

BAMS - FEBRUARY 2009

‘Marine Observations of Old Weather’

MARINE OBSERVATIONS

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DENNIS WATSON, CURT MURPHY, AND SCOTT WOODLEY

Historical ships' logbooks contain large numbers of undigitized marine observations of great potential value for climate research, as illustrated by the rescue of 1.5 million observations around World War II.

Our understanding of climate change and climate variability depends critically on historical weather observations. Studies of recent changes use instrumental observations directly (Stocker et al. 2007), while studies of longer time scales use data of climate proxies, which are calibrated to observations (Jones et al. 2005). The currently available instrumental observations allow some northern climate fields to be reconstructed for the last 100 yr (Fig. 6).

Weather observations, including measurement of

rainfall, are incomplete and possibly inaccurate data and metadata (Woodruff et al. 2005). This makes new digitization programs even more valuable, if existing or deficient observations were digitized and made available to climate researchers, they might extend our knowledge and understanding of climate change.

Recent work to digitize observations in the U.S. archives has been confined to reconstructing the weather of rural Britain (Whitler 2005), specific

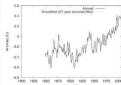


FIG. 1. Global mean sea surface temperature change (relative to 1941–80 average), from the HadSST dataset; Rayner et al. (2006).

1.5 million obs. digitized

OUTLINE

- **Digitization Process**
- **Main Ongoing CDMP Projects- Overview**
 - **Lightships (1937 – 1982)**
 - **Marine Observation Forms (1910-1947)**
 - **East India Trading Company Logbooks (1786-1834)**
- **Sample CDMP Marine/Ocean Projects**
- **Data Storage**
- **RSAD Data processing and projects**

PROCESSES

I. Records must be located and assessed:

- Where are they located ?
- Who has access?
- Are the records in good shape?
- Records must then be catalogued for contents, record completeness, quality of data, and scientific significance/contribution



PROCESSES

II. Records must then be IMAGED or SCANNED

- **Ownership of the documents:**
 - Some are only imaged **ON-SITE** by the hosting agency (records holder) and/or affiliated contractor
 - Some documents can be **SHIPPED** directly to CDMP project partners and then scanned



PROCESSES

IV. Images are then loaded into WSSRD by IMC

- Can be viewed based on the users search criteria, including wildcards.
- For some projects, this is the final step(imaging only), however many projects move to the next step(data entry).

*EDADS basically the same



WSSRD login screen as viewed in a web browser (above). Access is password protected.

East India Company Logbooks Search

Index Page numbers of each logbook are not always sequential. Images such as crew rosters and blank pages were not indexed. If a full logbook is desired, contact CDMP.

Batch ID: 142C [E] [L]
 Ship Name: Carmanthen [E] [L]
 Date: [E] [L]
 Sequence Number: 0013 [E] [L]
 Cruise Date: [E] [L]
 Position ID: [E] [L]
 Document ID: [E] [L]

[Search] [Reset]

Sample search page with user input (left) and resulting 'hits' (below) where images are accessed by clicking the 'View' tab.

East India Company Logbooks Search 1.0.0

Results Page
 Batch ID: 142C
 Ship Name: Carmanthen
 Sequence Number: 0013
 Set 1 - 0 Entries returned

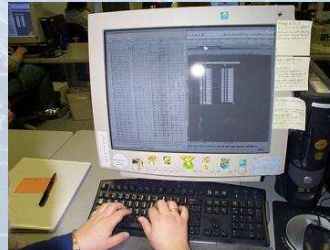
Field Count: 2 Items displayed out of 10 pages

View	Batch	File Size (KB)	Batch ID	Ship Name	Date	Sequence Number	Cruise Date	Position ID
View	1	243	142C	CARMAATHEN	08/11/1806	0013	15080000 1:30:20 PM	150800
View	1	243	142C	CARMAATHEN	08/12/1806	0013	15080000 1:30:20 PM	150800
View	1	243	142C	CARMAATHEN	08/13/1806	0013	15080000 1:30:20 PM	150800
View	1	243	142C	CARMAATHEN	08/14/1806	0013	15080000 1:30:20 PM	150800
View	1	243	142C	CARMAATHEN	08/15/1806	0013	15080000 1:30:20 PM	150800
View	1	243	142C	CARMAATHEN	08/16/1806	0013	15080000 1:30:20 PM	150800
View	1	243	142C	CARMAATHEN	08/17/1806	0013	15080000 1:30:20 PM	150800
View	1	243	142C	CARMAATHEN	08/18/1806	0013	15080000 1:30:20 PM	150800

PROCESSES

V. Data Entry

- Detailed keying instructions are created:
 - Exactly what to capture
 - Data to ignore
 - Strange entries to look for
 - Character positions for each keyed element determined
- Data is then captured by operators (left) using software created by the keying contractor (right).



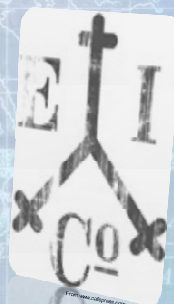
PROCESSES

V. Data Entry (Continued)

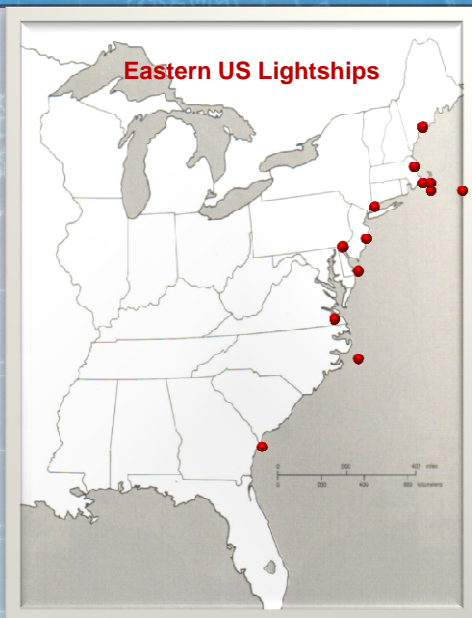
- Data is verified and delivered to CDMP and associated NOAA line offices included in the project.
- Data is then archived at NCDC and/or associated NOAA line offices, and also possibly translated to another format for inclusion in larger datasets (i.e. International Comprehensive Ocean-Atmosphere Dataset – ICOADS).

THREE CURRENT PROJECTS

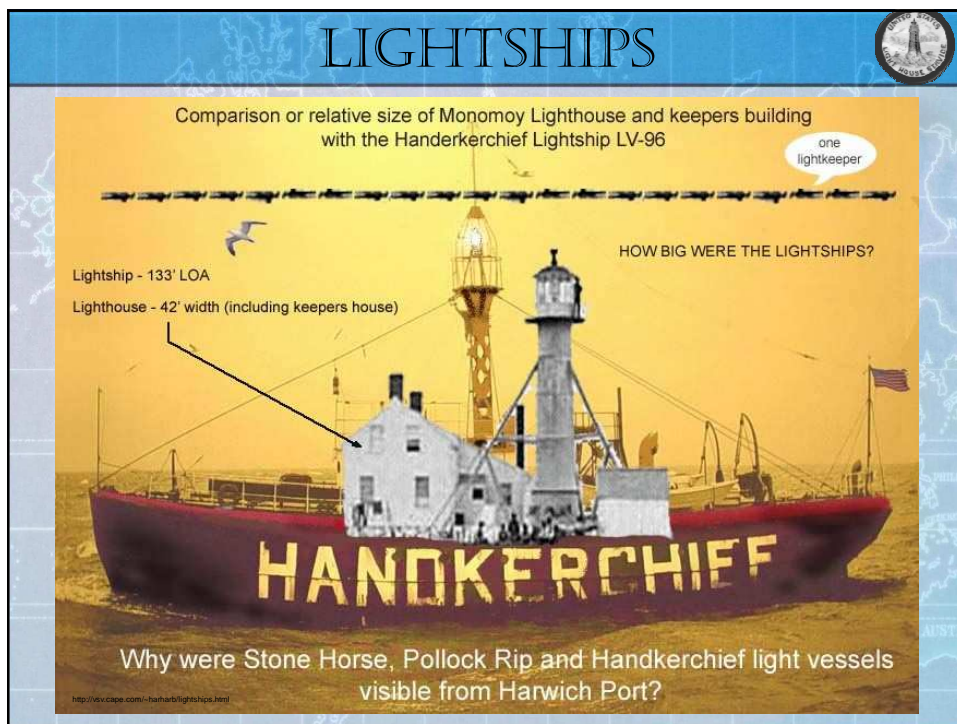
- Lightships (1937-1982)
 - Marine Observation Forms (1910-1947)
 - English East India Company Logbooks (1786-1834)
- *History, Project Goals, & Data Acquisition**



LIGHTSHIPS HISTORY



- Between 1820s - 1980s ~200 ships
- Heydays of 1909 there were ~50 on the eastern seaboard
- Hazardous coastal shipping routes
- 1967 Texas towers & large navigational buoys began replacing lightships
- Early 1980s the last lightship retired, ending a 150 yr lightship tradition in the US



LIGHTSHIPS

- Woods Hole Oceanographic Institute (WHOI)
- POR 1916-1982
- 20 form types
- 14 Lightships
- ~430,000 daily observations keyed

Lightship Anchorages 1828-1969

Pictures from <http://www.uscg.mil/History/ancs/Lightships.pdf>

Lightship Name	Period(s) of record
Ambrose	1937-74
Barneget	1947-70
Boston	1958-75
Buzzards Bay	1958-80
Chesapeake	1947-79
Delaware	1961-70
Diamond Shoals	1947-74
Five Fathoms	1957-72
Frying Pan Shoals	1936-79
Georges Shoal AFS	1956-60
Nantucket	1916-18 and 1947-82
Pollock Rip	1947-69
Portland	1956-66
Savannah	1954-64

©2005 Marine Data Rescue - Science and Future COMOP Priorities
S. Woodruff, R. Allen, G. Combs, D. Freeman, S. Linder, W. Seligman, D. Wheeler, C. Wilkerson, et al.

LIGHTSHIPS

Example Forms

- Varied from vessels to vessel and from year to year



MARINE OBSERVATION FORMS

- **Various marine observations (monthly and daily)**

- POR 1910-1947
- ~500,000 pages imaged
- ~192,000 pages keyed
- 33 different form types
- Multiple Nationalities (US, Canada, France, Germany, Netherlands, Russia, etc.)
- Standardizing their various temperature scales.
 - Air, wet bulb, sea surface, and attached thermometer readings.
 - Fahrenheit, Celsius, Kelvin, & Reaumur scales.

*"If fleecy white clouds cover
the heavenly way,
no rain should mar your
plans that day"*

*"When the wind backs, and
the weather glass falls,
Then be on your guard
against gales and
squalls"*

*"Red sky at night,
sailors delight,
Red sky in the
morn, sailors take
warn"*

MARINE OBSERVATION FORMS

- **Standardized temperature scales to Fahrenheit**

- **Reaumur :**

- freezing water = 0°
- Boiling water = 80 °

- **Conversion :**

- Celsius = (Rem.) x (5/4)
- Fehr. = (Rem.) x (9/4)+32

- **Used until ~1900s**

- Except in the measuring of milk temperature in cheese



PRESSURE.			TEMPERATURE.		
Barometer as read.	Att. 'Ther.	Pressure corrected.	Air, dry bulb.	Air, wet bulb.	Water at surface.
1.3	REAUMUR				
469	6	-	1	-	15
495	4	-	15	-	15
465	85	-	2	-	8
465	85	-	35	-	85
465	16	-	5	-	9
465	13	-	8	-	10
458	9	-	10	-	12
446	9	-	8	-	125
464	13	-	125	-	15
464	18	-	12	-	15
466	15	-	125	-	15

- [illegible]

Record BAROMETER TEM

barometer readings		
--------------------	--	--

Perce 0-15 in. d. w. d. w. Air, ther. dry bulb.

1	2	3	4
5	6	7	8

3	29.96	N-9	62
---	-------	-----	----

21	085	12023.46	631
----	-----	----------	-----

0.09

2	5066		
	107		

3	30.04	61	66
---	-------	----	----

2	12012	62	69
---	-------	----	----

0.07	x	0
------	---	---

U. Zell 72 78

[illegible]

Uncorrected = 30.06,
first it is the bottom of the
two values and secondly
because if you add 0.03
(too low) to 30.06 = 30.09
(the top value).
KEY: 3006 in f20

Barometer reads { too high _____
too low 0.05

WIND.

Type

direction.

2

237

1

205



La

3.5

1

WIND

True

True direction.

1003

446

22

DE

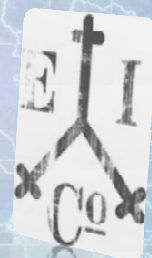
0902

VLT-6

allegro

44-6

EAST INDIA COMPANY



EAST INDIA COMPANY

- Cooperative project with the international Atmospheric Circulation Reconstructions over the Earth (ACRE) initiative
- Goals:
 - Preserve EIC logs
 - Capture early daily instrumental surface weather observations from the late 18th & early 19th centuries
- Original Logbooks held at the British Library (BL)
- POR 1786-1834
- ~1100 logbooks imaged
- 897 logbooks with instrumental data to be keyed
- ~285,000 daily observations



The East Indiaman Warley (1795), courtesy of the National Maritime Museum, London

EAST INDIA COMPANY

EIC sample logbook image with primary elements being digitized

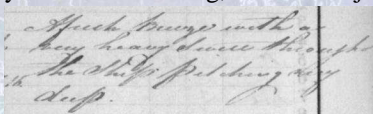
Hour	Course	K	F	Miles	Lat	Long	Wind	Force	State of Weather/Visibility	State of Sea
1	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
2	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
3	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
4	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
5	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
6	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
7	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
8	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
9	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
10	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
11	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
12	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
1	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
2	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
3	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
4	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
5	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
6	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
7	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
8	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
9	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
10	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
11	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light
12	N 1/2 E	1	1	10	10° 15' N	101° 15' E	Light breeze	8	Light breeze	Light

- Lat/Long (noon)
- Barometer (noon)
- Air Temperature (noon)
- Wind Direction (closest to noon)
- Wind Force (closest to noon)
- State of Weather/Visibility (all available)
- State of Sea (all available; none pictured)

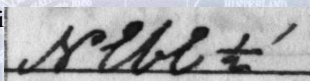
EAST INDIA COMPANY

What are the main difficulties associated with capturing EIC data?

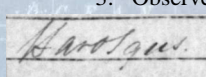
1. Legibility and lots of writing, rather than just numerical values



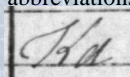
2. Ships bearing directions



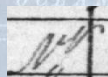
3. Observer abbreviations:



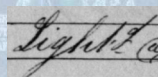
Hard Squalls



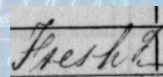
Tackled



Northerly



Lightning



Freshen in

EAST INDIA COMPANY

• Not just for weather enthusiasts....

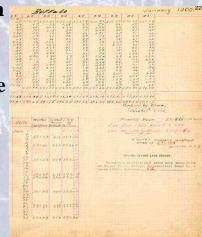
- Historians (early sailing and navigation, EIC trading/shipping routes, daily life on a ship's long voyage)
- Genealogists (crew rosters, birth/death information, prisoners, hired workers)
- Sailing buffs (early sailing terminology/techniques)
- Astronomers (astronomical events such as comets, etc)

SAMPLE MARINE/OCEAN PROJECTS:

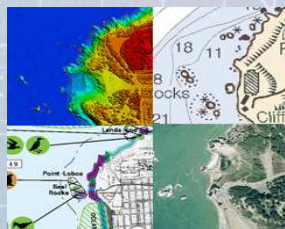
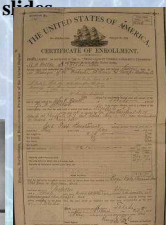


SAMPLE MARINE/OCEAN PROJECTS:

Working with NOAA's National Ocean Service (NOS), data such as historic US coastal and Great Lakes water levels are being digitized.

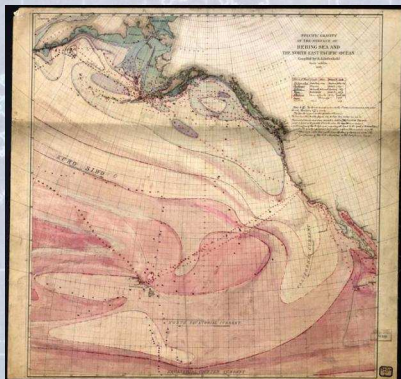


As part of the Thunder Bay National Marine Sanctuary and Underwater Preserve Research Collection, NOS, with the help of CDMP, is imaging and preserving 27,000 ship blueprints (left), ship enrollment certificates with metadata (right), ship photos (center), and slides.



In a collaborative effort to rescue shoreline data, CDMP assists in producing Geographical Information Systems (GIS)-compatible data in vector and georeferenced raster formats for use with visualization tools such as the NOS Data Explorer.

SAMPLE MARINE/OCEAN PROJECTS:



Adolf Lindenkohl's original watercolor of specific gravity in the Bering Sea and North Pacific Ocean. CDMP is working with the US Library of Congress to image the Coast and Geodetic Survey Library and Archives Collections.

Red represents less dense values and blue represents more dense.

Facilitated through NOAA's National Oceanography Data Center (NODC), an international effort to key historic lightship logs from Sweden and Finland is in progress to capture surface, profile and meteorological data. Right – an example late 19th Century Swedish log.

SAMPLE MARINE/OCEAN PROJECTS:



Admiral Matthew Fontaine Maury

Abstract Log of the Ship Garrick, Captain R. W. Foster.

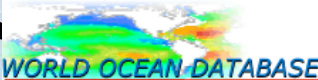
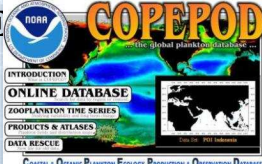
Date	Lat.	Long.	Current	Direction	Force	Wind	Force	Direction	Sea	State	Remarks
Nov 11	41° 15' N	70° 15' W	30° 15' E	40° 15' N	10	W	10	W	10	10	W. breeze
Nov 12	41° 15' N	70° 15' W	30° 15' E	40° 15' N	10	W	10	W	10	10	W. breeze
Nov 13	41° 15' N	70° 15' W	30° 15' E	40° 15' N	10	W	10	W	10	10	W. breeze
Nov 14	41° 15' N	70° 15' W	30° 15' E	40° 15' N	10	W	10	W	10	10	W. breeze
Nov 15	41° 15' N	70° 15' W	30° 15' E	40° 15' N	10	W	10	W	10	10	W. breeze
Nov 16	41° 15' N	70° 15' W	30° 15' E	40° 15' N	10	W	10	W	10	10	W. breeze
Nov 17	41° 15' N	70° 15' W	30° 15' E	40° 15' N	10	W	10	W	10	10	W. breeze
Nov 18	41° 15' N	70° 15' W	30° 15' E	40° 15' N	10	W	10	W	10	10	W. breeze
Nov 19	41° 15' N	70° 15' W	30° 15' E	40° 15' N	10	W	10	W	10	10	W. breeze
Nov 20	41° 15' N	70° 15' W	30° 15' E	40° 15' N	10	W	10	W	10	10	W. breeze
Nov 21	41° 15' N	70° 15' W	30° 15' E	40° 15' N	10	W	10	W	10	10	W. breeze
Nov 22	41° 15' N	70° 15' W	30° 15' E	40° 15' N	10	W	10	W	10	10	W. breeze
Nov 23	41° 15' N	70° 15' W	30° 15' E	40° 15' N	10	W	10	W	10	10	W. breeze
Nov 24	41° 15' N	70° 15' W	30° 15' E	40° 15' N	10	W	10	W	10	10	W. breeze
Nov 25	41° 15' N	70° 15' W	30° 15' E	40° 15' N	10	W	10	W	10	10	W. breeze
Nov 26	41° 15' N	70° 15' W	30° 15' E	40° 15' N	10	W	10	W	10	10	W. breeze
Nov 27	41° 15' N	70° 15' W	30° 15' E	40° 15' N	10	W	10	W	10	10	W. breeze
Nov 28	41° 15' N	70° 15' W	30° 15' E	40° 15' N	10	W	10	W	10	10	W. breeze
Nov 29	41° 15' N	70° 15' W	30° 15' E	40° 15' N	10	W	10	W	10	10	W. breeze
Nov 30	41° 15' N	70° 15' W	30° 15' E	40° 15' N	10	W	10	W	10	10	W. breeze

Weather observations made by Captain R.W. Foster aboard the ship "Garrick", July 1854, on his voyage from New York to Liverpool. The logbook entry is from an 1855 publication by Admiral M.F. Maury*, imaged by CDMP as part of the rare books collection. AND SAILING DIRECTIONS TO ACCOMPANY THE WIND AND CURRENT CHARTS, M.F. Maury, 1855.

DATA STORAGE



WHERE'S THE DATA GOING?

- **NCDC archive** 
- **International Comprehensive Ocean-Atmosphere Data Set (ICOADS)**  **International COADS**
- **Climatology of the World's Oceans Database (CLIWOC)** 
- **Other databases, i.e. NODC's World Ocean Database 2005 (WOD05), NMFS's COPEPOD plankton data**  

CDMP DATA RESCUE PARTNERS



**International
COADS**

*International Comprehensive Ocean-Atmosphere
Data Set (ICOADS)*
<http://icoads.noaa.gov/>



*RECOVERY of Logbooks And
International Marine data
(RECLAIM) Project*
<http://icoads.noaa.gov/reclaim/>



*Atmospheric Circulation
Reconstructions over the Earth
(ACRE)*
<http://www.met-acre.org/>

INCOMING RECORDS PROCESSING – REMOTE SENSING AND APPLICATIONS DIVISION (RSAD)



INCOMING RECORDS IN RSAD

- *Marine data from multiple sources (real time and delayed mode)*
 - *Received over GTS (Global Telecommunications System) satellite (Daily Processing)*
 - *~130K obs/day --- 30-40 Million/year*
 - *US Voluntary Observing Ships (VOS)*
 - *Buoys (moored and drifting)*
 - *Coastal Marine Automated Network*
 - *VOSclim project*
 - *Delayed Mode (Observation frequency is highly variable for delayed mode)*
 - *~3K-5K obs/month*
 - *US VOS paper forms*
 - *Shipboard Environmental Data Acquisition System (SEAS)*
 - *~200K-400K/quarter*
 - *Global data distributed quarterly from Global Collection Centers in UK and Germany*

RSAD – DATA PROCESSED AND SHARED

NCDC is a partner and major data provider to the International Comprehensive Ocean-Atmosphere Dataset (ICOADS)



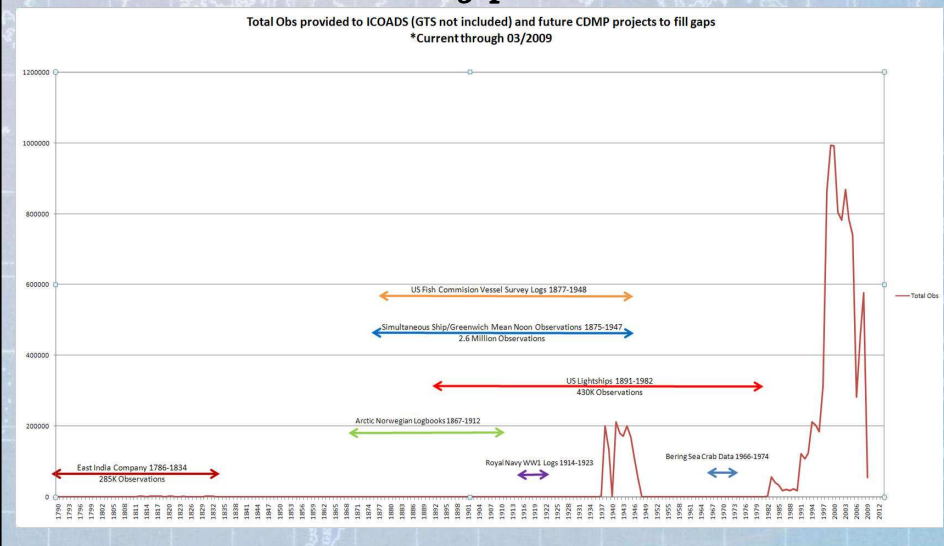
<http://icoads.noaa.gov/>

Since 2007

- *11.1 Million surface marine observations provided to ICOADS*
 - *Including GTS transmissions, the number jumps to 81.2 Million*

RSAD – DATA PROCESSED AND SHARED

Obs provided to ICOADS and CDMIP projects lined up to help fill gaps



RSAD PROJECTS AND DATA ACCESS

Voluntary Observing Ship Climate Project - VOSclim

About VOSclim Project Ship Data Project Documents Links and Contacts Information Monitoring and Promotion

Voluntary Observing Ship Climate (VOSclim) Project

About VOSclim

VOSclim Brochure

VOSclim Project Document

VOSclim Article - The Way Ahead

Image courtesy of Seatrade Reefer Chartering

<http://www.ncdc.noaa.gov/oa/climate/vosclim/vosclim.html>

- High-quality subset of marine meteorological data, with extensive associated metadata, available in both real-time and delayed mode to support global climate studies.
- NCDC is data acquisition center (DAC) for this project and hosts the webpage and performs data collection and distribution

RSAD PROJECTS AND DATA ACCESS

NCDC Marine data general information and dataset links:

- <http://www.ncdc.noaa.gov/oa/marine.html>

VOSclim data access:

- <http://www.ncdc.noaa.gov/oa/climate/vosclim/vosclimdata.html>
- <http://www7.ncdc.noaa.gov/CDO/CDOMarineSelect.jsp>

NCDC 'Climate Data Online (CDO)' data access to ships and buoys:

- <http://www7.ncdc.noaa.gov/CDO/CDOMarineSelect.jsp>
- Note – This web service is under construction and new data sources are being added as they become available. Please check back often for new updates.
- COMING SOON – **ICOADS release 2.5**
 - POR 1662-2007

THE END



Questions?

For additional information contact:
Eric.Freeman@noaa.gov

EAST INDIA COMPANY



To illustrate difficulties that sometimes arise in historic digitization projects we will now play everyone's favorite game

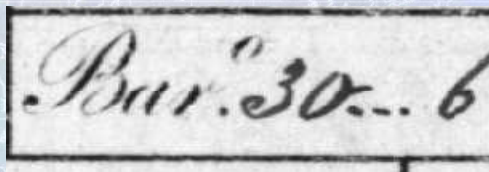


‘Name that value!’

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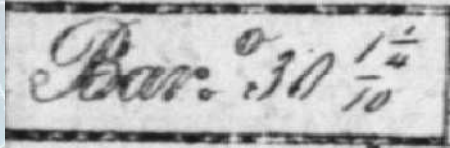
Barometric Pressure in Inches of Mercury:



**Answer:
30.06"**

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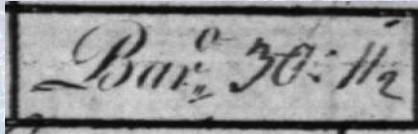
Barometric Pressure in Inches of Mercury:



Answer: 30.125"

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Barometric Pressure in Inches of Mercury:



**Answer:
30.15"**

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Temperature in Degrees
F

Ther 71.45

Answer:
71.75°F

Well....how did we know that it wasn't supposed to be 71.45°? One magical find...the only one like it so far:


Ther. 66° 30'

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What is that? It looks like barometric pressure and is recorded in the pressure box? Hmmm.

Acc 36. 20
Sym 29.59

Sympiesometric Pressure – A mercury-less barometer containing colored almond oil and hydrogen gas and typically used on ships. More sensitive but less accurate than a mercurial barometer, it was used to detect rapid changes in pressure to quickly alert of soon-to-change weather conditions.



http://www.antique-horology.org/_editorial/sympiezo-meter.html

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Interesting reads:

P.M. Confined in Irons Jas. Reynolds for drunkenness and riotous conduct.

‘P.M. Confined in irons Jas. Reynolds for drunkenness and riotous conduct’



A.M. Punished the prisoner with 3 dozen lashes in presence of the Ships Company.

‘A.M. Punished the prisoner with 3 dozen lashes in presence of the Ships Company.’

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Interesting reads:

A comet observed in the West and set at half past 7.

‘A comet observed in the West and set at half past 7.’ – Comet of April 1821



The atmosphere during the last two days, has been loaded with light red dust, with which the sails rigging are now partially tinged.

The atmosphere during the last two days has been loaded with light red dust, with which the sails rigging are now partially tinged.’

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Interesting reads:

... Finding the Woman who secreted herself on board had only been asked in church not married Capt. Swinton performed the Ceremony of marriage with Jno. Hughes of the 89th Reg. & Elizabeth Williams (Spinther) on the Qr. Deck
1833



'Finding the woman who secreted herself on board had only been asked in church not married Capt. Swinton performed the Ceremony of marriage with Jno. Hughes of the 89th Reg. & Elizabeth Williams (Spinther) on the Qr. Deck'

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Interesting reads:

At 5 A.M. The Wife of Sergt. Goodall of H.M. 69th Reg. was safely delivered of a Female Child.



'At 5 A.M. The Wife of Sergt. Goodall of H.M. 69th Reg. was safely delivered of a Female Child'

P.M. Sergt. Goodall of H.M. 69th Reg. female child was baptized by the Name of Catherine.

'P.M. Sergt. Goodall of H.M. 69th Reg. female child was baptized by the Name of Catherine...'

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Interesting reads:

At 1 P.M. Committed the body of the deceased to the deep with the usual ceremony.

‘At 1 P.M. Committed the body of the deceased to the deep with the usual cer.

A.M. Examined the Lazaretto on finding the Rats had done considerable damage to some Cases, on searching the Cases of Teas, found three completely gutted also a large quantity of Rice missing which they evidently had destroyed.

‘A.M. Examined the Lazaretto on finding the Rats had done considerable damage to some Cases. on searching the Cases of Teas, found three completely gutted also a large quantity of Rice missing which they evidently had destroyed.’

