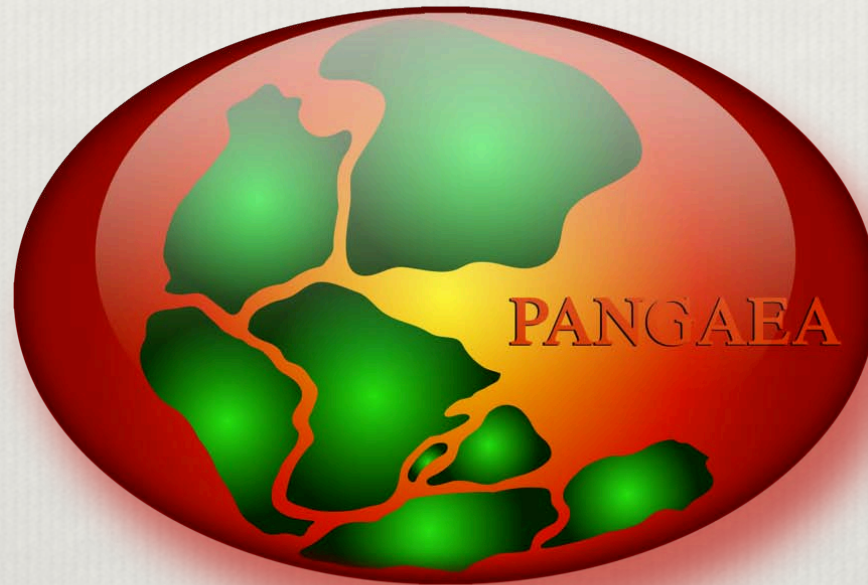


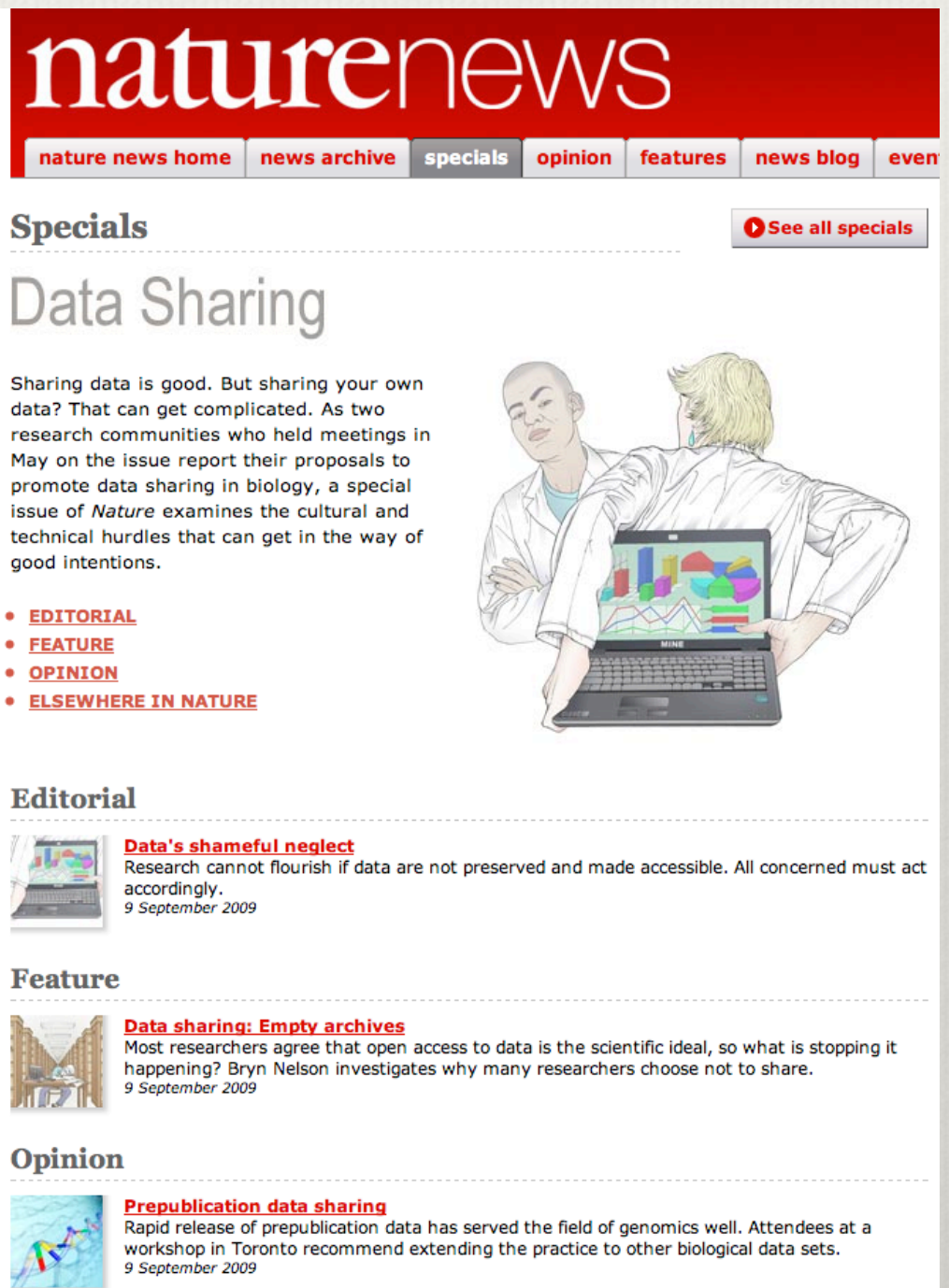
# An introduction to the Data Library PANGAEA®



# Data sharing and archiving

Nature:  
Vol 461, 10 September 2009

[doi:10.1038/461145a](https://doi.org/10.1038/461145a)



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**Specials** [▶ See all specials](#)


## Data Sharing

Sharing data is good. But sharing your own data? That can get complicated. As two research communities who held meetings in May on the issue report their proposals to promote data sharing in biology, a special issue of *Nature* examines the cultural and technical hurdles that can get in the way of good intentions.

- [EDITORIAL](#)
- [FEATURE](#)
- [OPINION](#)
- [ELSEWHERE IN NATURE](#)




### Editorial



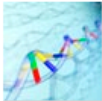
**[Data's shameful neglect](#)**  
Research cannot flourish if data are not preserved and made accessible. All concerned must act accordingly.  
9 September 2009

### Feature



**[Data sharing: Empty archives](#)**  
Most researchers agree that open access to data is the scientific ideal, so what is stopping it happening? Bryn Nelson investigates why many researchers choose not to share.  
9 September 2009

### Opinion



**[Prepublication data sharing](#)**  
Rapid release of prepublication data has served the field of genomics well. Attendees at a workshop in Toronto recommend extending the practice to other biological data sets.  
9 September 2009

# DFG Recommendations for *Good Scientific Practice*

**DFG**

## **Empfehlungen der Kommission "Selbstkontrolle in der Wissenschaft"**

---

Vorschläge zur Sicherung guter wissenschaftlicher Praxis  
Januar 1998

### **Empfehlung 7**

Primärdaten als Grundlagen für Veröffentlichungen sollen auf haltbaren und gesicherten Trägern in der Institution, wo sie entstanden sind, für zehn Jahre aufbewahrt werden.




## What is PANGAEA<sup>®</sup> ?

Pangaea is an **Open Access data library** for **earth system research**. Data are stored **georeferenced** in space and time in a relational database and a tape archive.

The data content is accessible on the Internet via a search engine, a data warehouse and web services.

The system is open to any scientist or project to archive and publish data.

# History & Milestones

- ❖ 1987 Core repository database
- ❖ 1989 SEDI/SEDAT proprietary predecessor
- ❖ 1994 SEDAN/SEPAN relational predecessor
- ❖ 1996 PANGAEA
- ❖ 1998 [www.pangaea.de](http://www.pangaea.de)
- ❖ 2001 WDC-MARE
- ❖ 2004 OAI and DOI  each dataset can be identified, shared, published and cited by using a Digital Object Identifier (DOI)
- ❖ 2006 Data citation, portal software
- ❖ 2008 Data warehouse
- ❖ 2009 Elsevier-Partnership

# Digital Object Identifier

[doi:10.1016/S0098-3004\(02\)00039-0](https://doi.org/10.1016/S0098-3004(02)00039-0)



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Computers & Geosciences

Volume 28, Issue 10, December 2002, Pages 1201-1210

DOI: [10.1016/S0098-3004\(02\)00039-0](https://doi.org/10.1016/S0098-3004(02)00039-0)

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## PANGAEA—an information system for environmental sciences

Michael Diepenbroek<sup>a</sup>, Hannes Grobe<sup>b</sup>, Manfred Reinke<sup>b</sup>, Uwe Schindler<sup>c</sup>, Reiner Schlitzer<sup>b</sup>, Rainer Sieger<sup>b</sup> and Gerold Wefer<sup>a</sup>

<sup>a</sup> Center for Marine Environmental Sciences (MARUM), University Bremen, Bremen 28334, Germany

<sup>b</sup> Alfred Wegener Institute for Polar and Marine Research, Bremerhaven 27515, Germany

<sup>c</sup> Physics Department, University of Erlangen-Nuremberg, Erlangen 91058, Germany

Received 23 March 2001; revised 20 April 2001; accepted 5 May 2001. Available online 20 September 2002.

### Abstract

PANGAEA is an information system for processing, long-term storage, and publication of georeferenced data related to earth science fields.

# DOI – Digital Object Identifier

Is a character string used to uniquely identify an electronic document or object.

The DOI for a document is permanent, whereas its location and other metadata may change

Is resolved by a doi-resolver: <http://dx.doi.org/>

Example:

doi:10.1594/PANGAEA.737668



<http://dx.doi.org/10.1594/PANGAEA.737668>



# Who are the hosts of PANGAEA ?

**(1) Alfred Wegener Institute for Polar and Marine Research (AWI)**

member of the Helmholtz Association of National Research Centres  
funded by the Federal Ministry of Education and Research (BMBF)

&

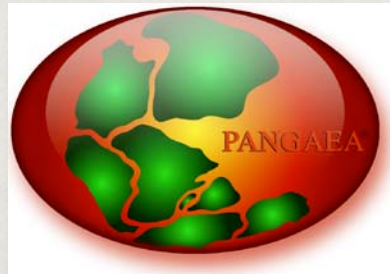
**(2) Center for Marine Environmental Sciences (MARUM)**

at Bremen University  
funded by the German Research Foundation (DFG)

*Both institutions have committed to long-term operate PANGAEA and the World Data Center for Marine Environmental Sciences (WDC-MARE)*



# Publication of data with PANGAEA





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Article |  |   |

**Marine Micropaleontology**  
Volume 76, Issues 3-4, September 2010, Pages 92-103

doi:10.1016/j.marmicro.2010.06.002 | [How to Cite or Link Using DOI](#)  
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Research paper

# Ontogenetic effects on stable carbon and oxygen isotopes in tests of live (Rose Bengal stained) benthic foraminifera from the Pakistan continental margin

Stefanie Schumacher<sup>a, b, c</sup>, Frans J. Jorissen<sup>a, b</sup>, Andreas Mackensen<sup>c</sup>, Andrew J. Gooday<sup>d</sup> and Olivier Pays<sup>e</sup>

- <sup>a</sup> Laboratory of Recent and Fossil Bio-Indicators (BIAF), Angers University, 2 Bd Lavoisier, 49045 Angers Cedex 01, France
- <sup>b</sup> Laboratory of Marine Bio-Indicators (LEBIM), Ile d'Yeu, Ker Chalon, France
- <sup>c</sup> Alfred Wegener Institute for Polar and Marine Research, Am Alten Hafen 26, 27568 Bremerhaven, Germany
- <sup>d</sup> National Oceanography Centre, Southampton, European Way, Southampton SO14 3ZH, United Kingdom
- <sup>e</sup> LEESA, Ecology and Conservation Biology group, Angers University, 2 Bd Lavoisier, 49045 Angers Cedex 01, France

Received 11 December 2008; revised 10 June 2010; accepted 17 June 2010. Available online 25 June 2010.

Abstract

**PANGAEA® – Supplementary Data**  
Stable carbon and oxygen isotope ratios for different test sizes of live benthic forami...

- ### Related Articles
- Distribution of rose bengal stained deep-sea benthic fo...  
*Deep Sea Research Part A: Oceanographic Research Papers*
  - Vertical distributions and stable isotopic compositions...  
*Deep Sea Research Part I: Oceanographic Research Papers*
  - Foraminiferal response to an active methane seep enviro...  
*Marine Micropaleontology*
  - Morphology and microhabitat preferences of benthic fora...

# PANGAEA is a designated archive for the journal Earth System Science Data (ESSD)

[doi:10.1594/PANGAEA.547983](https://doi.org/10.1594/PANGAEA.547983)

Earth Syst. Sci. Data, 1, 1–5, 2009  
www.earth-syst-sci-data.net/1/1/2009/  
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## Compilation of ozonesonde profiles from the Antarctic Georg-Forster-Station from 1985 to 1992

G. König-Langlo and H. Gernandt

Alfred Wegener Institute for Polar and Marine Research, Bussestraße 24, 27570 Bremerhaven, Germany

Received: 29 July 2008 – Published in Earth Syst. Sci. Data Discuss.: 22 September 2008  
Revised: 1 December 2008 – Accepted: 23 December 2008 – Published: 12 January 2009

**Abstract.** On 22 May 1985 the first balloon-borne ozonesonde was successfully launched by the staff of Georg-Forster-Station (70°46′ S, 11°41′ E). The subsequent weekly ozone soundings mark the beginning of a continuous investigation of the vertical ozone distribution in the southern hemisphere by Germany.

The measurements began the year the ozone hole was discovered. They significantly contribute to other measurements made prior to and following 1985 at other stations. The regular ozone soundings from 1985 until 1992 are a valuable reference data set since the chemical ozone loss became a significant feature in the southern polar stratosphere.

The balloon-borne soundings were performed at the upper air sounding facility of the neighbouring station Novolazarevskaya, just 2 km from Georg-Forster-Station. Until 1992, ozone soundings were taken without interruption. Thereafter, the ozone sounding program was moved to Neumayer-Station (70°39′ S, 8°15′ W) 750 km further west.

### Data coverage and parameter measured

Repository-Reference: [doi:10.1594/PANGAEA.547983](https://doi.org/10.1594/PANGAEA.547983)

Coverage: East: 11.8300; South: -70.7700;

Location Name: Georg-Forster-Station, Antarctica

Date/Time Start: 1985-05-22T05:19:00

Date/Time End: 1992-01-29T01:19:00

Parameter	Short Name	Unit	Comment
Altitude	Altitude	m	height above mean sea level
Date/Time	Date/Time		universal time code (UTC)
Longitude	Longitude		at launching point
Latitude	Latitude		at launching point
Ozone, partial pressure	O <sub>3</sub>	mPa	
Pressure, at given altitude	PPPP	hPa	
Temperature, air	TTT	degC	
Wind direction	dd	deg	
Wind speed	ff	m/sec	

### 1 Introduction

The first permanently operated German research base – later named Georg-Forster-Station – was established in 1976 in the Schirmacher Oasis at 70°46′ S, 11°41′ E. The station was permanently used and operated as an annex to the Russian station Novolazarevskaya until 1987, and then as a German Antarctic station named after the German natural scientists, author and revolutionary Georg Forster (1754–1794) until 1993.

Long-term studies of magnetospheric-ionospheric processes, geophysical investigations, biological studies and sea ice observations using satellite imaging were performed.

The station became known to the international scientific community when the vertical extent of the “ozone hole” in the southern polar stratosphere was firstly recorded by regular balloon-borne ozone observations in 1985 (Gernandt, 1987a, b).

The ozone sounding programme was a major contribution of the Meteorological Service to the Antarctic research of the German Democratic Republic (GDR). The station was established as a long-term ozone-sonde observatory in cooperation with the Russian Arctic and Antarctic Research Institute (AARI) and the Aerological Observatory Lindenberg (AOL) in order to study the climatology of the ozone layer in



Correspondence to: G. König-Langlo  
([gert.koenig-langlo@awi.de](mailto:gert.koenig-langlo@awi.de))

Final data report  
for projects

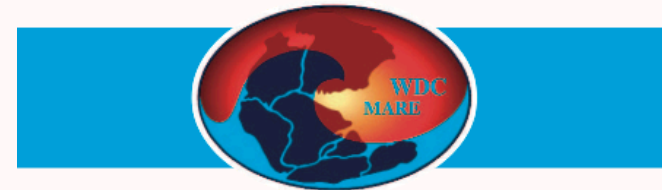
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information in a booklet

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libraries with focus on marine  
research

**WDC-MARE**  
Reports

0001  
**2004**



Integrated Data Sets of the DFG Research Project SFB 313

Environmental Change: The Northern North Atlantic  
(Veränderungen der Umwelt: Der nördliche Nordatlantik)

---

Hannes Grobe, Michael Diepenbrock,  
Priska Schäfer, Jörn Thiede & Gerold Wefer

---

WORLD DATA CENTER FOR MARINE ENVIRONMENTAL SCIENCES

Alfred Wegener Institute for Polar and Marine Research, Bremerhaven  
MARUM Center for Marine Environmental Sciences, Bremen

What type of data are archived in  
PANGAEA ?

ATMOSPHERE



BIOSPHERE

KRYOSPHERE

HYDROSPHERE

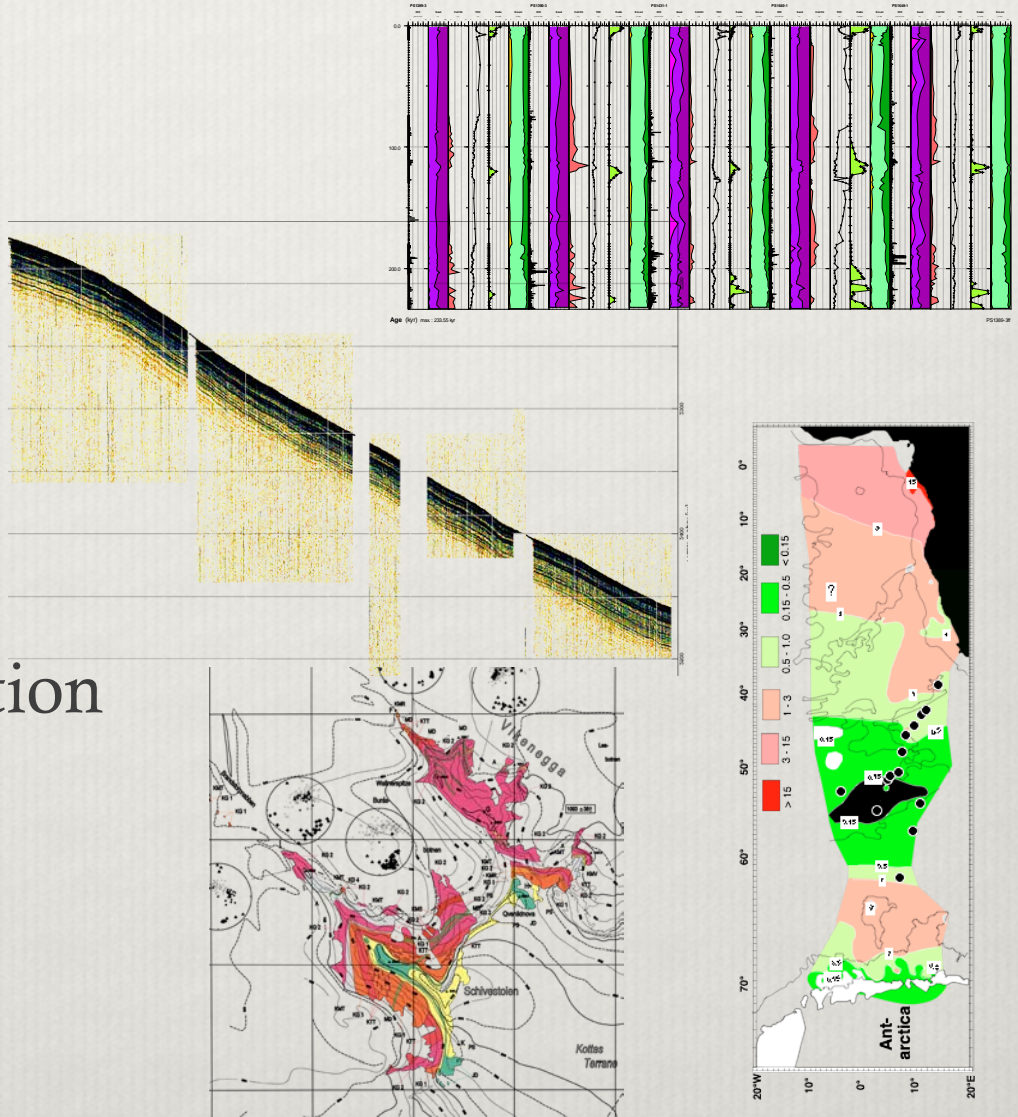
LITHOSPHERE

# Major Projects

<u>International</u>	<u>EU</u>	<u>National</u>
<i>Radiation</i> IODN	<i>Pollen</i> GONARC	<i>Marine environment</i> green
JGOFS	CarboOcean	<i>Tree rings</i> SERPO
<i>Oceanography</i> WOCCE	<i>Ocean acidification</i> Euroceans	HISTRA
<i>Ice cores</i> EPTCA	HERMES/Hermione	<i>Data archaeology</i> ARCOD
<i>Marine geology</i> IODP	EPOCA	DFG/BMBF

# Examples from Geoscientific Research

- ◆ Sediment profile
- ◆ Seismic profile
- ◆ Mineral distribution
- ◆ Geological map



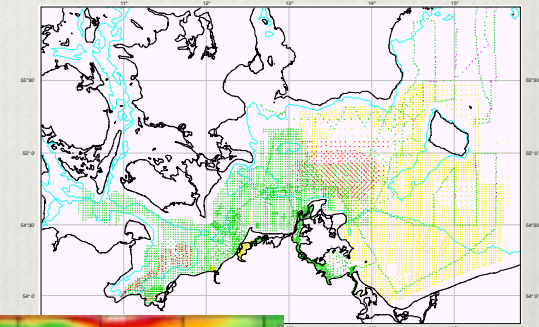


# Examples from Environmental Research

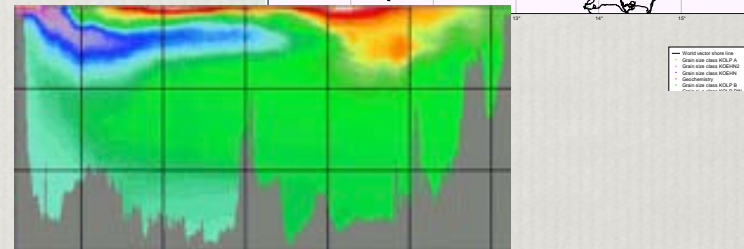
◆ Images



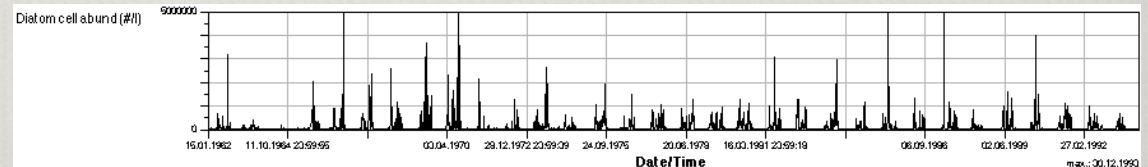
◆ Distributed samples



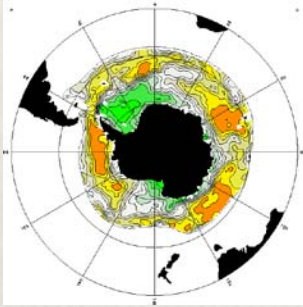
◆ Hydrographic profiles



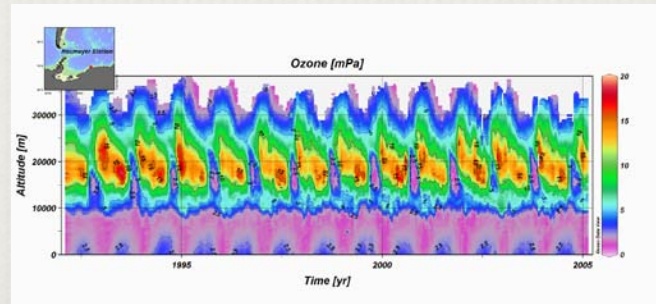
◆ Times Series



# Examples from Antarctic Research



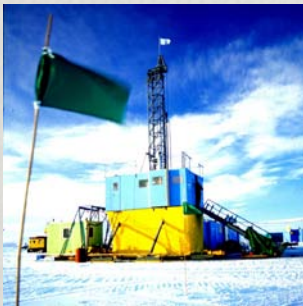
Southern Ocean Atlas



Ozone profiles



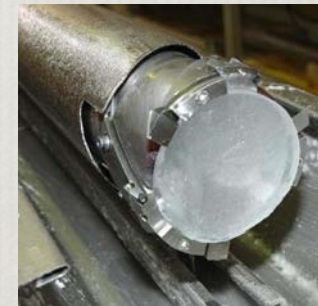
Sediments and Rocks



CRP  
Cape Roberts Project



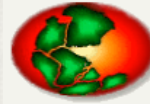
Archive of  
Underwater Imaging



EPICA  
European Project for  
Ice Coring in Antarctica

# JGOFS

Joint Global Ocean Flux Studies



PANGAEA

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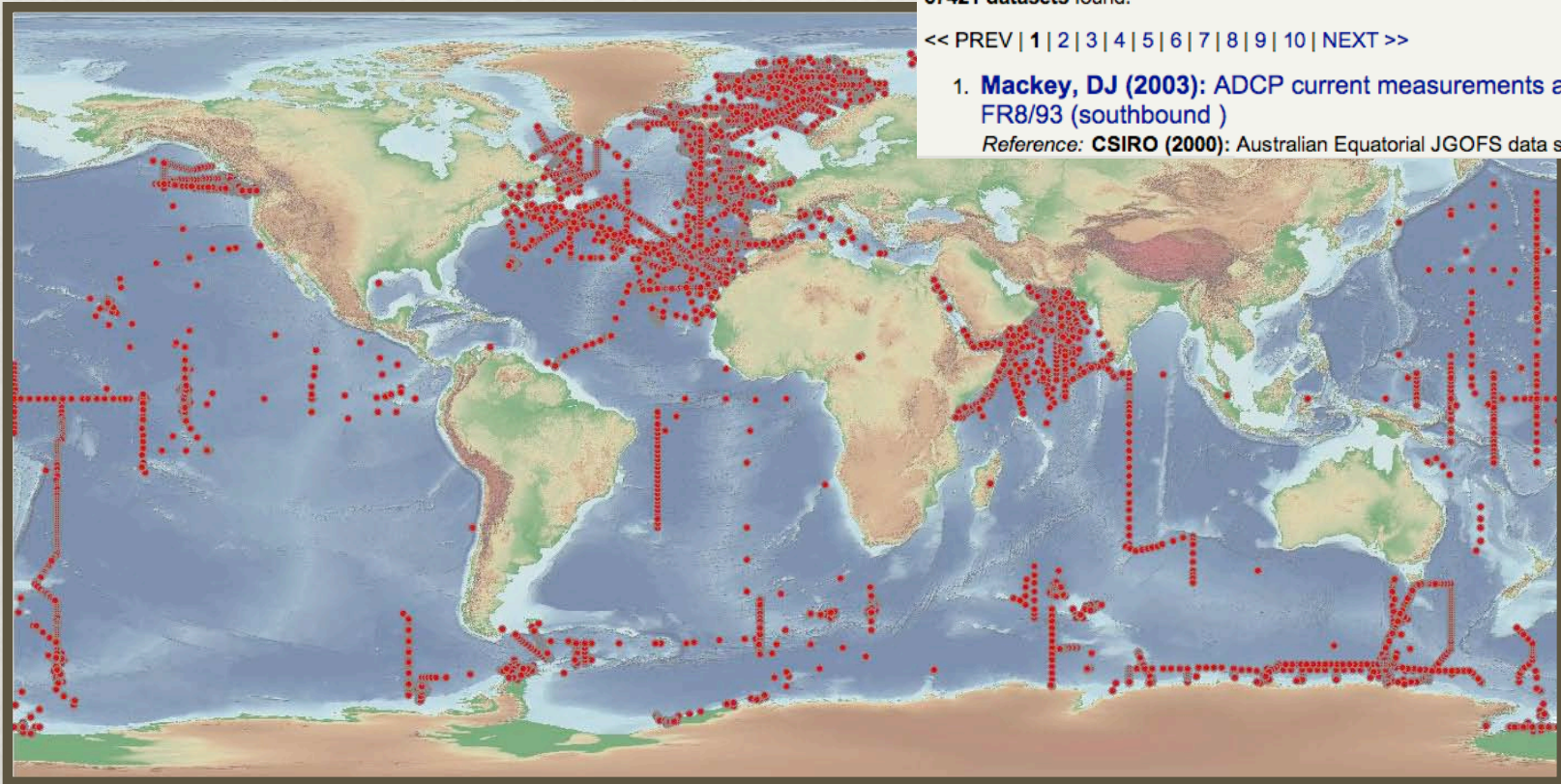
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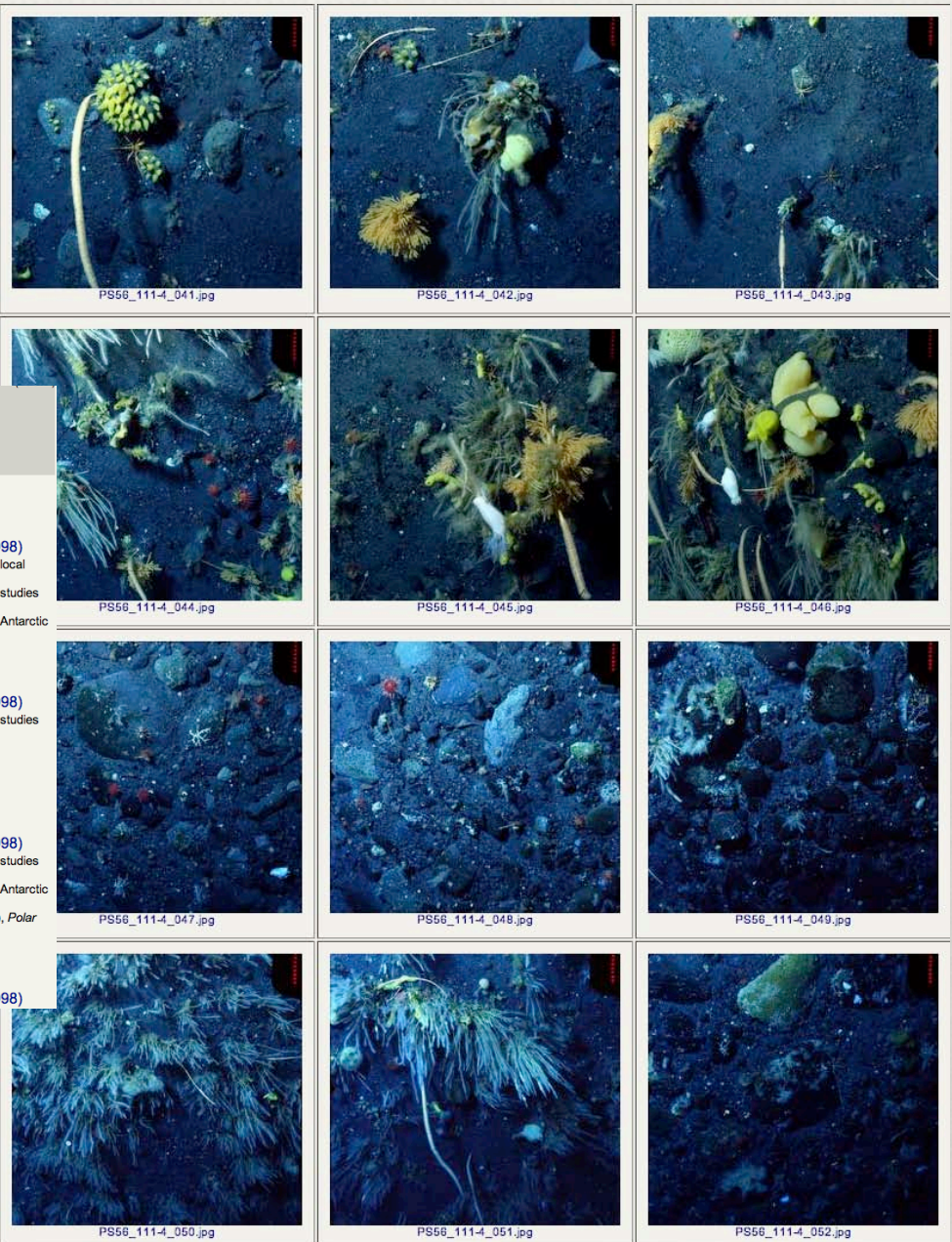
<< PREV | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | NEXT >>

1. **Mackey, DJ (2003):** ADCP current measurements at cruise FR8/93 (southbound )

Reference: **CSIRO (2000):** Australian Equatorial JGOFS data set,



# Sea-bed photos



Search for:

sea-bed

Search

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Clear

189 datasets found!

<< PREV | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | NEXT >>

- Gutt, J (2004):** Sea-bed photographs (benthos) from the Weddell Sea along ROV profile PS48/281 (©AWI, Gutt 1998)  
*Reference:* Raguá-Gil, JM; Gutt, J; Clarke, A et al. (2004): Antarctic shallow-water mega-epibenthos: shaped by circumpolar dispersion or local conditions?, *Marine Biology*  
Gutt, J; Arntz, WE; Balguerías, E et al. (2003): Diverse approaches to questions of diversity: German contributions to benthos studies around South American and Antarctica, *Gayana*  
Gutt, J; Piepenburg, D (2003): Scale-dependent impacts of catastrophic disturbances by grounding icebergs on the diversity of Antarctic benthos, *Marine Ecology Progress Series*  
(and more)  
Size: unknown  
doi:10.1594/PANGAEA.198686 - Score: 80% - Similar datasets
- Gutt, J (2004):** Sea-bed photographs (benthos) from the Weddell Sea along ROV profile PS48/238 (©AWI, Gutt 1998)  
*Reference:* Gutt, J; Arntz, WE; Balguerías, E et al. (2003): Diverse approaches to questions of diversity: German contributions to benthos studies around South American and Antarctica, *Gayana*  
Gutt, J (2001): High latitude antarctic benthos: a coevolution of nature conservation and ecosystem research?, *Ocean and Polar Research*  
Gutt, J (2001): On the direct impact of ice on marine benthic communities, a review, *Polar Biology*  
(and more)  
Size: unknown  
doi:10.1594/PANGAEA.198685 - Score: 80% - Similar datasets
- Gutt, J (2004):** Sea-bed photographs (benthos) from the Weddell Sea along ROV profile PS48/219 (©AWI, Gutt 1998)  
*Reference:* Gutt, J; Arntz, WE; Balguerías, E et al. (2003): Diverse approaches to questions of diversity: German contributions to benthos studies around South American and Antarctica, *Gayana*  
Gutt, J; Piepenburg, D (2003): Scale-dependent impacts of catastrophic disturbances by grounding icebergs on the diversity of Antarctic benthos, *Marine Ecology Progress Series*  
Gutt, J; Starmans, A (2001): Quantification of iceberg impact and benthic recolonisation patterns in the Weddell Sea (Antarctica), *Polar Biology*  
(and more)  
Size: unknown  
doi:10.1594/PANGAEA.198684 - Score: 80% - Similar datasets
- Gutt, J (2004):** Sea-bed photographs (benthos) from the Weddell Sea along ROV profile PS48/213 (©AWI, Gutt 1998)

[doi:10.1594/PANGAEA.319877](https://doi.org/10.1594/PANGAEA.319877)

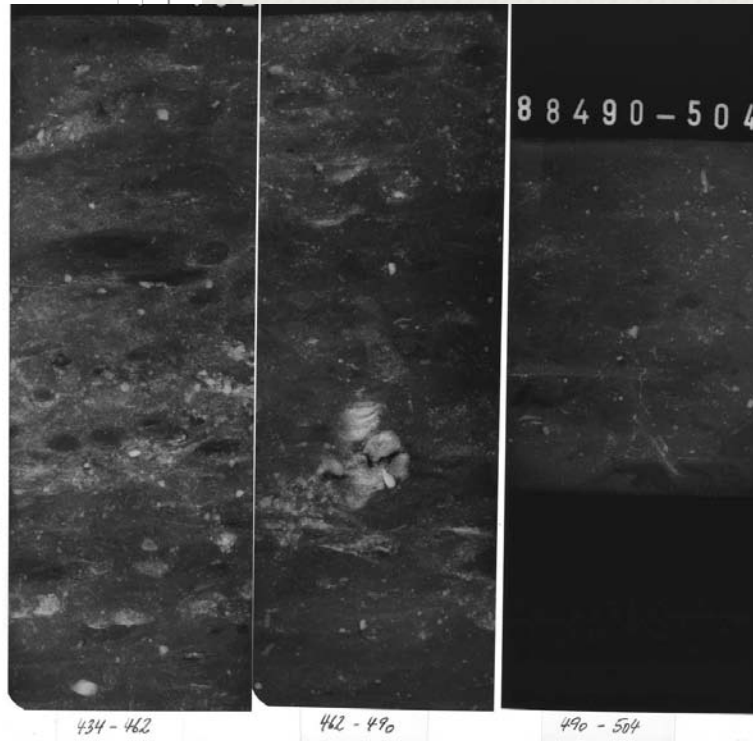
PS1768-8 (SL)  
Recovery: 8.96 m

North of SW Indian Ridge  
52° 35.6' S, 4° 28.5' E

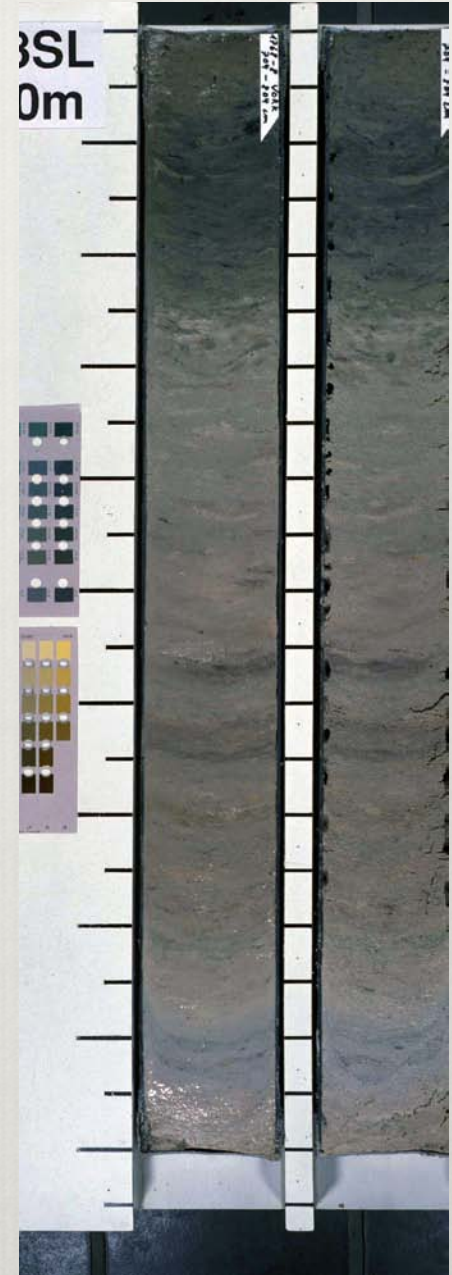
ANT VIII/3  
Water depth: 3270 m

Lithology	Struct. Colour	Description	Age
10YR 7/3		0-35 cm: diatomaceous ooze, very pale brown (0-13 cm), light yellowish brown (13-35 cm)	
10YR 6/4		35-62 cm: diatomaceous ooze, very pale brown (35-53 cm), pale brown (53-62 cm)	
10YR 7/3			
10YR 8/2		62-70 cm: diatomaceous ooze, very pale brown, two light gray layers (62-64 cm and 66-68 cm)	
10YR 7/4		70-94 cm: diatomaceous ooze, very pale brown, darker spots	1
2.5Y 7/4		94-139 cm: diatomaceous ooze, light yellowish brown (94-96 cm), dark brown (96-99 cm), pale yellow (99-139 cm)	
		106-170 cm: partly core deformation	
5Y 5/3		139-230 cm: diatomaceous mud, homogeneous, olive	
5Y 4/2		230-240 cm: diatomaceous mud, h	
5Y 5/3		240-440 cm: diatomaceous mud, o occur throughout, 290-306 cm: some thi black (S) 350-375 cm: alternati scatterer diatomax 386-387 cm: diatomax 395 cm: large burrow	
5Y 4/2		440-453 cm: diatomaceous mud, o	
2.5Y 5/2		453-486 cm: diatomaceous mud, gi 453-458 cm: some bu 474-478 cm: yellowish 480-483 cm: ash-rich 485-486 cm: olive (SY	

TOP  
↓  
BOTTOM



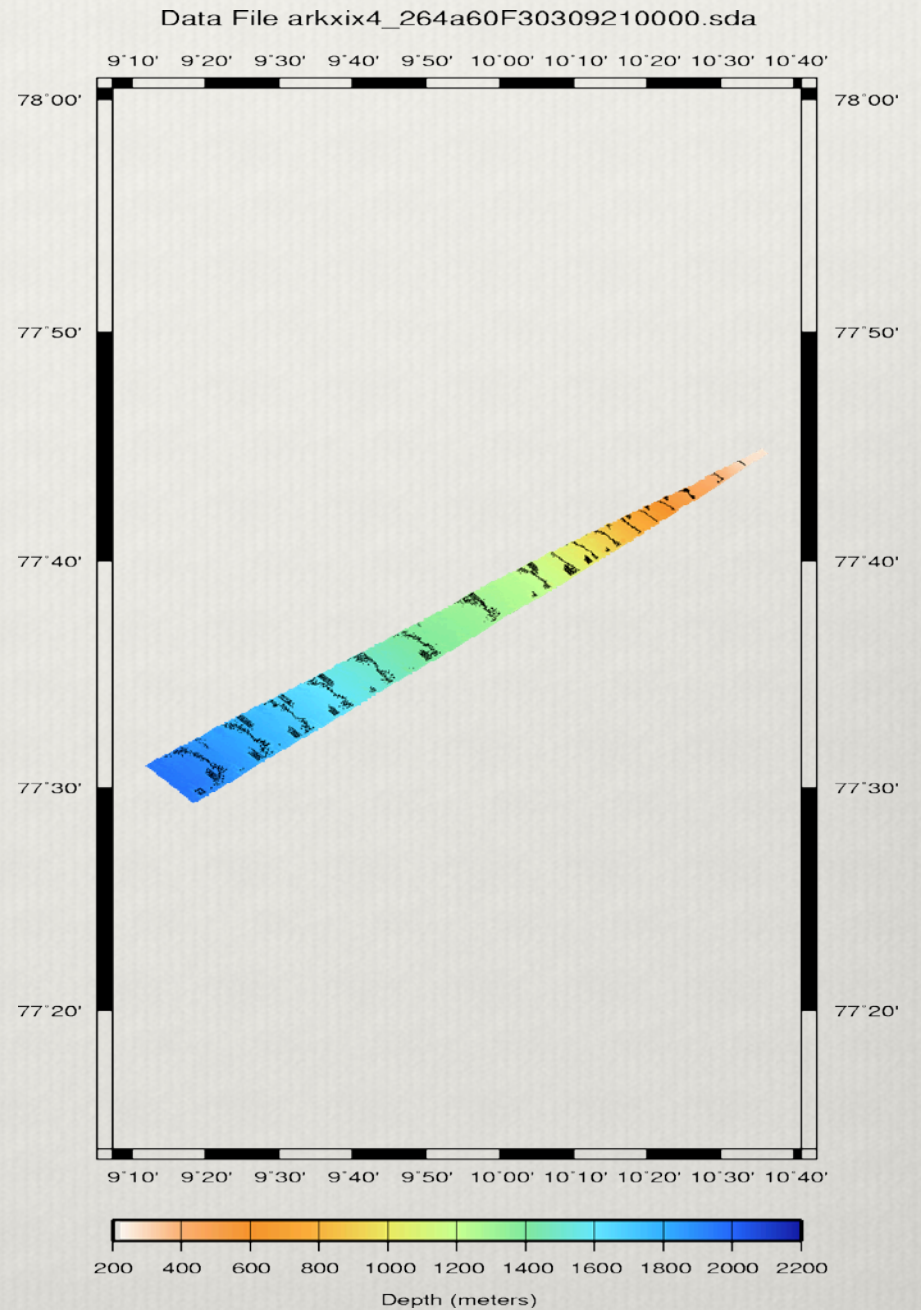
# Sediment core documentation



[doi:10.1594/PANGAEA.108079](https://doi.org/10.1594/PANGAEA.108079)

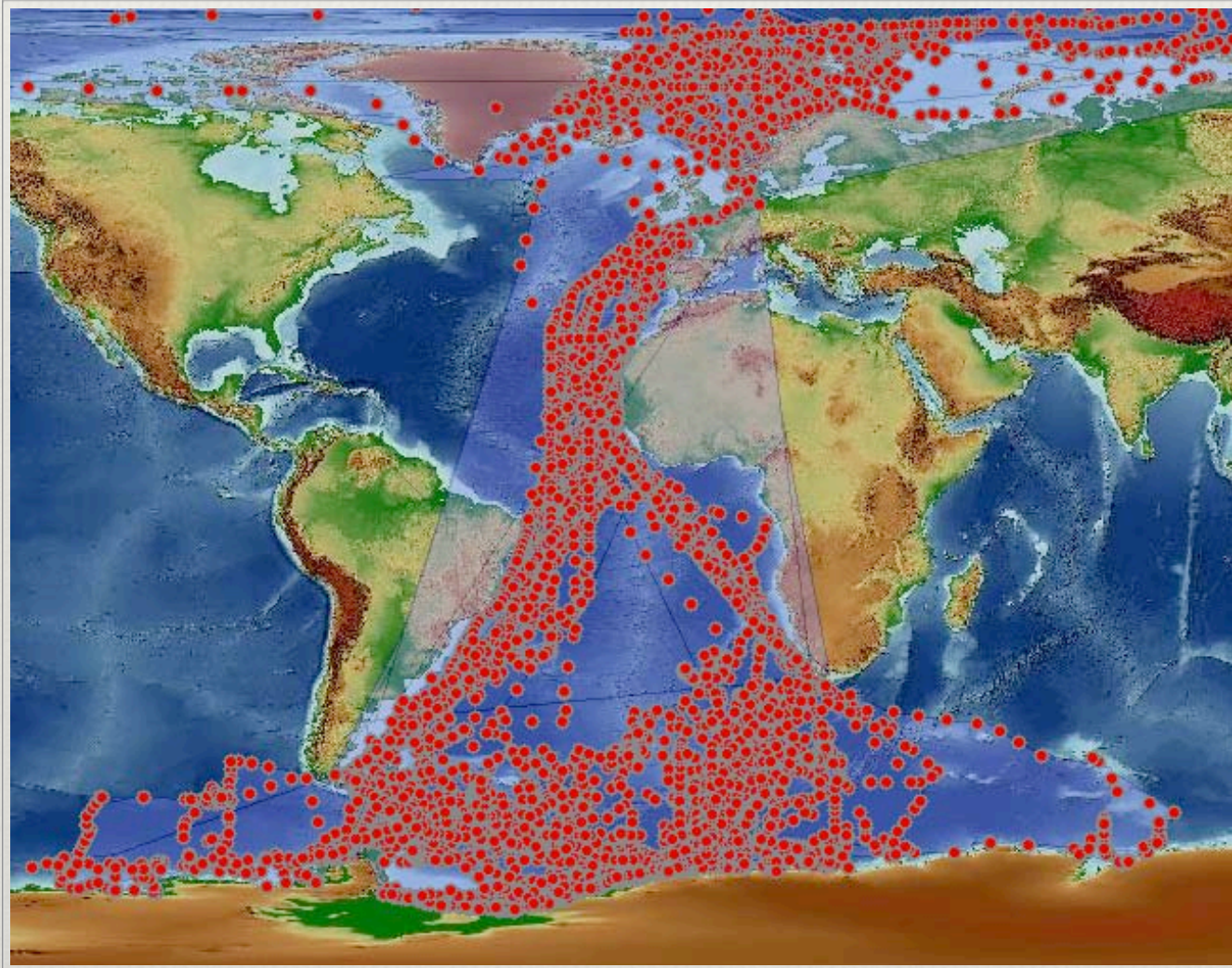


# Bathymetry



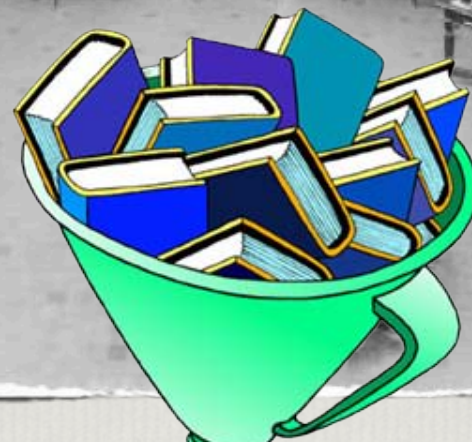
[doi:10.1594/PANGAEA.351142](https://doi.org/10.1594/PANGAEA.351142)

# Meteorological observations



[doi:10.1594/PANGAEA.269619](https://doi.org/10.1594/PANGAEA.269619)



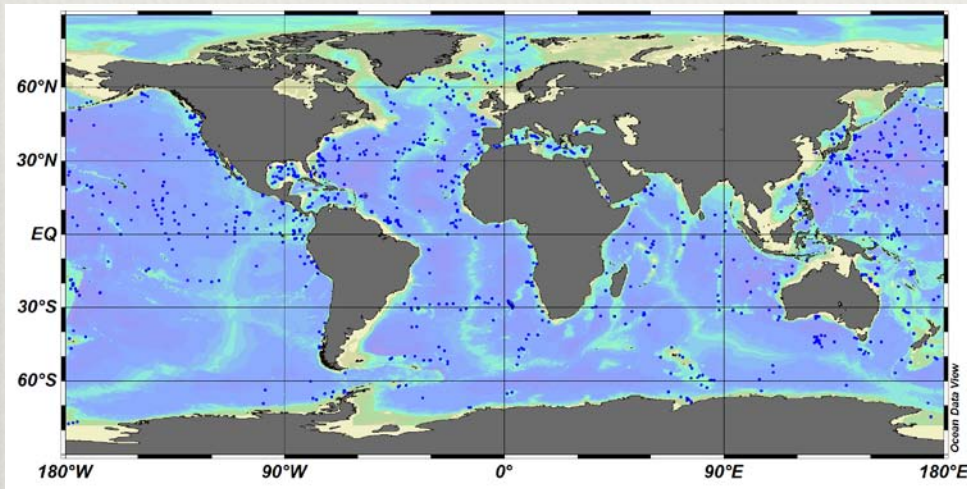


**Data**

**Archeology**

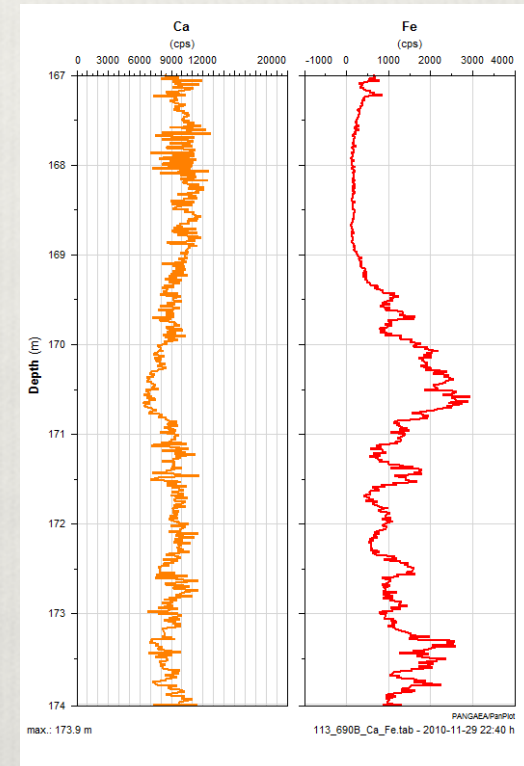


# DSDP and ODP



The PANGAEA web server operates the Mirror Site for the Ocean Drilling Program (ODP) in Europe.

<http://odp.pangaea.de>

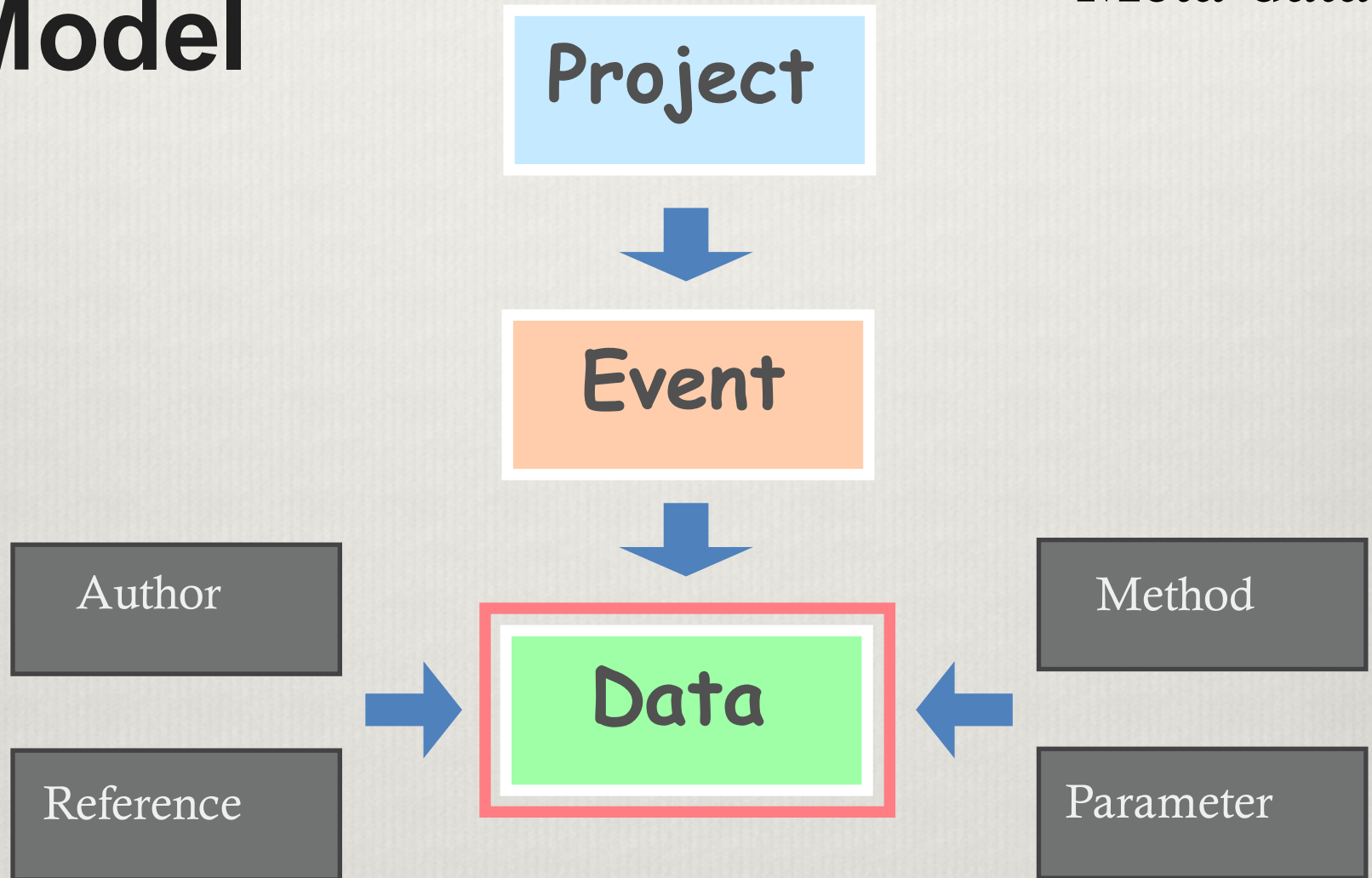


Röhl et al. 2000

[doi:10.1594/PANGAEA.57539](https://doi.org/10.1594/PANGAEA.57539)

# Data Model

Meta-data



# Geo-code & meta-data

*when ?*



date/time or age

*what ?*



parameter [unit]

*how ?*



method

*where ?*



latitude  
longitude

123.4

text



ice, water, air,  
sediment, object...

*who ?*



investigator  
reference

!

*... no data without metadata*

*no metadata without data ...*

!

# Empty archives

Most researchers agree that open access to data is the scientific ideal, so what is stopping it happening? **Bryn Nelson** investigates why many researchers choose not to share.



In 2003, the University of Rochester in New York launched a digital archive designed to preserve and share dissertations, preprints, working papers, photographs, music scores — just about any kind of digital data the university's investigators could produce. Six months of research and marketing had convinced the university that a publicly accessible online archive would be well received. At the time of the launch, the university librarians were worried that a flood of uploaded data might swamp the available storage space.

Six years later, the US\$200,000 repository lies mostly empty.

or didn't understand how to use the archive, or lamented that they just didn't have any more hours left in the day to spend on this business.

As Gibbons and anthropologist Nancy Fried Foster observed in their 2005 postmortem<sup>1</sup>, "The phrase 'if you build it, they will come' does not yet apply to IRs [institutional repositories]."

A similar reality check has greeted other data-sharing efforts. Most researchers happily embrace the idea of sharing. It opens up observations to independent scrutiny, fosters

data. Physicists, mathematicians and computer scientists use arXiv.org, operated by Cornell University in Ithaca, New York; the International Council for Science's World Data System holds data for fields such as geophysics and biodiversity; and molecular biologists use the Protein Data Bank, GenBank and dozens of other sites. The astronomy community has the International Virtual Observatory Alliance, geo-

scientists and environmental researchers have Germany's Publishing Network for Geoscientific & Environmental Data (PANGAEA),

**"We got the software up and running and said 'Give us your stuff'. That's**

# Workflow in data publishing

- Provision of data (PI)
- Import to PANGAEA (curator)
- Proof-Read (PI)
- ↕
- Corrections (curator/editor)
- Peer review (reviewer ?)
- Publication with DOI & citation

**Editorial**

**Review**

# Keep in mind:

Submit your data to PANGAEA **before** your manuscript is in press

Reference in the paper to your data by doi:

*For supplementary data see doi:10.1594/PANGAEA.472241*

Data can be pass-word protected until the paper is published

Data formats: Preferred format for data tables is TAB-delimited TEXT-files (ASCII), submitted as ZIP-archive, or excel-format

Curator for GLOMAR-related data is Lydia Gerullis

See also: [http://wiki.pangaea.de/wiki/Main\\_Page](http://wiki.pangaea.de/wiki/Main_Page)



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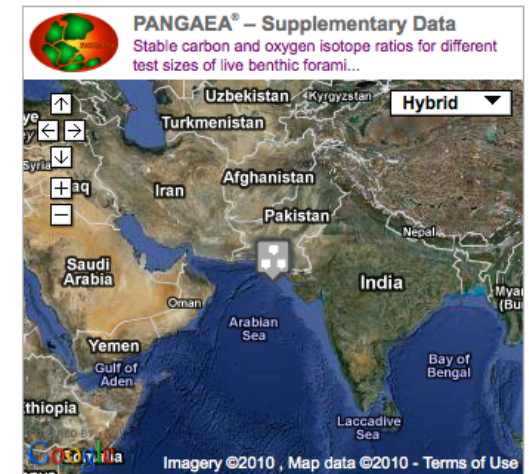
**Marine Micropaleontology**  
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Research paper

**Ontogenetic effects on stable carbon and oxygen isotopes in tests of live (Rose Bengal stained) benthic foraminifera from the Pakistan continental margin**

Stefanie Schumacher<sup>a, b, c</sup>, Frans J. Jorissen<sup>a, b</sup>, Andreas Mackensen<sup>c</sup>, Andrew J. Gooday<sup>d</sup> and Olivier Pays<sup>e</sup>



2010

- Schumacher, S., Jorissen, F.J., Mackensen, A., Gooday, A.J., Pays, O. (2010). Ontogenetic effects on stable carbon and oxygen isotopes in tests of live (Rose Bengal stained) benthic foraminifera from the Pakistan continental margin, *Marine Micropaleontology*, 76(3-4), 92-103., doi:10.1016/j.marmicro.2010.06.002 .  
Primary data: doi:10.1594/PANGAEA.707882



# Final take-home message

use Digital Object Identifier (DOI) or Handles (hdl)  
instead of URLs

PANGAEA datasets can be identified, shared, published  
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Examples