

Historical Climate Data Resources in the North Pacific – Arctic Region

Kevin R. Wood and James E. Overland

with contributions from

Trausti Jónsson, Icelandic Meteorological Office

Brian V. Smoliak, University of Washington

&

Igor Smolyar, NOAA/Nat'l. Oceanographic Data Center

Detecting change is an historical problem

**What is different today compared to yesterday,
the 1950s, or the 19th century?**

**Are there large-scale or low-frequency patterns
that aid (or confound) understanding?**

We search the past for clues

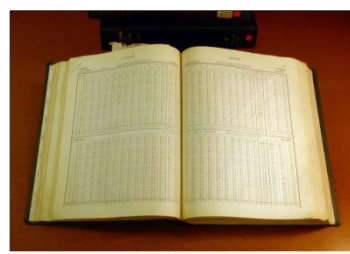
Historical resources

- Instrumental time series & fragments

~200
years



MS met. records



Published records

- Descriptive records (written & visual)

100s
of years
(1600s in Russia)



Revenue steamer *Corwin* at Nome, June 1st 1901

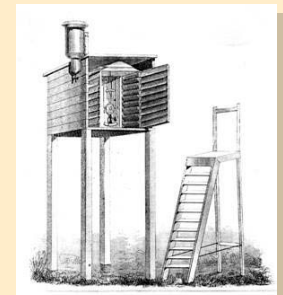
- Climate proxies (ice cores...)

Constraints

- Quality, homogeneity, metadata



Minimum thermometers (1881).
Photo: Deborah J. Warner NMAH



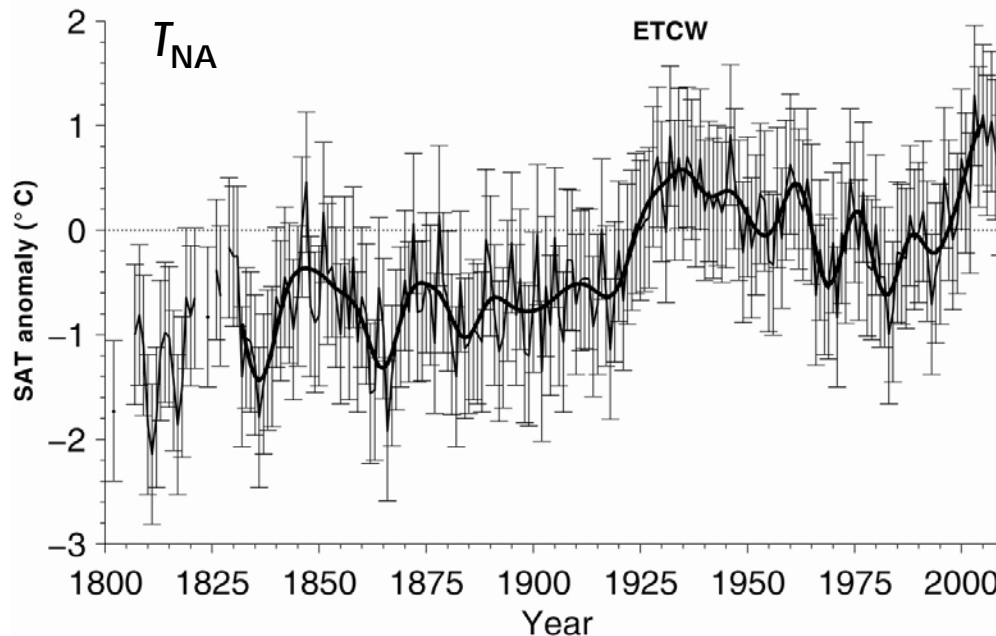
Russian instrument
shelter, 1868



Met. station at *Taimir's* winter quarters, 1914
(Russian Hydrographical Expedition to the Arctic, 1910-15)

- Other noise issues...

An example: Air temperature variations on the Atlantic – Arctic boundary since 1802



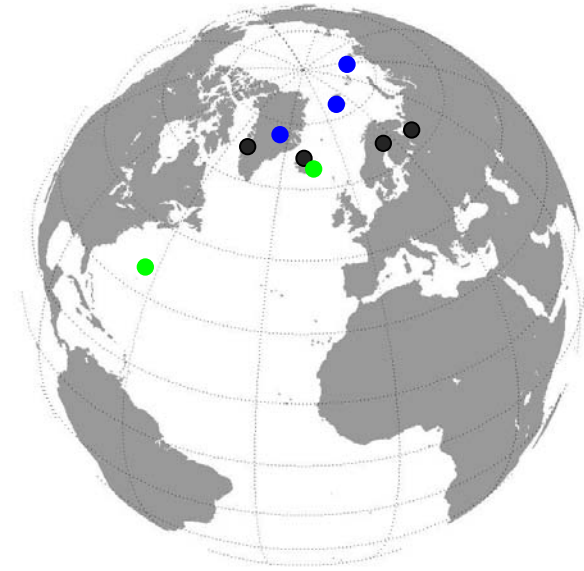
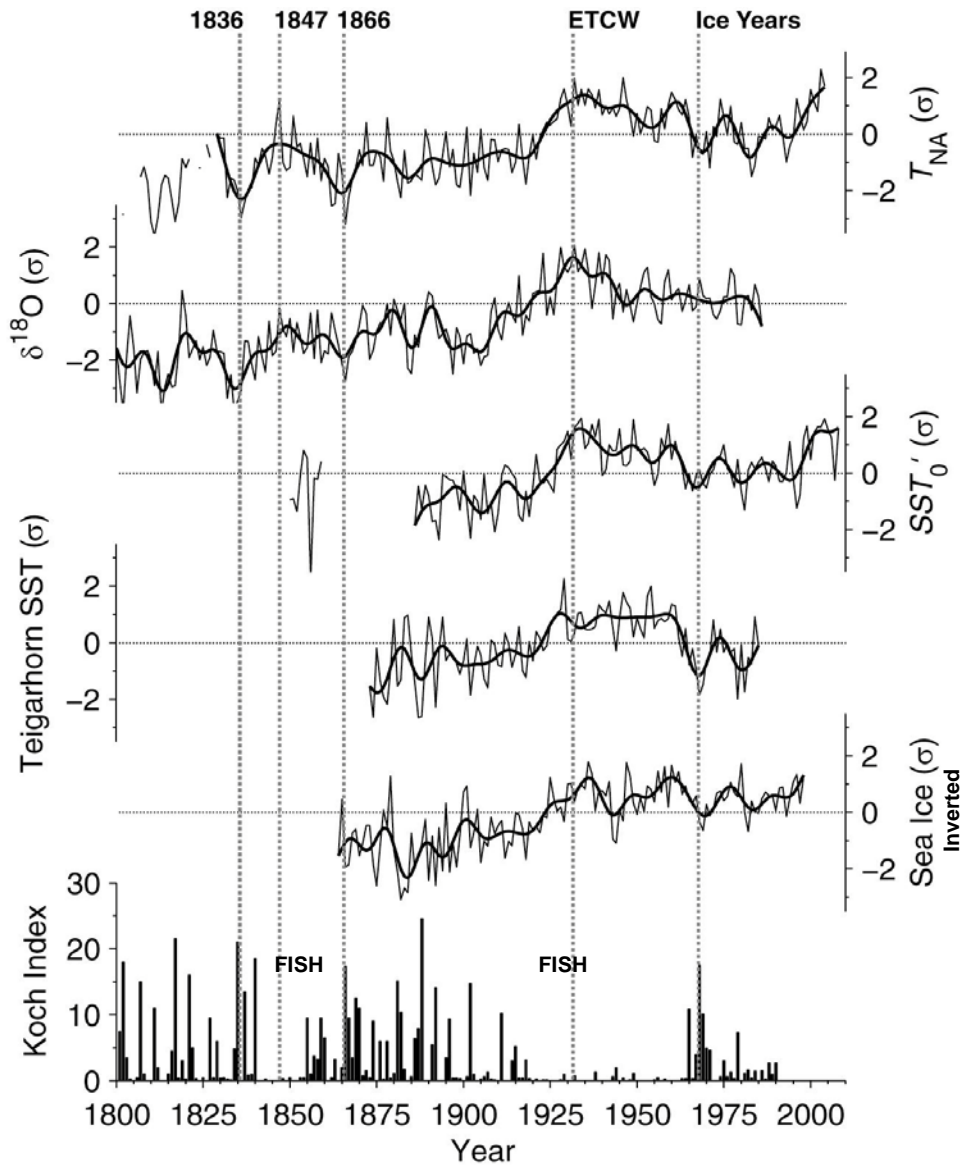
What we see

Irregular pattern of SAT fluctuations

ETCW event is the most striking historical example

No obvious AMO cycle

Independent data are consistent

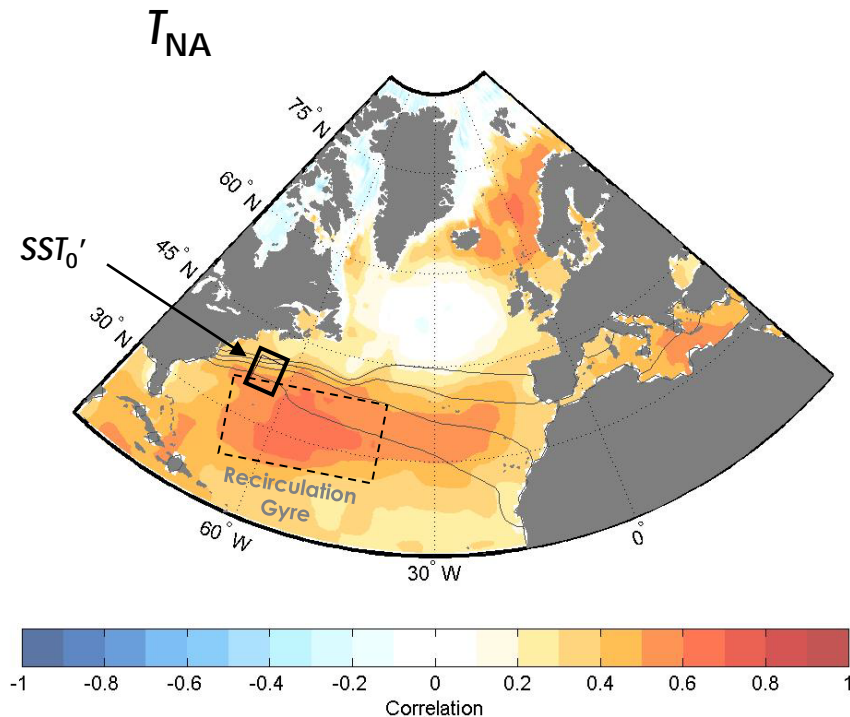


- Composite SAT locations
- Ice cores
- SST anomaly records

Correlation	$\delta^{18}O$	SST_0'	Teigarhorn SST'	Sea Ice
Annual	0.67	0.67	0.72	-0.64
Filtered ^a	0.82	0.92	0.85	-0.84

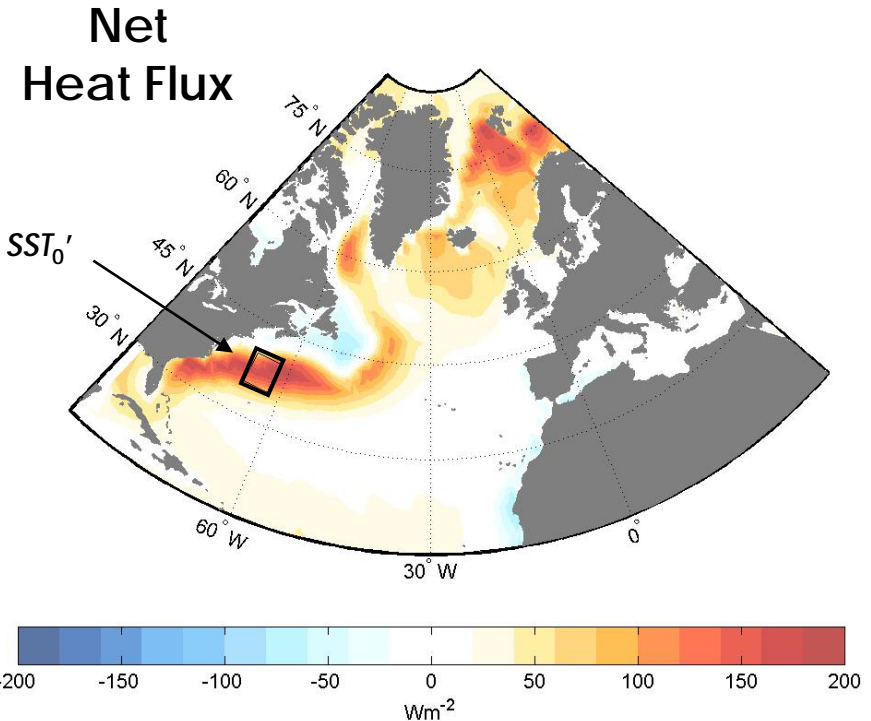
^aAs in Figure 1.

Teleconnection with mid-latitude SST' is seen



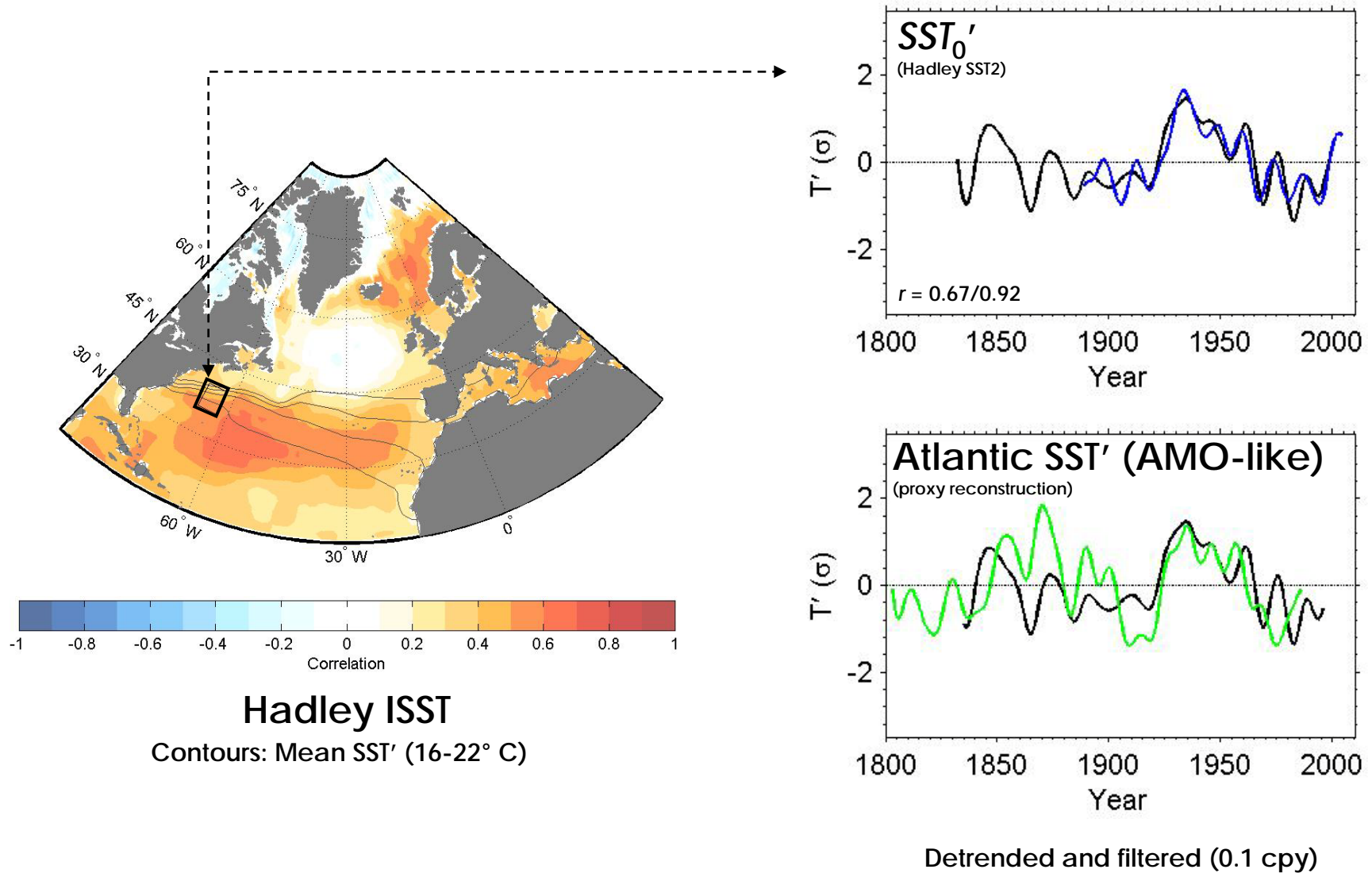
Hadley ISST

Contours: Mean SST' (16-22° C)

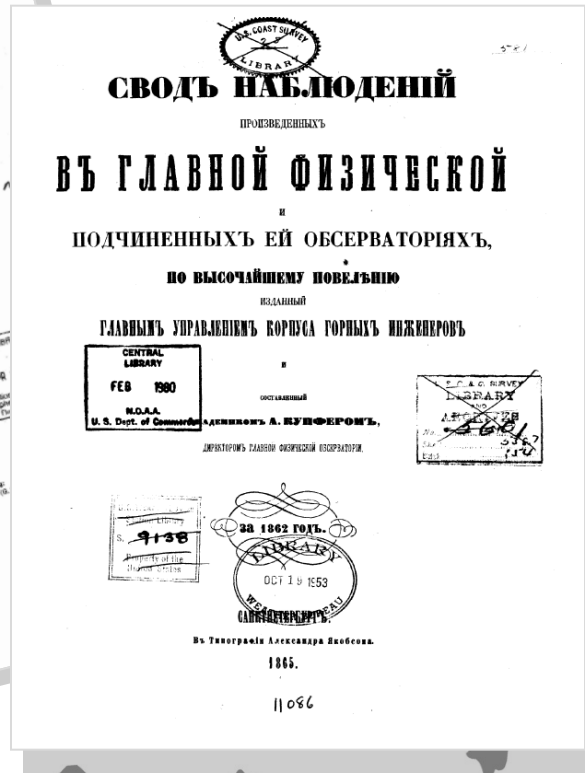


NCEP-NCAR Reanalysis

High correlation is robust across data sets



Historical data in North Pacific – Arctic



Russian America

~1820-1867

9 locations with met. records

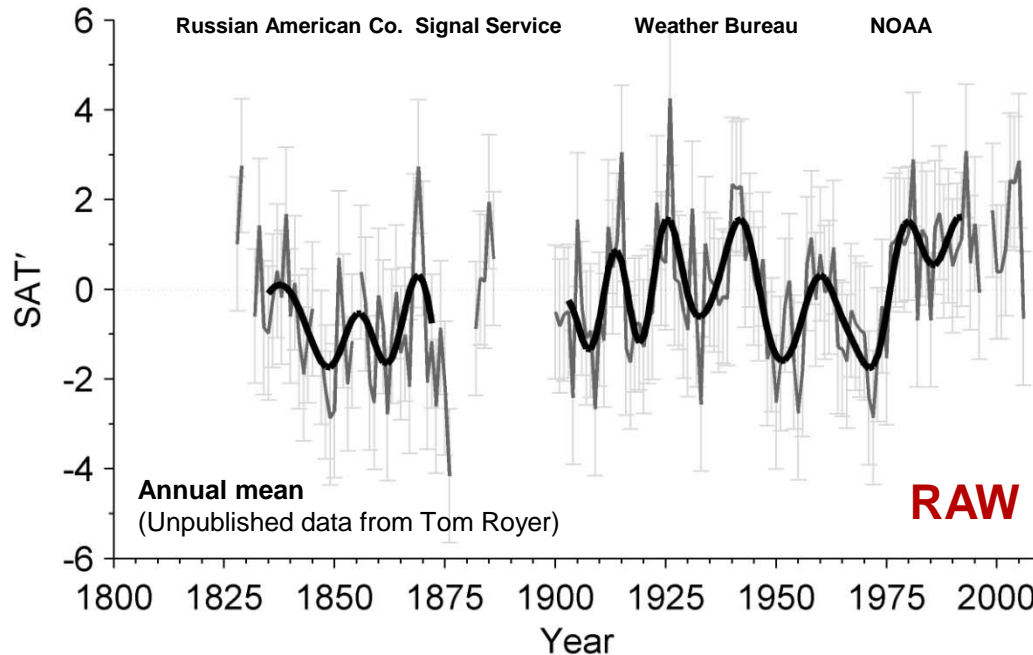
Nowo Archangelsk (Sitka)
may provide near continuous
record from 1820s

Original records destroyed?



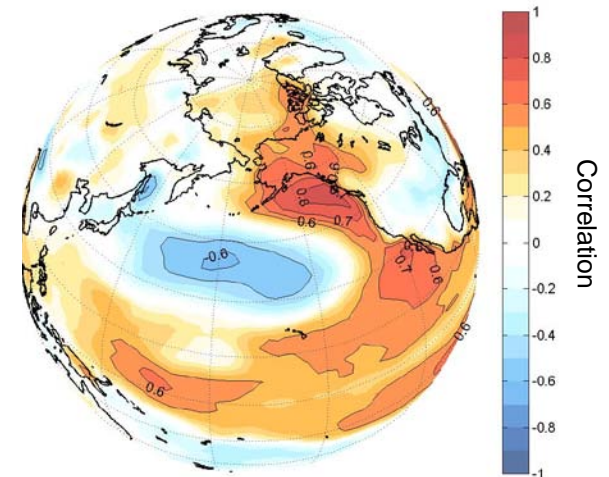
Nowo Arkhangelsk in 1829

Nowo Archangelsk – Sitka SAT' time series



1828-2009

NCEP-NCAR Reanalysis



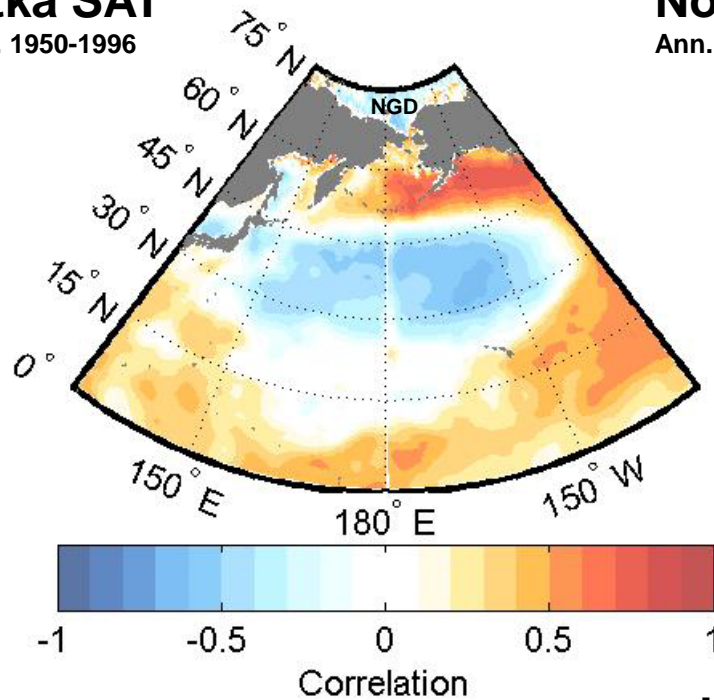
2m T
1950-1996

Also: sub-daily barometric pressure from 1847 awaits digitization

Correlation with SST anomaly

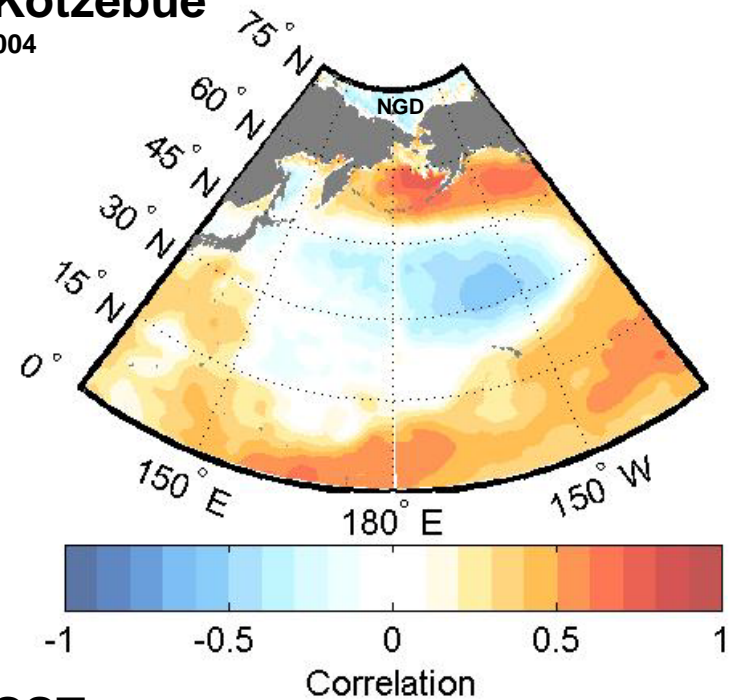
Sitka SAT'

Ann. 1950-1996



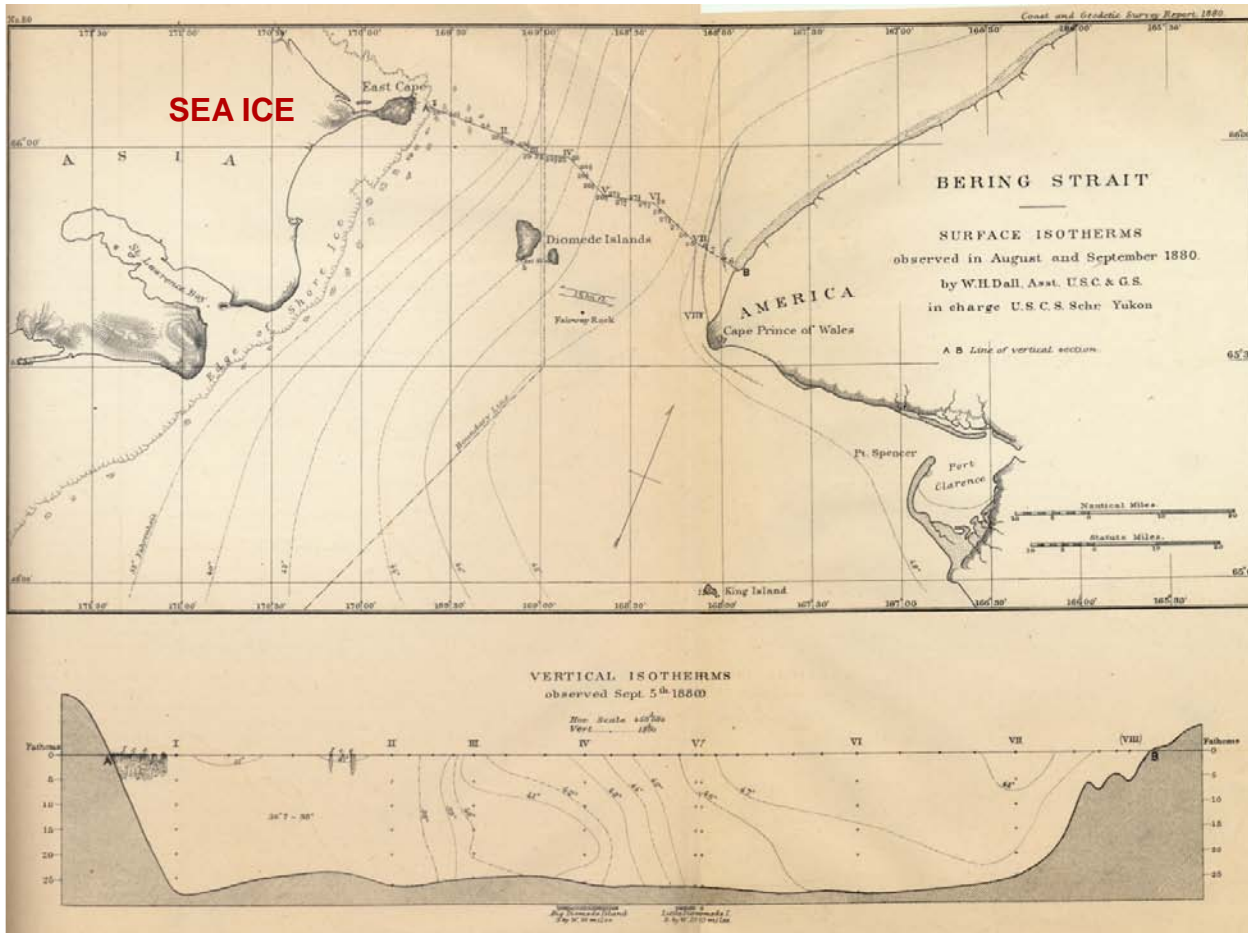
Nome/Kotzebue

Ann. 1950-2004



HadISST

Historical ocean & sea ice data



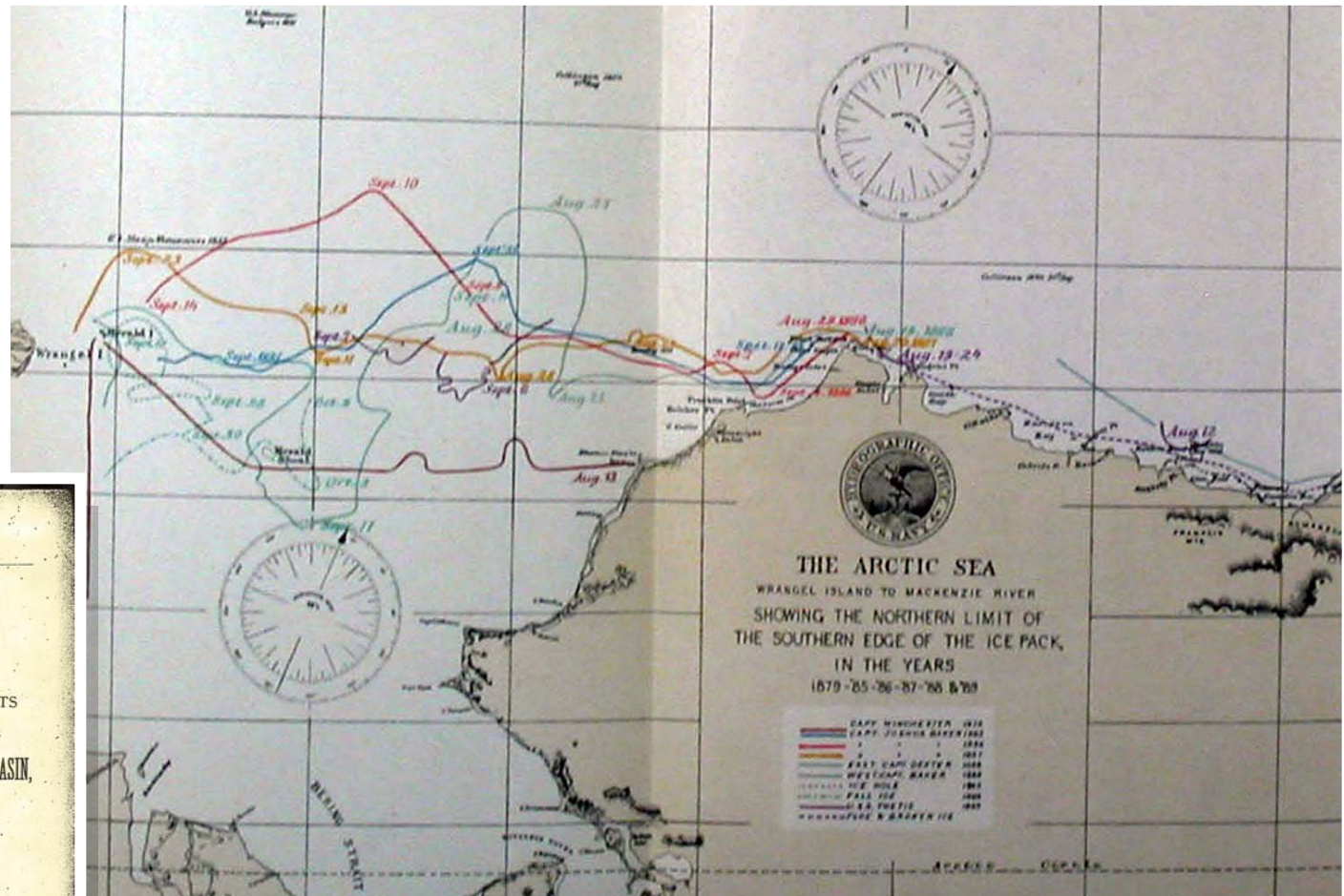
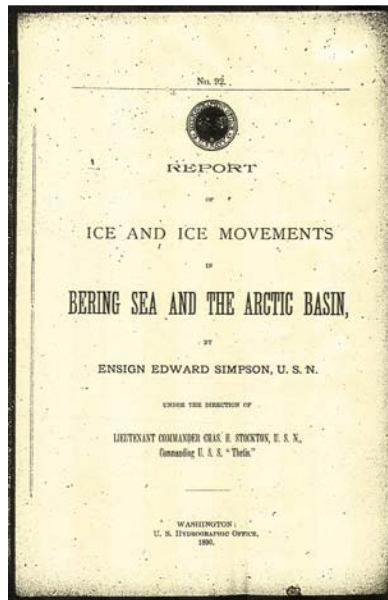
**First Bering Strait
transect by Dall for
U.S. Coast Survey,
Sept. 5, 1880 .**



Schooner Yukon

On the 3d of September we sailed from Chamisso Harbor for Bering Strait, arriving off East Cape of Asia about 6 A. M. of the 5th. Broken ice intervened between us and the shore, and the bight southward from the cape was packed full of ice. We could not approach nearer to the shore than four miles.

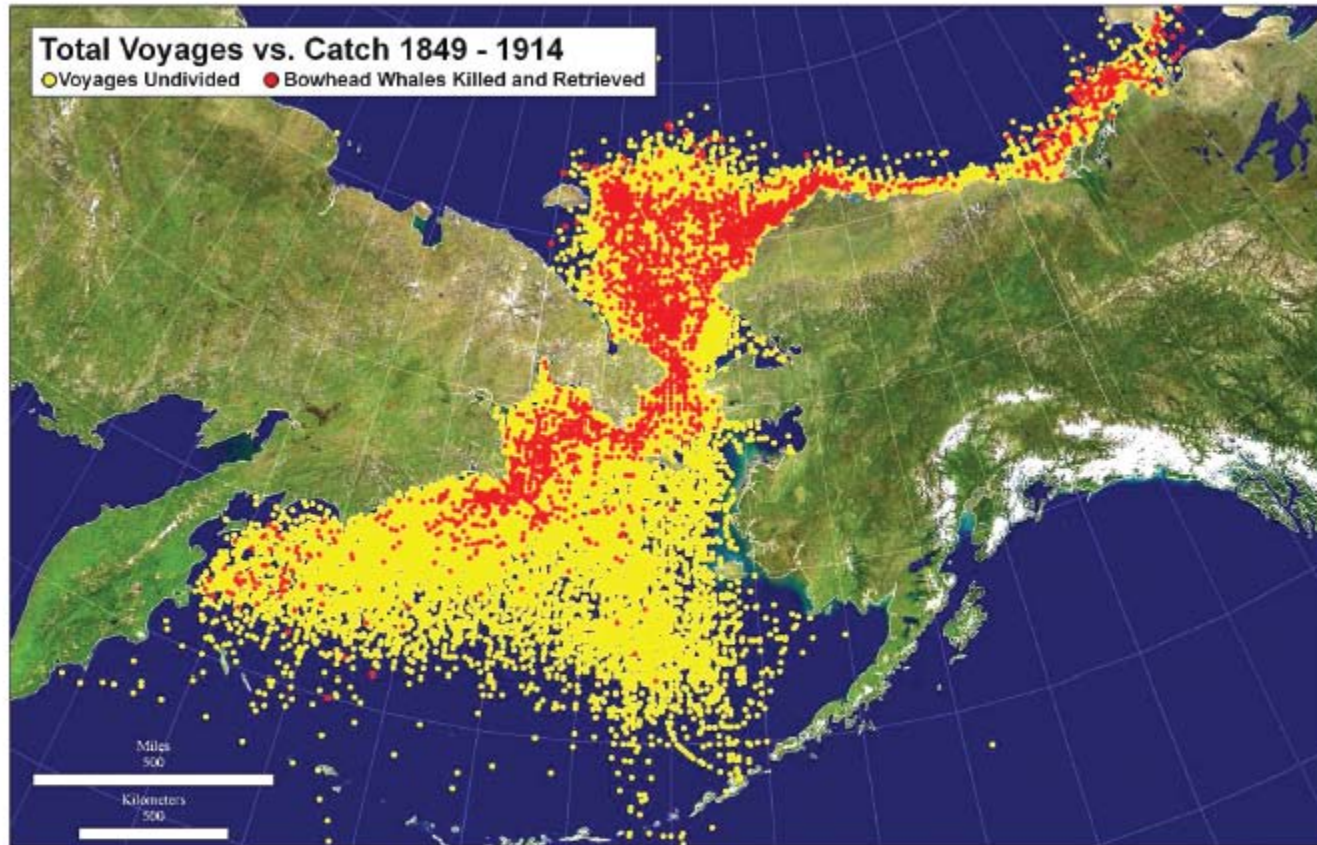
Historical ocean & sea ice data



U.S. Hydrographic Office Report, 1890.

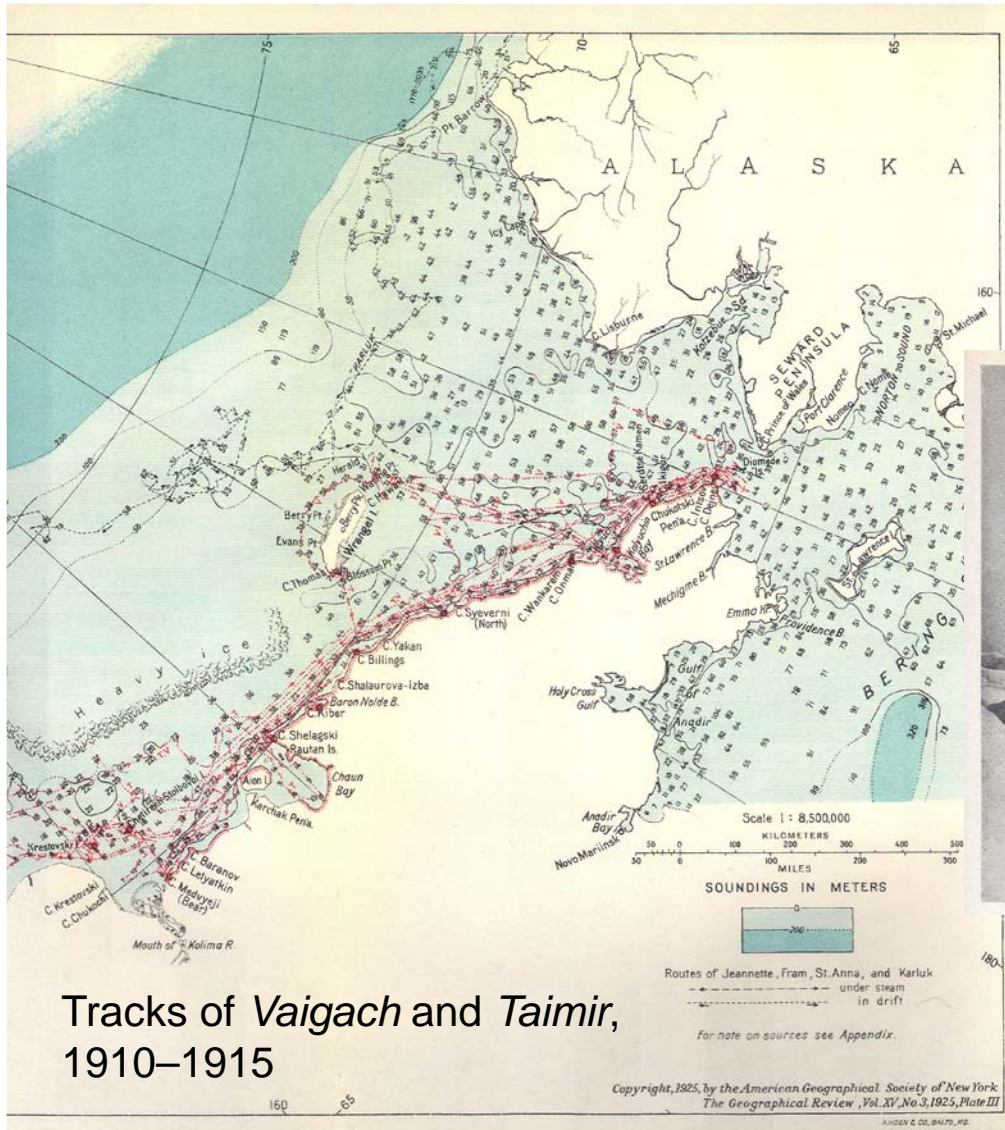
August-September ice edge for
1879, 1885, 1886, 1887, 1888, 1889

Biogeography of bowhead whale fishery



Map 4.—Total documented daily ship locations and bowhead captures, 1849–1914. The yellow dots represent all documented ship locations, which were recorded daily in the logbooks and journals. More than one ship could, of course, visit the same location, and the same ship could remain at, or revisit, a location. The red dots represent the total documented bowhead captures. This map does not indicate the intensity (number of times) that ships visited a location.

Historical ocean & sea ice data



Tracks of *Vaigach* and *Taimir*,
1910–1915

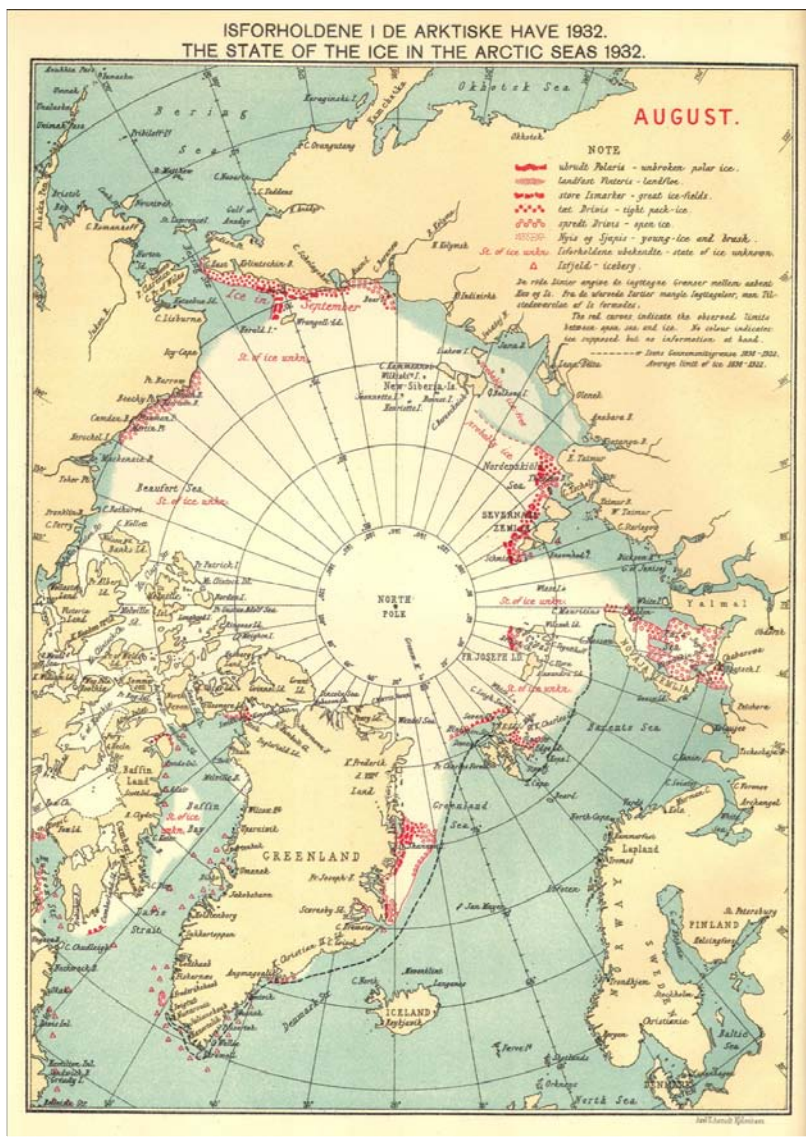
Russian Hydrographical Expedition to the Arctic, 1910–1915



Vaigach near Wrangel Island, 1913

Do data still exist?

Historical ocean & sea ice data



**ГИДРОПОГИЧЕСКИЕ НАБЛЮДЕНИЯ
МОРСКИХ ЭКСПЕДИЦИЙ 2-ГО МРГ,
1932-33 Г.**

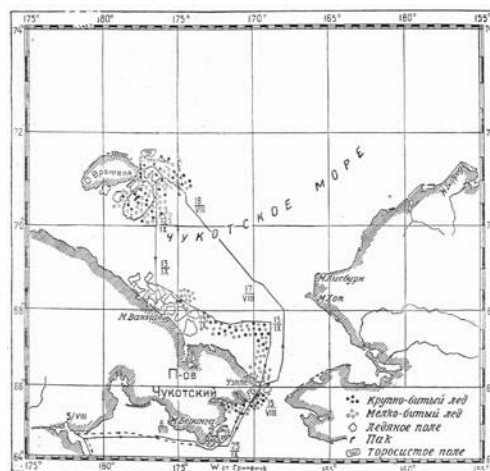


Рис. 9. Ледовая карта экспедиции АКО в 1932 г. на пароходе «Совет»
Составил В. В. Акматов

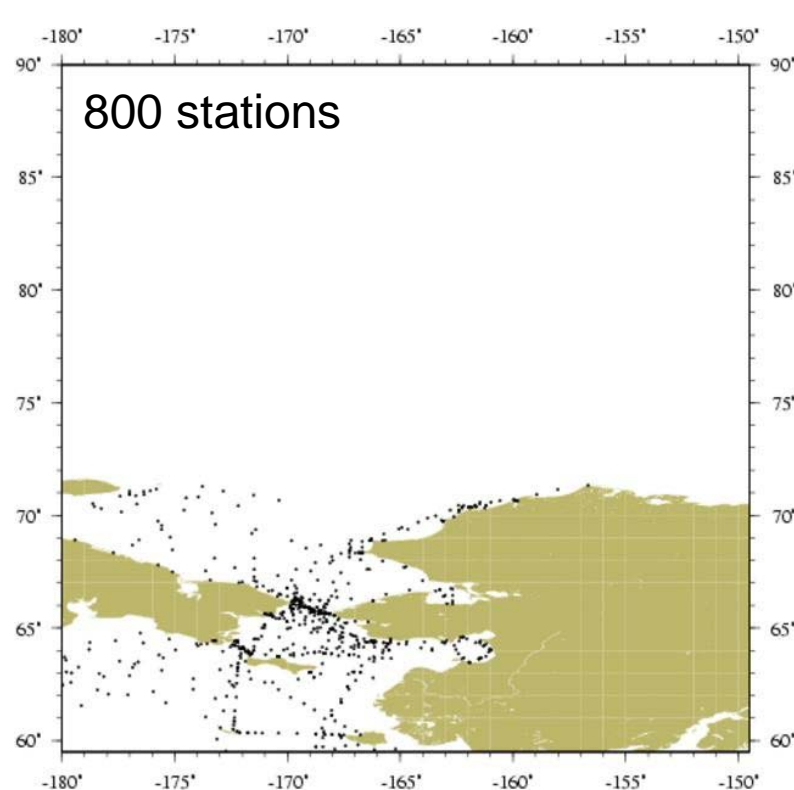
Ice map from the Soviet
Aug. 10 – Sep. 23, 1932



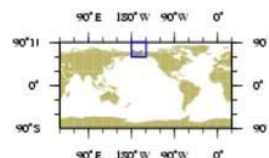
A. Sibiriyakov under jury-rigged sails after loss of propeller shaft near North Cape

Hydrological Observations of the Second IPY Sea Expeditions, 1932–33 (multiple ships).

Historical ocean & sea ice data

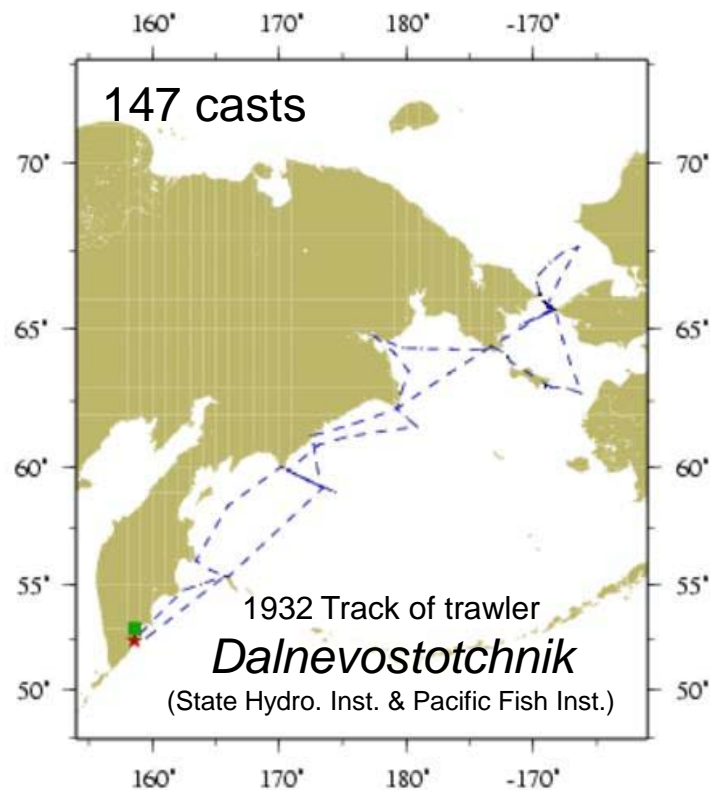


800 stations



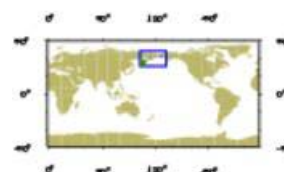
Geographic distribution of stations
Number of stations = 800

NOAA NODC Ocean Climate Laboratory
<http://www.nodc.noaa.gov/OCL/>



147 casts

1932 Track of trawler
Dalnevostotchnik
(State Hydro. Inst. & Pacific Fish Inst.)



WOD Cruise Reference: SU008752
Number of Casts: 147

★ = Start of cruise track
■ = End of cruise track

NOAA/NESDIS/NODC Ocean Climate Laboratory
<http://www.nodc.noaa.gov>

**Hydrocasts in the RUSALCA region 1930-1940
(including Russian IPY-2 sea expeditions) in NODC-WOD09**

Objectives for the coming year:

Find and collate a wide range of historical data

Construct continuous regional time series and indexes where possible

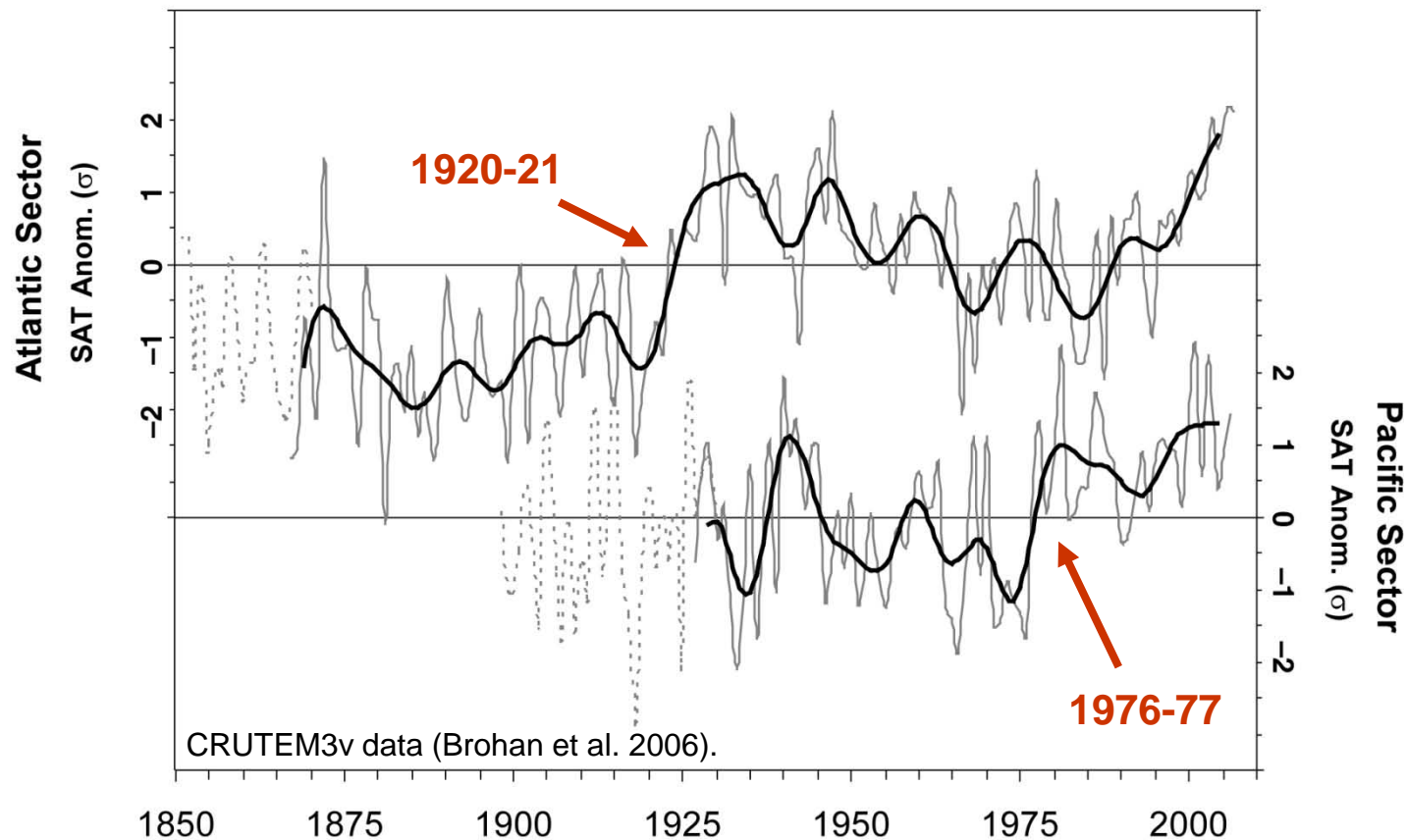
Case study approach (compare 1930s with data obtained during RUSALCA?)

Contribution for Climate Data Modernization Program (CDMP), Int'l Env. Data Rescue Program (IEDRO) & extended reanalysis (NCEP & ACRE)

Develop Int'l and interdisciplinary collaboration

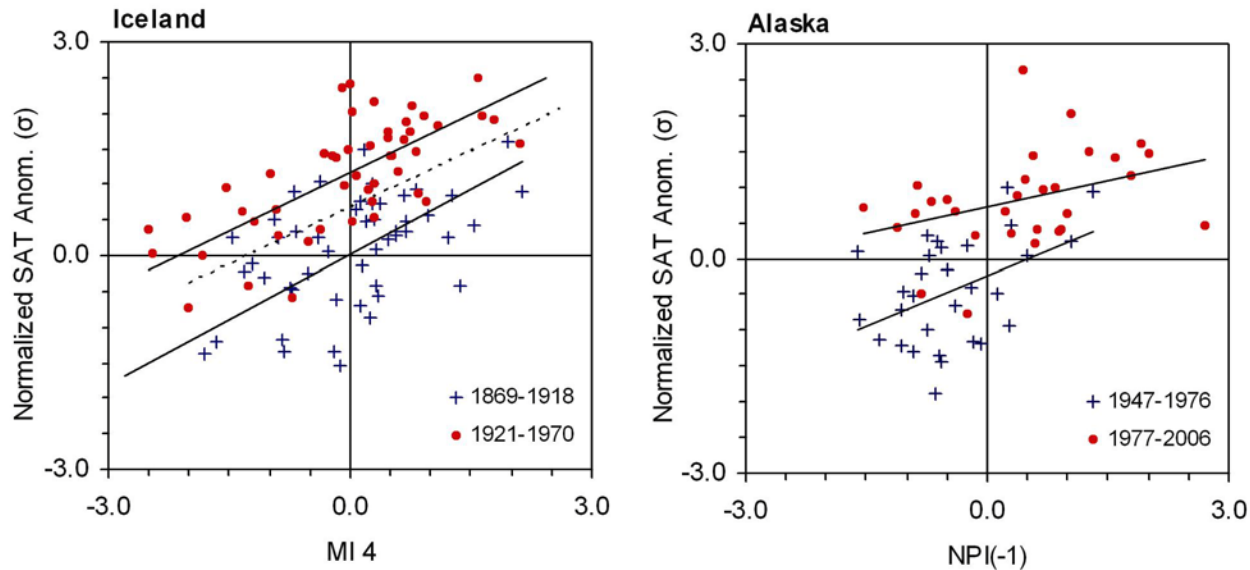
Supplemental Slides

Regionally distinct SAT curves



Winter (DJFM) SAT anomalies from land-based stations north of 60° N in the Atlantic sector (90° W – 45° E) and Pacific sector (135° E – 90° W)

Systematic influence



The consistency of correlation coefficients as y-intercepts shift is an indicator of systematic forcing in the system.

F. Litke

