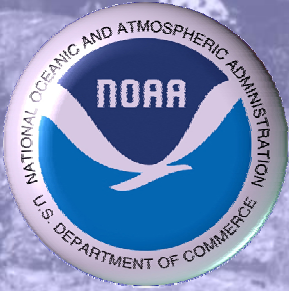


Digitization of Marine & Lacustrine Records of Climate Change

a project of the
NOAA/NESDIS/National Geophysical Data Center

in cooperation with:
Florida State University,
Lamont-Doherty Earth Observatory,
Oregon State University,
Scripps Institution of Oceanography
University of Rhode Island

funded by the NOAA Climate Data Modernization Program



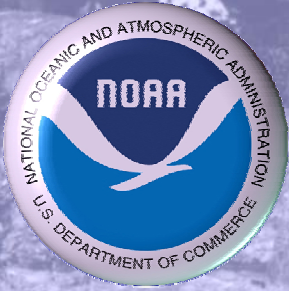
How this task contributes to modernization and utilization of a climate database:

Sea floor & Lakebed sediments provide a valuable record of Climate Change

- ▶ The length, continuity, and time-resolution of data available from selected sediment cores is a unique resource for global change research
- ▶ Finely varved sediments from areas of rapid deposition provide a high-resolution record of past climates
- ▶ Volcanic ash layers contribute to climate studies on relatively short timescales
- ▶ Sediments from oceans & lakes identify regional controls on the magnitude of climate change, and extend the record of climate change beyond ice core drilling data
- ▶ Sediment data are also vital to ecosystems/habitat

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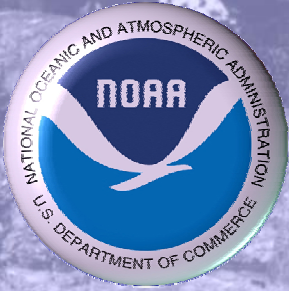
How this task contributes to modernization and utilization of a climate database:

Researchers need the ability to find sediment cores with potential for further study

- ▶ Not all cores have the necessary resolution/components
- ▶ Current online information is insufficient to identify the most valuable cores

We propose to add core photographs and detailed descriptions to an existing online database

- ▶ High-resolution core photographs help researchers quickly find cores of interest
- ▶ Detailed core descriptions facilitate rapid location of cores with components like volcanic ash, fine lamination, or microfossils of interest



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Task description:

A multi-year project to rescue*/digitize images & descriptions of cores from multiple institutions

1. Scan photographs, X-rays & paper documents

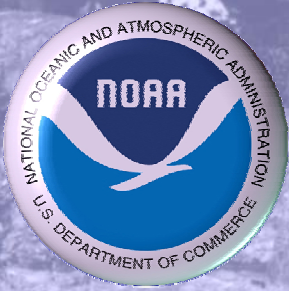
- ▶ 8,400 color core photographs
- ▶ 42,500 grayscale core photographs
- ▶ 7,500 core X-rays
- ▶ 20,000 grayscale sea floor photographs
- ▶ 14,000 pages of paper documents

2. Key-enter data from written descriptions

- ▶ 5,000 pages of paper containing core information

3. NGDC will add results to an existing web database

***Many negatives, prints, & paper reports are stored under substandard conditions. Some original negatives have already become unusable.**



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Task description: Scan 8,400 color photographs

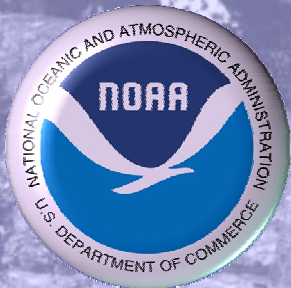


Example of color core photographs

Original negatives are
4 x 5 inches

There are 8,000 OSU negatives
+ 400 35mm negatives from
the Antarctic Research Facility
at Florida State University &
NGDC

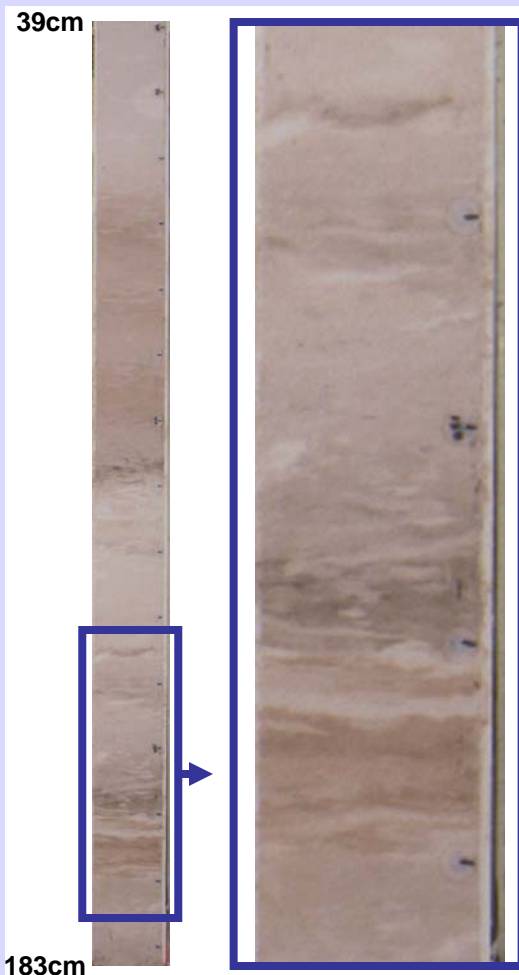
Photographs from the Oregon State University, College of
Oceanic & Atmospheric Sciences (OSU)



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Task description: Scan 8,400 color photographs



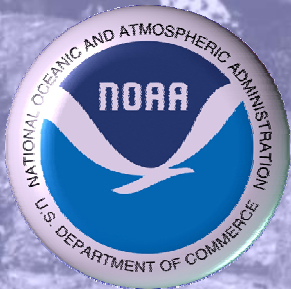
Closeup of a color core photograph

EW 9709-09PC

Light and dark intervals in this core indicate the presence of more or less carbonate, corresponding to glacial/interglacial periods in the climate record.

**Location 0 degrees 0.03' south latitude,
138 degrees 47.209' west longitude,
4322 meters water depth**

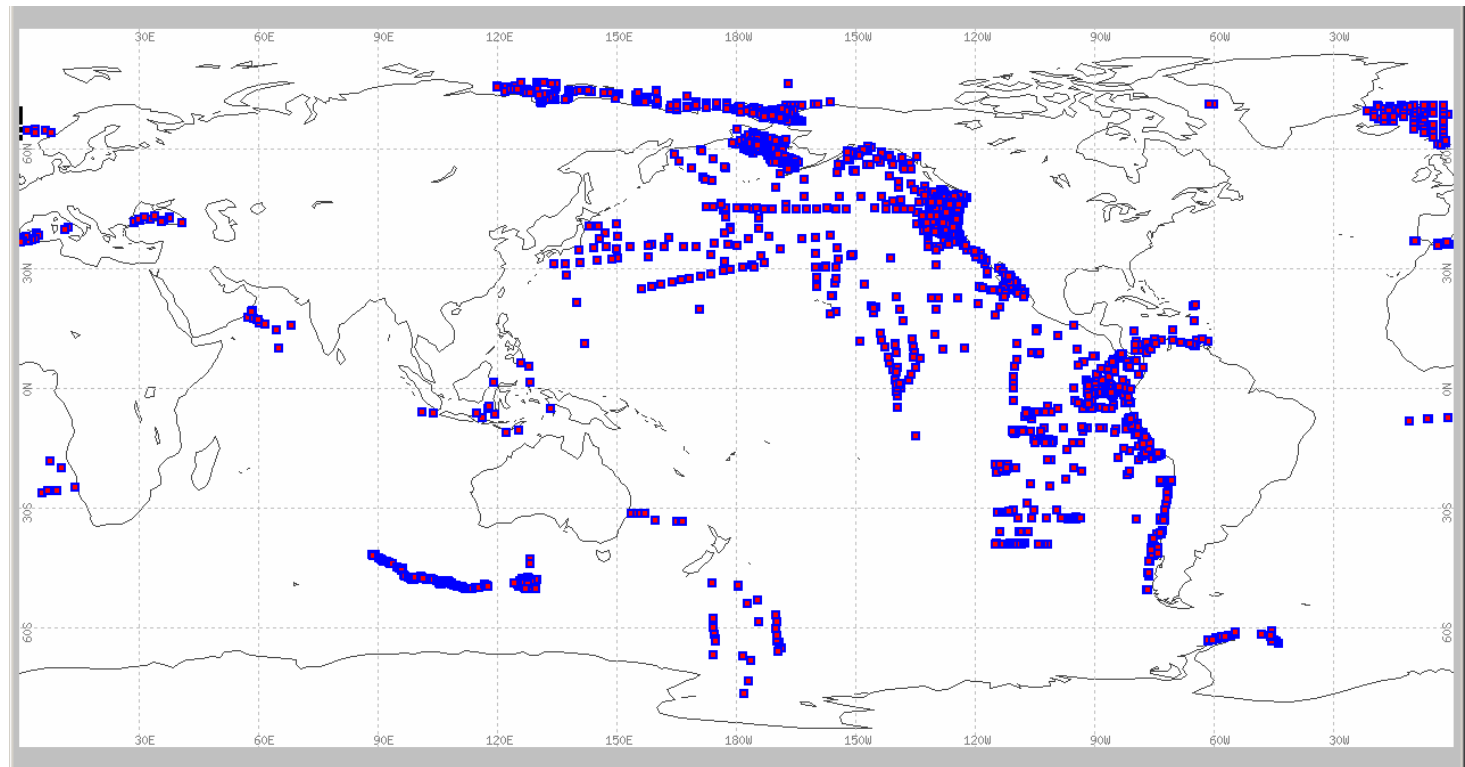
Photograph from the Oregon State University, College of Oceanic & Atmospheric Sciences (OSU)



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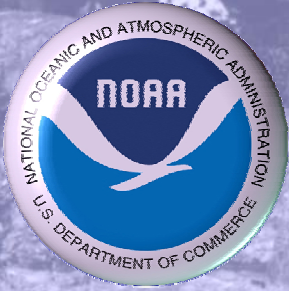
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Task description: Scan 8,400 color photographs



Locations of OSU samples in the database

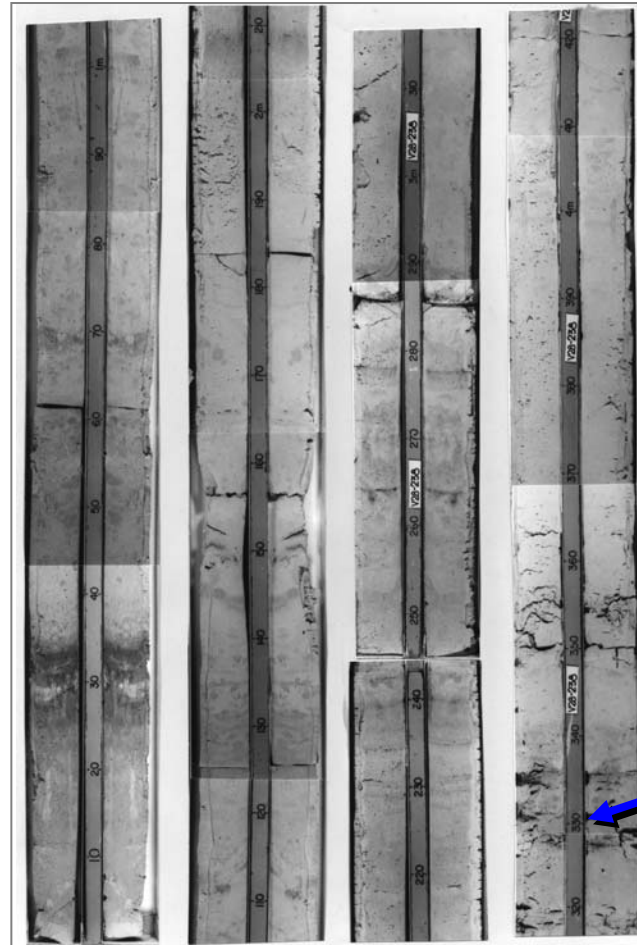
8,000 color photographs are from the Oregon State University, College of Oceanic & Atmospheric Sciences (OSU)



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Task description: Scan 42,500 grayscale core photos



Example of grayscale core photographs (1 print)

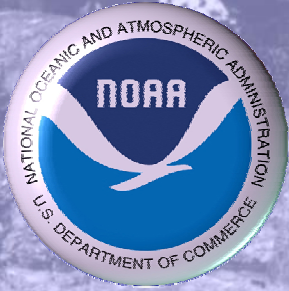
Original prints are
8.5 x 11 inches

There are 42,000 LDEO prints

There are also 500 8 x 20 inch
negatives from the Scripps
Institution of Oceanography

Vertical stripes are rulers showing depth
in core. Sample depth within a core is
crucial in identifying suitable material for
study and for correlating research results.

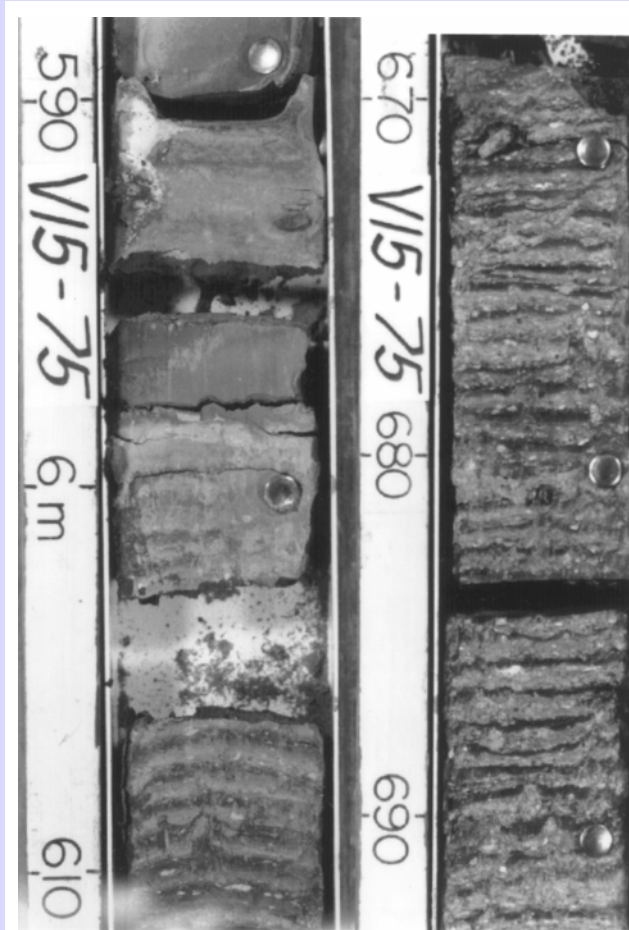
Photographs from the Lamont-Doherty Earth Observatory
(LDEO) of Columbia University



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Task description: Scan 42,500 grayscale core photos



Closeup of a grayscale core photograph: V15-75

593-765 cm [590-610 & 670-690 shown]:

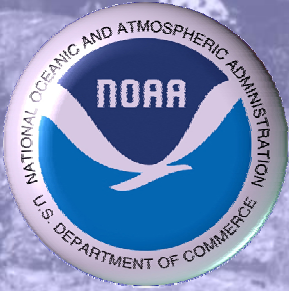
A layer of alternating dark gray and grayish white lutite varves. According to the varve theory, these laminae represent deposition during spring and summer.

The dark gray varves are much finer grained and represent deposition during autumn and winter, when the decreased turbulence of the water permitted the fine clay particles to settle to the bottom.

Microlamination within the grayish white varves indicates the action of summer storms. The varves are folded indicating that some lateral movement occurred here: taking each couplet as the sediment deposited in a year.

The layer as a whole represents at least 130 years of deposition. Large pebbles, probably ice-rafted, occur sparingly in the layer.

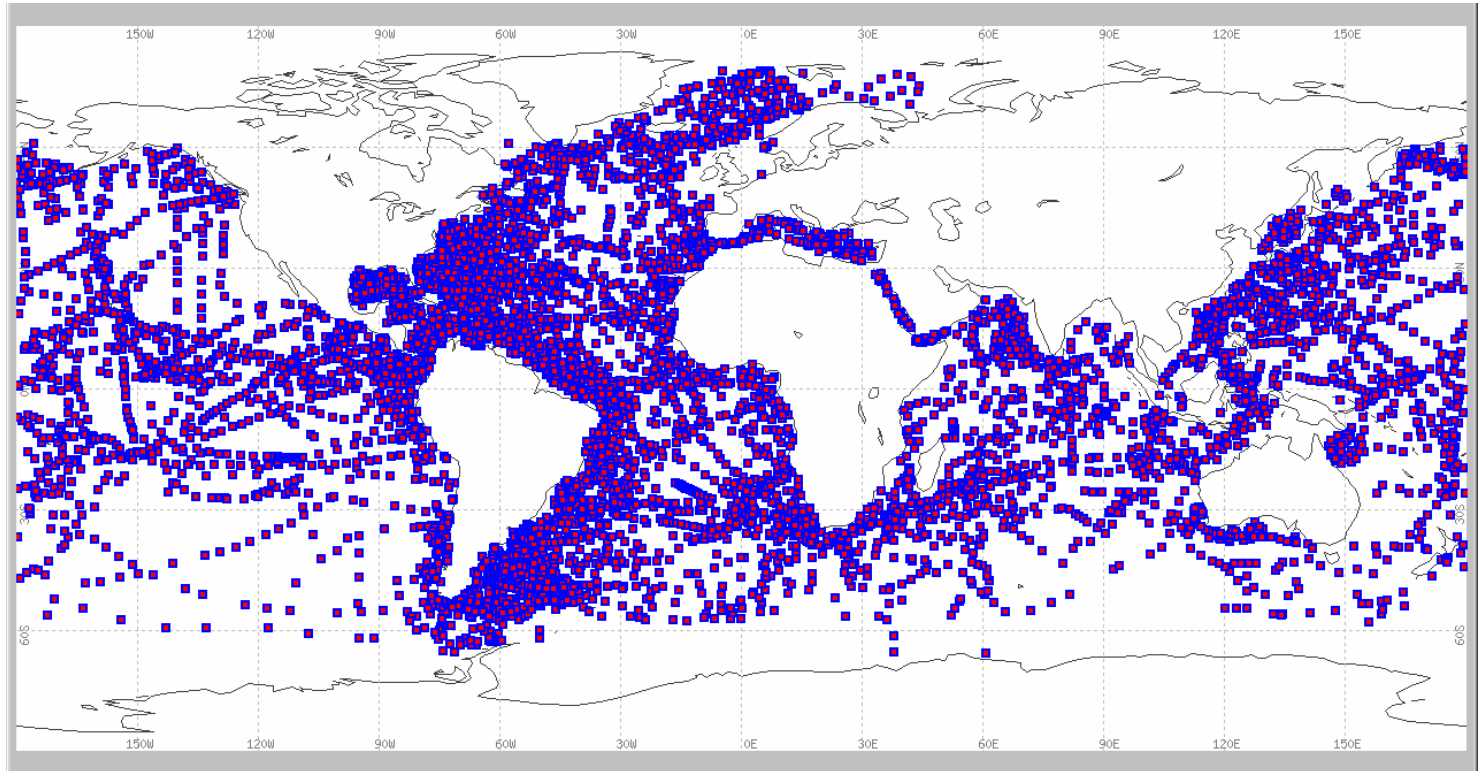
Photographs and description from the Lamont-Doherty Earth Observatory (LDEO) of Columbia University.



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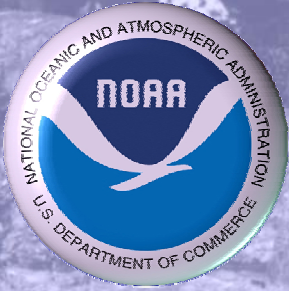
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Task description: Scan 42,500 grayscale core photos



Locations of LDEO samples in the database

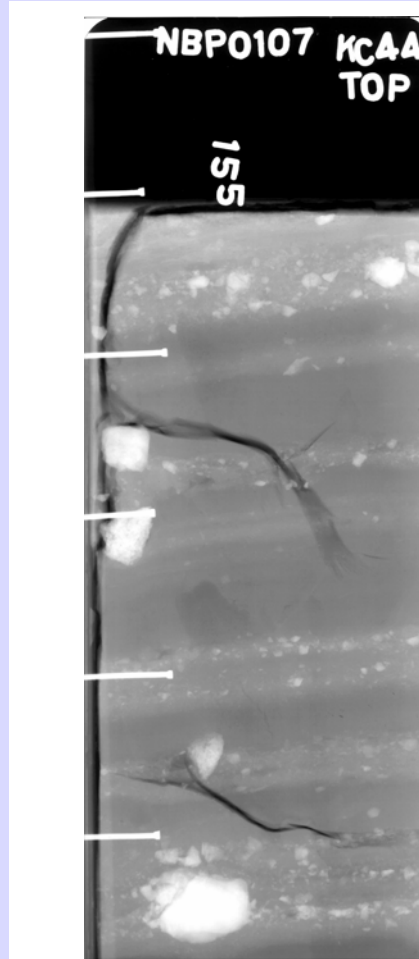
42,000 Photographs are from the Lamont-Doherty Earth Observatory (LDEO) of Columbia University



Task description: Scan 7,500 core X-rays

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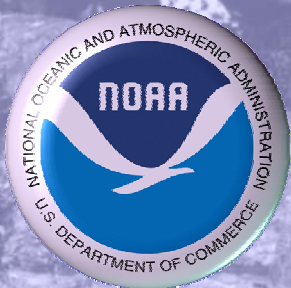
Example of grayscale core X-ray

Originals are in 3 sizes:

- 18 x 5 inches
- 20 x 4 inches
- 17 x 14 inches

There are 7,500 X-rays
all from the ARF

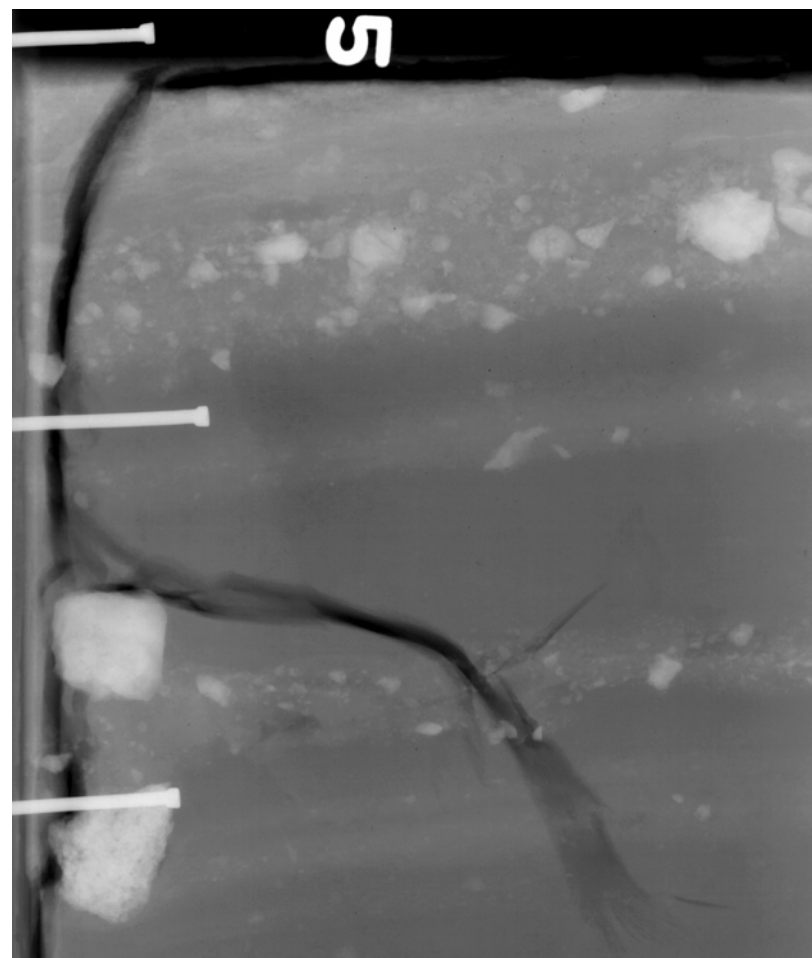
X-ray from the Antarctic Research Facility (ARF) located at Florida State University (FSU)



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Task description: Scan 7,500 core X-rays



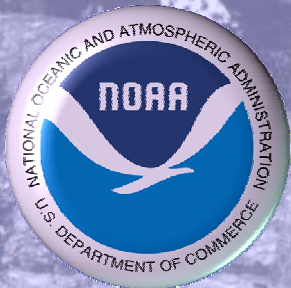
**Closeup of a grayscale
core X-ray**

**Showing alternating layers
of mud with pebbles
(dropped from melting
ice bergs) & layers of
diatomaceous mud.**

NBP01-07 KC44

155-165cm

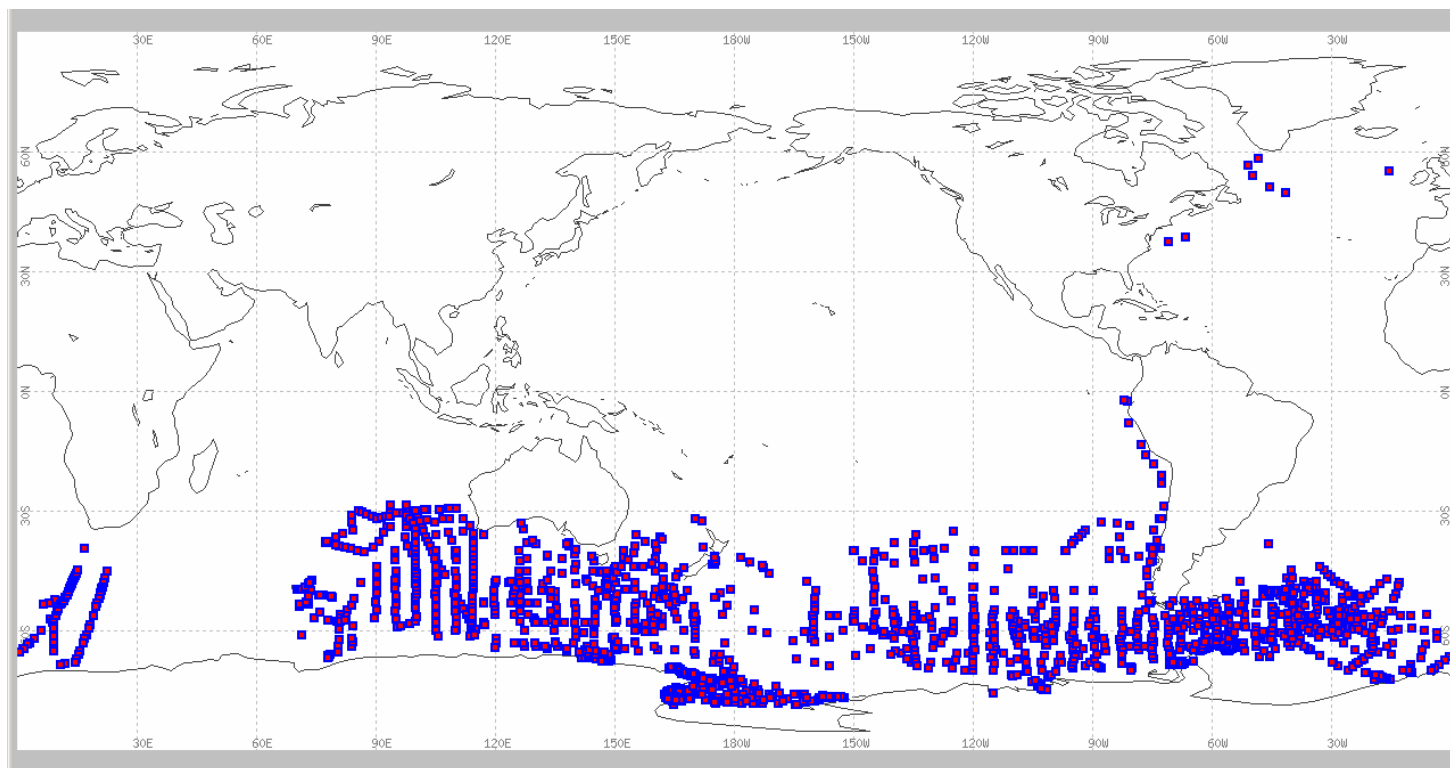
X-ray from the Antarctic Research Facility (ARF) located at
Florida State University (FSU)



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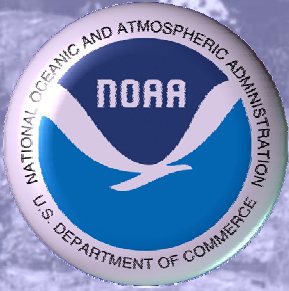
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Task description: Scan 7,500 core X-rays



Locations of ARF samples in the database

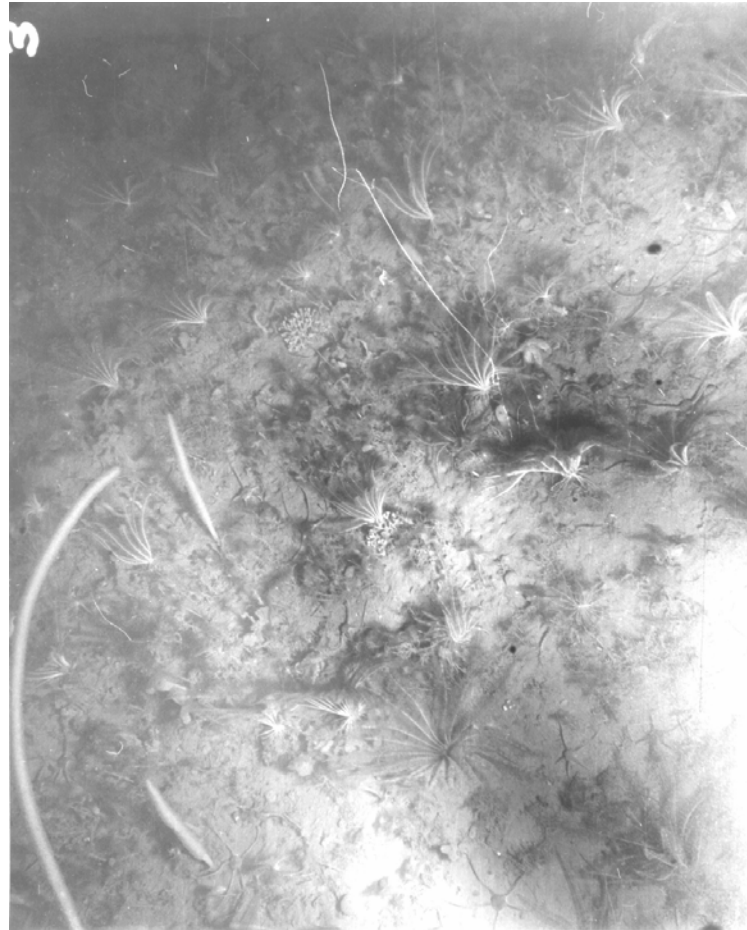
All X-rays are from the Antarctic Research Facility (ARF) located at Florida State University (FSU)



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Task description: Scan 20,000 grayscale seabed photos



Example of a grayscale Sea floor photograph

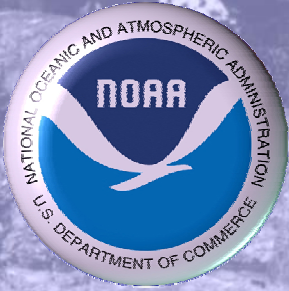
Eltanin ELT 6 camera station 26
Scotia Sea, winter 1963

There are 2,000 sea floor
photos from the Antarctic
Research Facility in 2 sizes:

- 5 x 7 inches
- 8 x 10 inches

There are also 18,000 frames
of 35mm film in NGDC's
archives (lower priority)

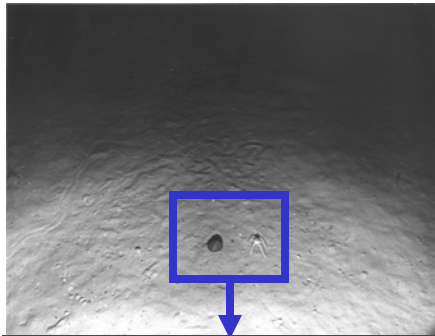
Sea floor photograph from the Antarctic Research Facility (ARF)
located at Florida State University (FSU)



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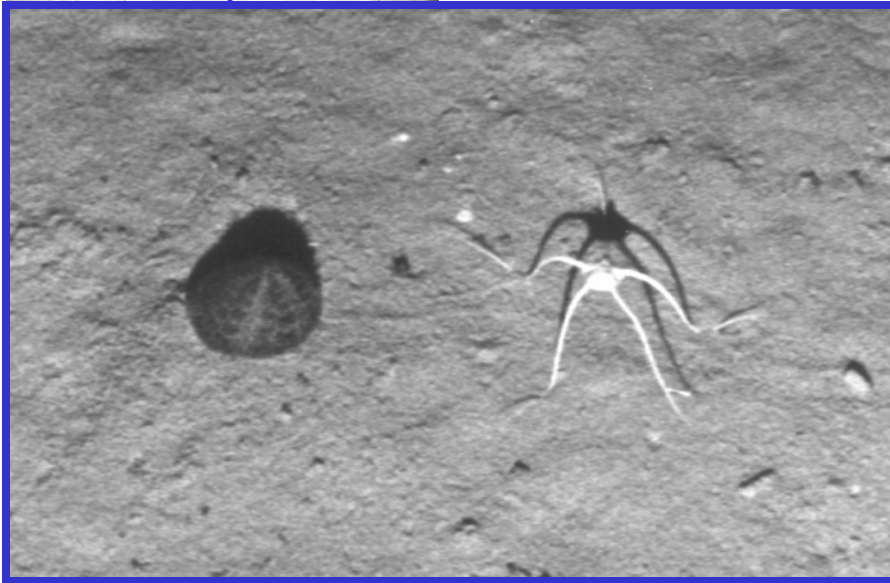
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Task description: Scan 20,000 grayscale seabed photos



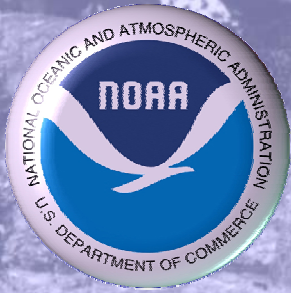
Close up of a sea floor photograph

Eltanin cruise ELT 10 camera station 10
Western Drake Passage
Fall 1963



Showing a solitary
sea urchin (left), a
single brittle star in
up-right walking
position (right), &
crawling traces in
the sediment.

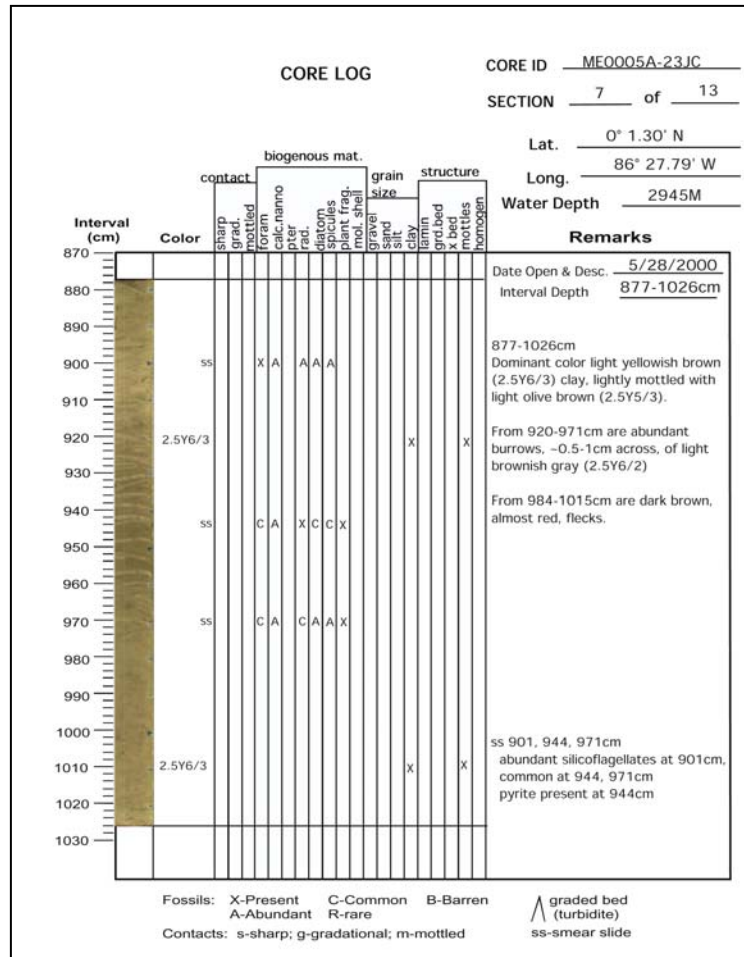
Sea floor photograph from the Antarctic Research Facility (ARF)
located at Florida State University (FSU)



Task description: Scan 14,000 paper documents

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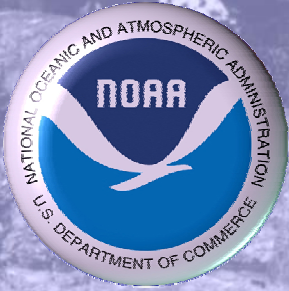


Example of a paper core log

Original pages are 8.5 x 11 inches

There are 14,000 paper documents

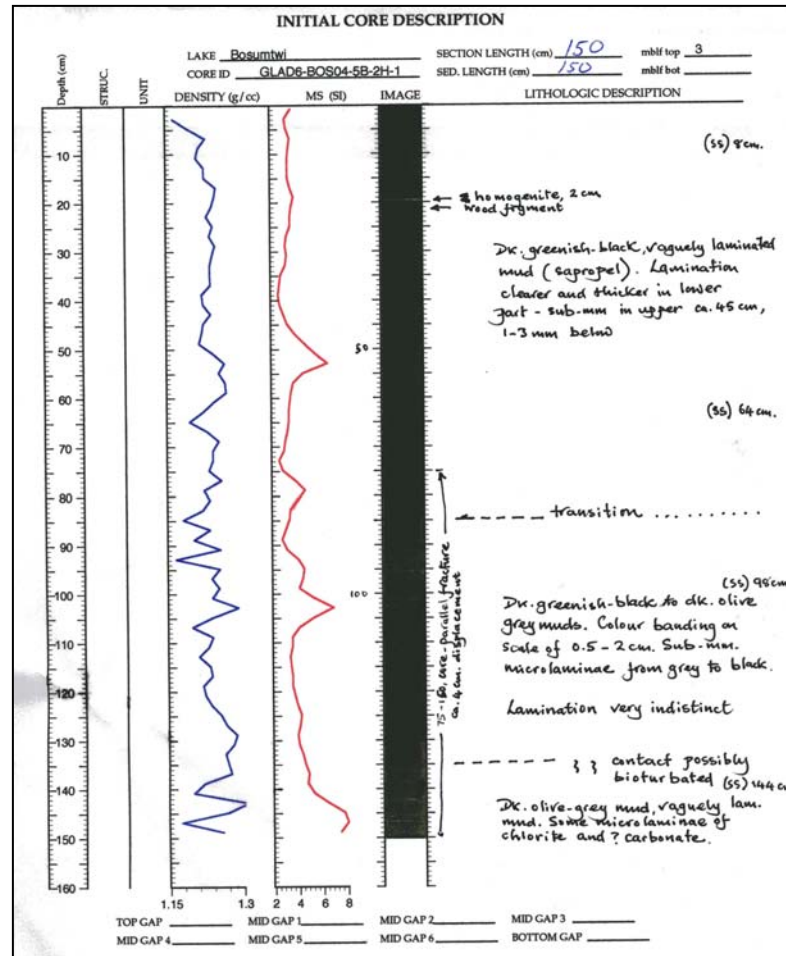
Core log from the Oregon State University, College of Oceanic & Atmospheric Sciences (OSU)



Task description: Key-enter descriptive data

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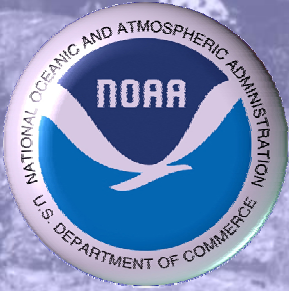


Example of a paper core data log

Original pages are 8.5 x 11 inches

There are 1,000 URI pages + 4,000 pages from OSU

Core data log from the University of Rhode Island (URI),
Graduate School of Oceanography



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Task description: Specifications (see document)

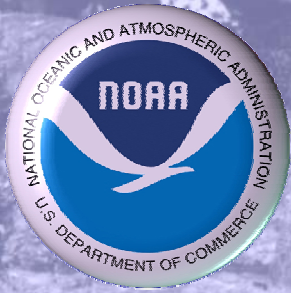
A multi-year project to digitize images & written descriptions of cores from multiple institutions

1. Scanning output

- ▶ Unedited .TIFF, version 5.0 or 6.0 headers
- ▶ lossless LZW-compression
- ▶ 600dpi optical resolution sized to print full-scale (35mm originals sized to print 600dpi @ 8.5x11 inches)

2. Key-entry output

- ▶ Entered twice, compared, resolved by contractor
- ▶ 99.5% accuracy rate required
- ▶ Entry form provided by NGDC



Documents/data freely available via web access at a NOAA facility:

Data & Images will be available via a web-accessible, geospatially enabled database

Digitization of Marine & Lacustrine Records of Climate Change

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Index to Marine & Lacustrine Geological Samples
National Geophysical Data Center

Layers:

- ALL Repositories
- ADML Samples
- AMI Samples
- BIO Samples
- DSDP Holes
- FSU Samples
- GEOMAR Samples
- LDEO Samples
- LacCore Samples
- ODP Sites
- OSU Samples
- PMEL Samples
- RSMAS Samples
- SIO Samples
- SOC Samples
- SOEST Samples
- URI Samples
- USC Samples
- USOS MP Samples
- USOS WH Samples
- UT Samples
- WHOI Samples
- WISC Samples
- Elevation/Bathymetry
- Relief (searh)
- Lakes
- Continents

Reo	Latitude	Longitude	Link	Facility	Ship	Cruise	ID	Device	YearMoDy	Water Depth	Lake	Int	Top cm	Bot cm	Age	Lith1	Color	Desc	Province
1	30.817	-176.133	Data	OSU	Oceanographer	OC72-2	16	core, gravity	19720418	4082		1	0	118	unknown	terigenous mud or ooze			
2	30.417	-175.883	Data	OSU	Thomas Thompson	TT028	012-012	core, gravity	19680527	5145		1	0	170		terigenous mud or ooze			
3	28.9	-177.887	Data	SIO	Agassiz	STYX VII	25D	dredge (old tmb)	19680922	1567		1	0	0	unknown	volcanic igneous rock			
4	28.9	-177.887	Data	SIO	Agassiz	STYX VII	25D	dredge (old tmb)	19680922	1567		2	0	0	unknown	allogenic limestone			

The Index to Marine & Lacustrine Geological Samples database

<http://www.ngdc.noaa.gov/mgg/curator/curator.html>