loading subsidence
- Sub-surface extraction
- Permafrost degradation

Ocean Surface

- Glacier/ice sheet melting
- Thermal expansion

•



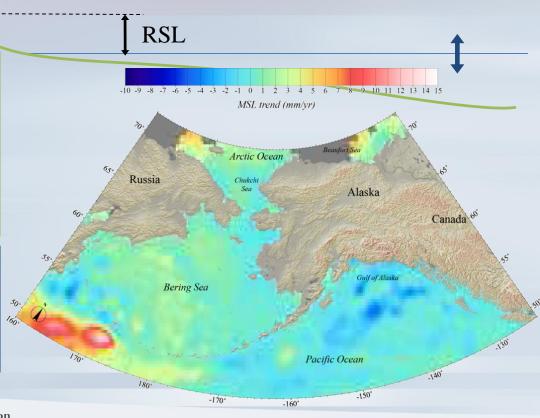


Vertical Land Motion

- Gradual isostatic adjustment
- Rapid tectonic changes
- Loading subsidence
- Sub-surface extraction
- Permafrost degradation

Ocean Surface

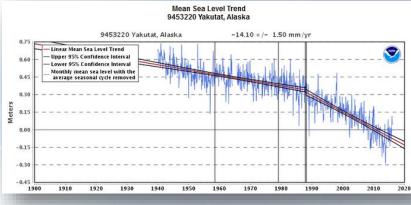
- Glacier/ice sheet melting
- Thermal expansion
- Regional variability



1992-2014 sea surface trends (AVISO gridded [0.25°x0.25°] and merged satellite altimetry data)



• 26 active tide gauges; only 17 with extended records







26 active tide gauges; only 17 with extended records

8 stations (5 active) co-located with continuous GNSS

NOAA Technical Report NOS 139

NOAA Guidance Document for Determination of Vertical Land Motion at Water Level Stations Using GPS Technology

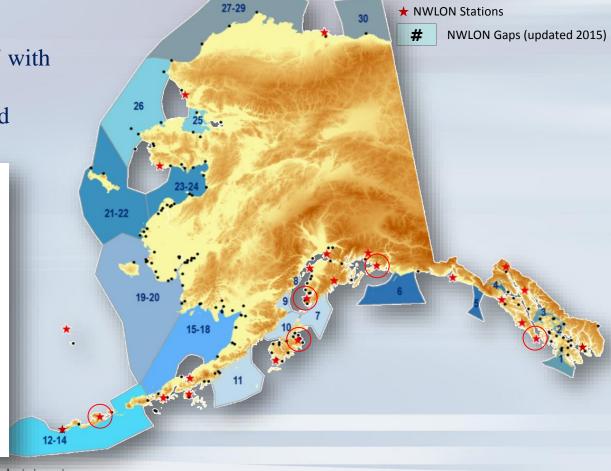


Silver Spring, Maryland August 2015



National Oceanic and Atmospheric Administration

National Ocean Service Center for Operational Oceanographic Products and Services

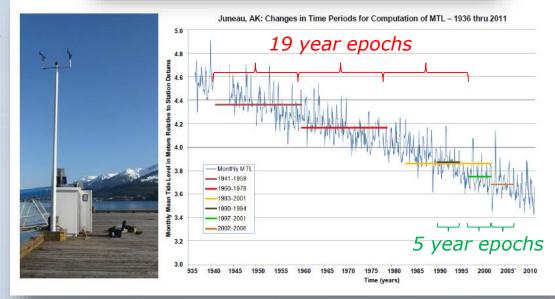




- 26 active tide gauges; only 17 with extended records
- 8 stations (5 active) co-located with continuous GNSS
- Discontinuous records; few repeat secondary/tertiary stations
- Modified Procedure for 5-year
 Tidal Epochs

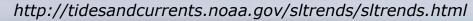
NOAA Technical Report NOS CO-OPS 068

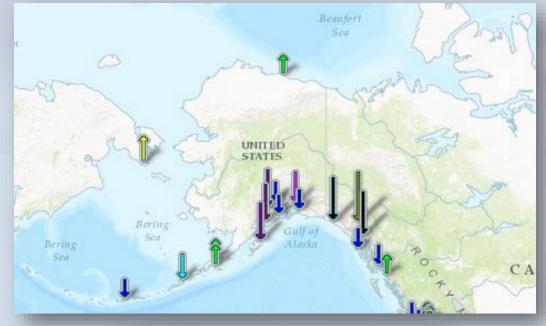
Implementation of Procedures for Computation of Tidal Datums in Areas with Anomalous Trends in Relative Mean Sea Level





- 26 active tide gauges; only 17 with extended records
- 8 stations (5 active) co-located with continuous GNSS
- Discontinuous records; few repeat secondary/tertiary stations
- Modified Procedure for 5-year Tidal Epochs
- Greatest unknowns in parts of the region most vulnerable to rising relative sea levels...









Collaborative Efforts

- Integrated water level network
- Alaska's LCC network promotes coordination, dissemination, and development of applied science to inform landscape level conservation in the face of a changing climate and related stressors.



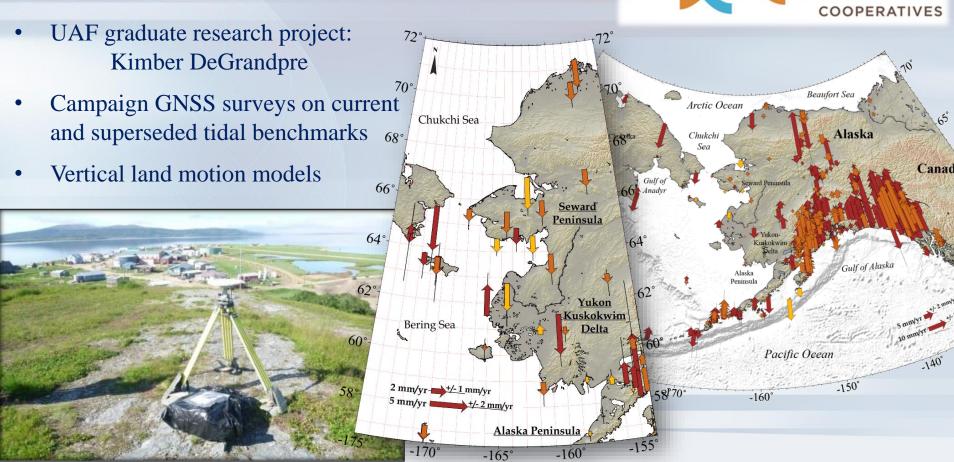






Baseline Data: RSL trends





Ecosystem Science: Nesting Habitats

- PI: Dr. Sarah Saalfeld (FWS/Manomet)
- Identification of important environmental variables related to waterbird nest densities

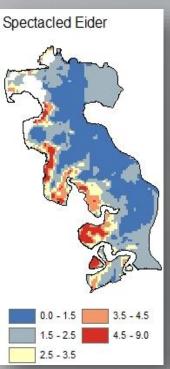
Predictive maps of nesting surfaces in SL scenarios

- 6 species:
 - Cackling Goose
 - Emperor Goose
 - Black Brant
 - Greater White-fronted Goose
 - Common Eider
 - Spectacled Eider









LANDSCAPE CONSERVATION

COOPERATIVES

Communication and Outreach

- Community Based Observing Opportunities
- Ongoing Webinar Series
- Coastal Resiliency Workshops







Thank You! Questions? ShoreZone, 2012