

Adding Value to Global-Change Data

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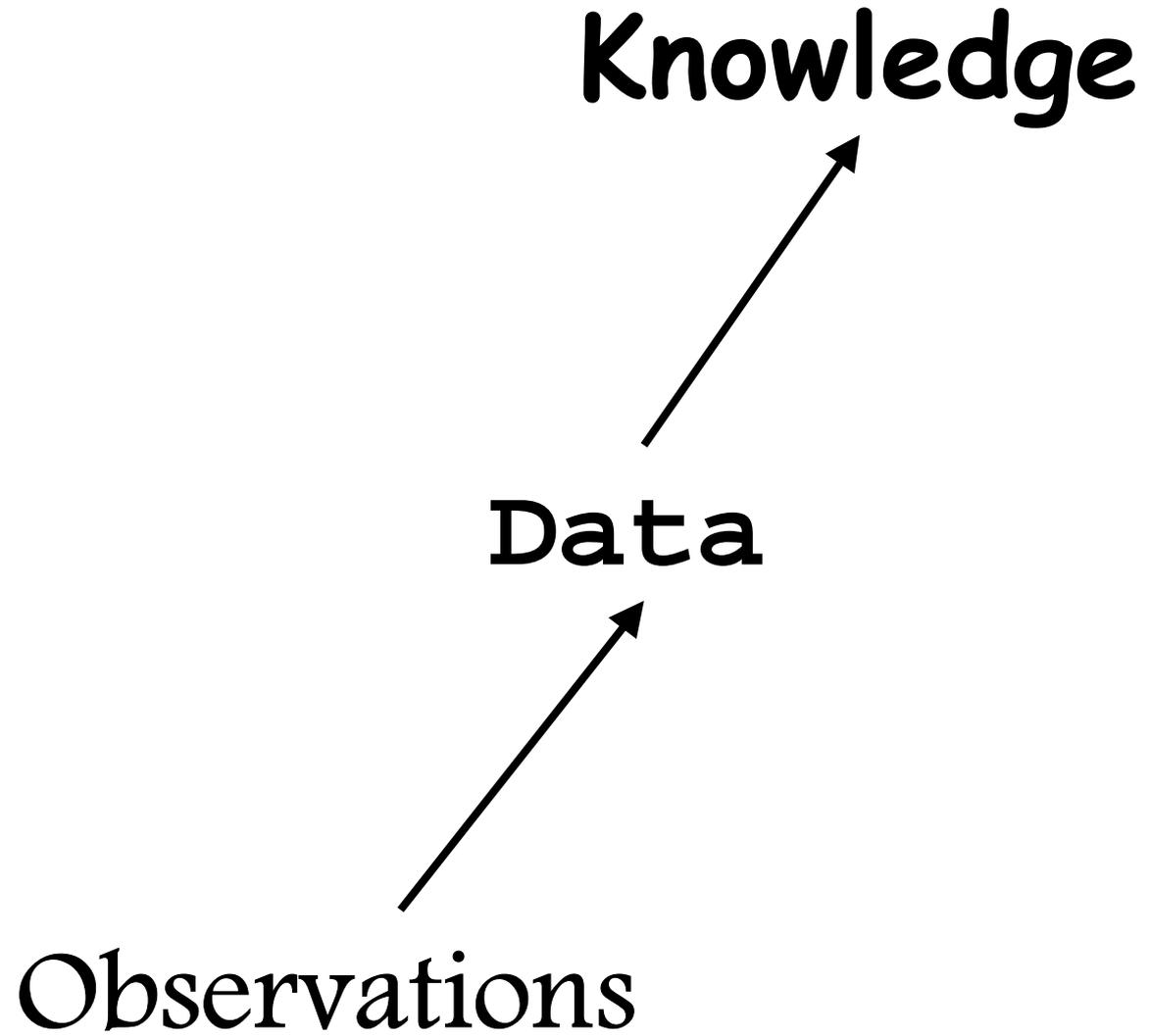


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or

Twenty Years of Lessons Learned

Value →





- Locating the data

“Where are the data I need?”

- Acquiring the data

“How quickly and inexpensively can I get the data?”

- Understanding and using the data

“Now that I have the data, what do they mean and how do I use them?”

Locating the data

- **How to identify the proper data archive(s)**
 - *data centers*
 - *other institutions - universities, etc.*
 - *individuals*
- **How to find specific data base(s) in the holdings of the archive(s)**
 - *online catalog*
 - *site search engine*
 - *hunt-and-peck browsing*
- **Dedicated systems (e.g., Global Change Data and Information System, NASA Global Change Master Directory)**
- **Web search tools (Google, Ask Jeeves, ...)**



Global Change Data and Information System

globalchange.gov - U.S. Global Change Data and Information System (GCDIS) - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address Go

GCDIS
Global Change Data
and Information System

Welcome to **globalchange.gov**

USGCRP
U.S. Global Change
Research Program

Gateway to Global Change Data

Home page New Datasets Data Policies Publications News Research Help

Find a Data Center Find a Dataset

Search by Discipline go Dataset Search Form

Agency Programs

- * ARM
- * CDIAC
- * DAACs
- * DTIC
- * EIA
- * EROS
- * FGDC
- * GCMD
- * LTER
- * NAL
- * NCAR
- * NOAA NEDI
- * NOAA NVDS
- * NOAA Server

Data Policies

- * DIWG Policies
- * Agency Data Policies
- * Comments

Full list of policy info...

Publications

- * Our Changing Planet for FY2002 **NEW**
- * NAST Report
- * Carbon Cycle Science Plan
- * National Assessment Plan

News and Opinions from the Wires

Freezing a moving target (Los Angeles Times)

globalchange.gov Update for 17 December 2001

- [Dept. of Energy ARM Program Releases IOP Data](#)
- [Possibility of Abrupt Climate Change Needs Research and Attention](#)
- [Satellite Data Help Researchers Track Carbon in Northern Hemisphere Forests](#)
- [Global Climate Observing System \(GCOS\) National Report Available](#)
- [OMB Releases Final Guidelines for Section 515](#)
- [Methane Explosion Warmed the Prehistoric Earth, Possible Again](#)
- [National Environmental Change Information System \(NECIS\)](#)
- [U.S. Climate Action Report Available for Comment](#)
- [U.S. Department of Defense Provides Access to Unclassified Technical Reports](#)
- [New NASA Satellite Sensor and Field Experiment Show Aerosols Cool the Surface but Warm the Atmosphere](#)
- [Latest News from the Wires](#)

Data and Information Working Group

- * DIWG Description
- * DIWG Policies

USGCRP Links

- * USGCRP
- * GCRIO
- * National Assessment
- * Carbon Cycle Science Program
- * Metadata Guidelines
- * Calls for Proposals

Ask Dr. Global Change

USGCRP
U.S. National Assessment
The Potential Consequences of Climate Variability and Change

Start WorkBugs' ... Cushman (... Eudora - [In] globalcha... NASA's Glo... Microsoft P... Internet 8:35 AM



Global Change Master Directory

NASA's Global Change Master Directory - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://gcmd.nasa.gov/> Go



Global Change Master Directory
a directory of Earth science data

[search tips] search

or search by topic keyword below:

Agriculture · Atmosphere · Biosphere
Human Dimensions · Hydrosphere
Land Surface · Oceans · Paleoclimate
Radiance/Imagery · Solid Earth
Snow and Ice · Sun-Earth Interactions

Data Centers · Location · Instruments · Platforms · Projects

or use another search option

[describe your data](#)

first time here?

what's new?

- New Release of the GCMD!
- Satellites capture the Australian fires!

user connection

directory resources

- data-related services
- learning center
- conference calendar
- Earth science links
- keywords
- subscription service

site map

home · search for data · describe your data

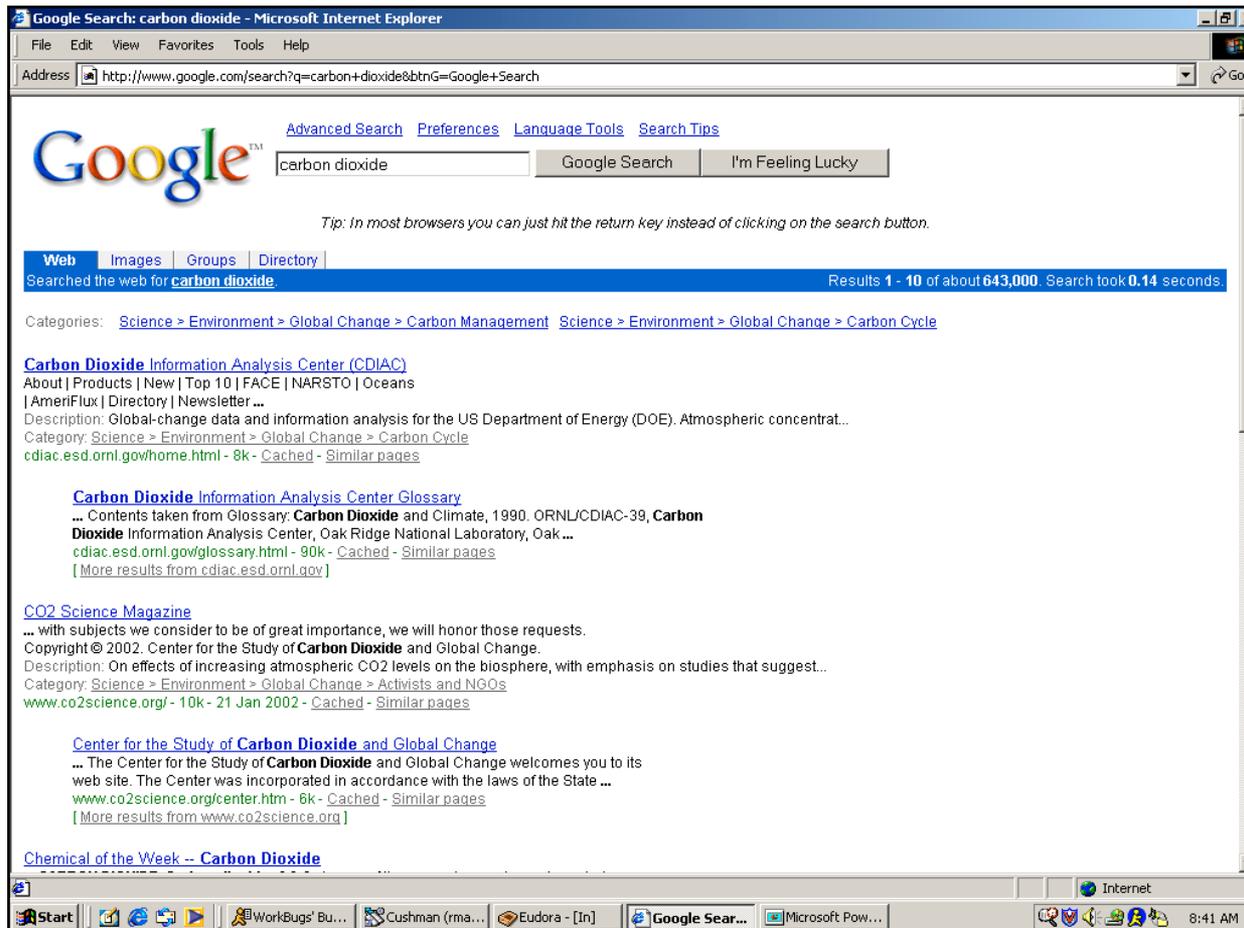
site search · first time here · what's new · user connection · directory resources

Responsible NASA Official: Lola Olsen, olsen@gcmd.nasa.gov
Contact [GCMD User Support](#) for assistance.
View [GCMD's privacy statement](#)

Start Internet 8:22 AM



Web search engines



Acquiring the data

- **“Traditional” (user writes/calls/faxes/emails, then data are shipped)**

- *magnetic tape*
- *diskette*
- *CD*

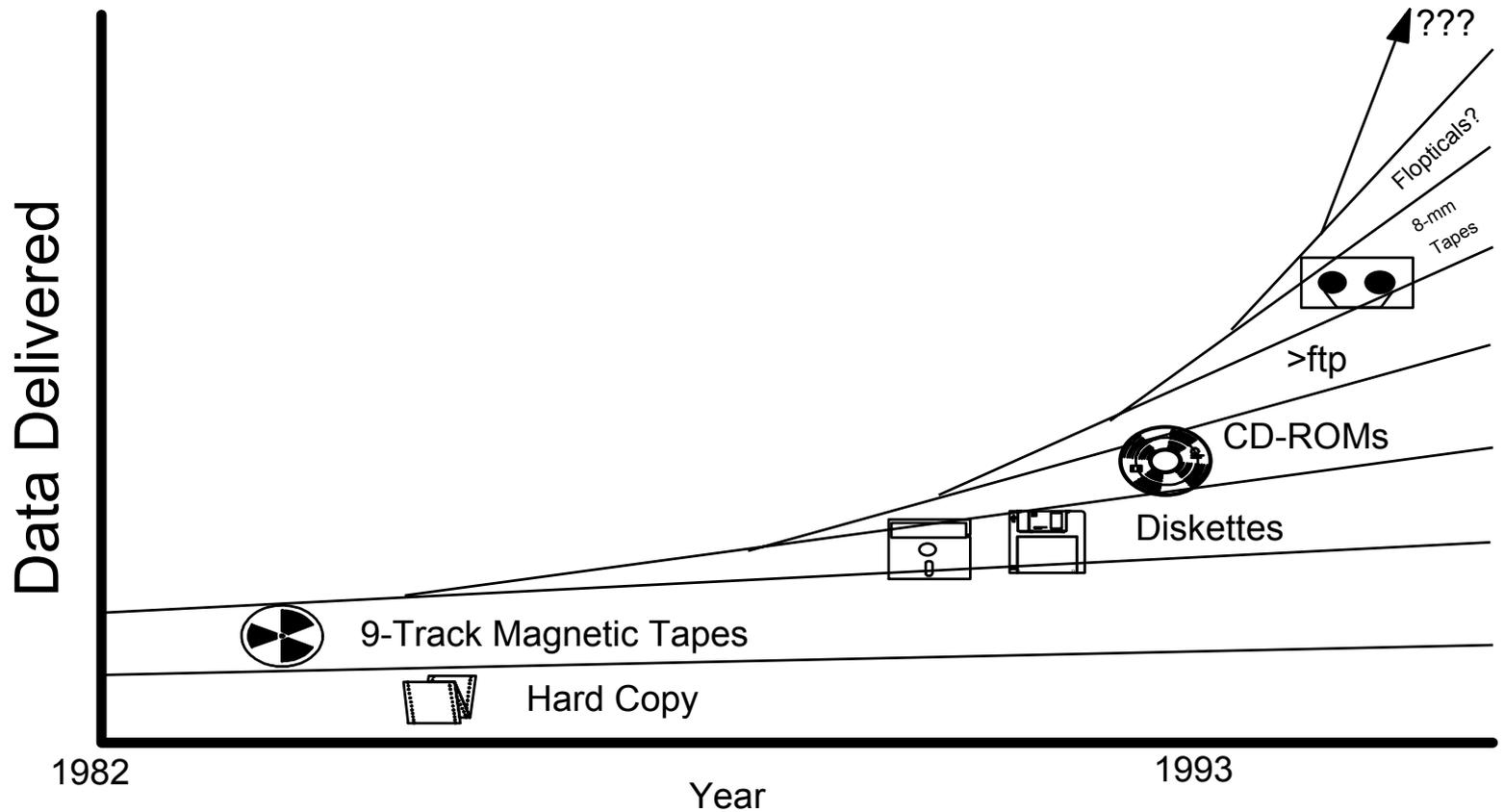
“You can’t beat the baud rate of Federal Express”

- **Online**

- *web page (“Save As...”)*
- *ftp*



Data distribution media: a pre-WWW view





Understanding and using the data

■ What do the data mean?

- *format*
- *variable names*
- *units*
- *missing-value indicators*
- *etc.*

Data contributor concerns



- **Convenience (i.e., no additional effort)**

- *typically, little or no funding for data management*
- *typically, no rewards for data management*

- **Intellectual property rights**

- *researchers like to see data publications with their names*
- *reluctance to release data to public before researchers have published*

Challenges for the data center

■ **Managing data**

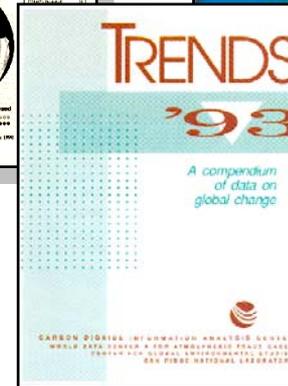
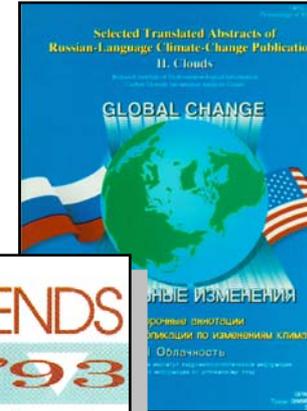
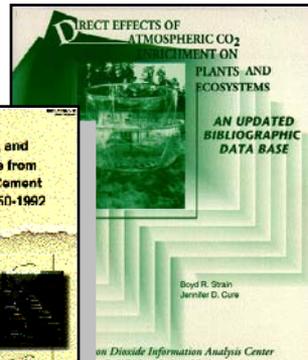
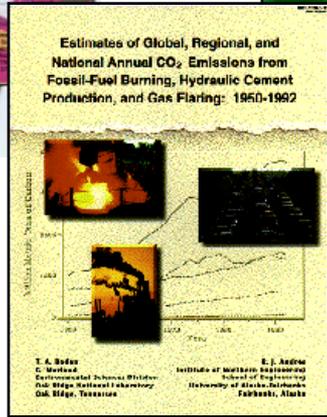
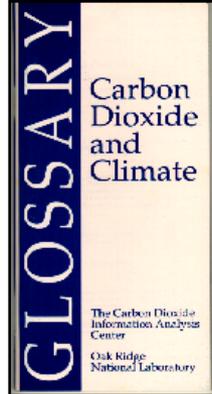
- *long-term archive*
 - *sufficient disk storage*
 - *periodic migrations to newer media*
 - *unique file names*
 - *catalogs*
- *up-to-date holdings*
 - *current*
 - *periodically revised as necessary*

■ **Satisfying needs of the users**

■ **Satisfying concerns of the data contributors**

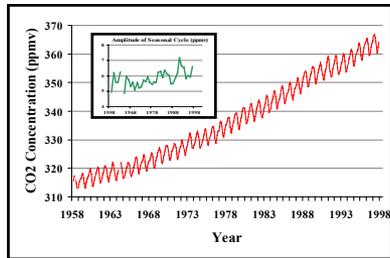


The Carbon Dioxide Information Analysis Center

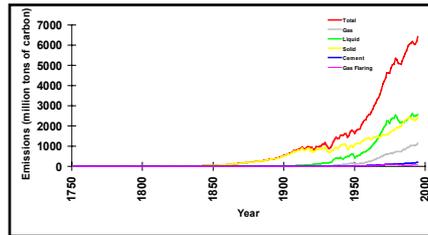


Providing a wide variety of data and information products to the global-change community since 1982, on behalf of the U.S. Department of Energy's Office of Biological and Environmental Research

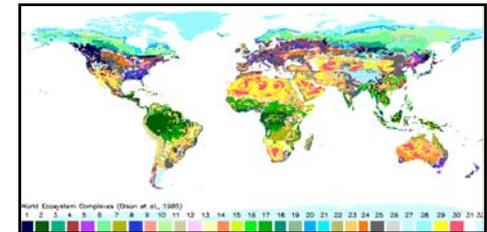
CDIAC's carbon cycle data



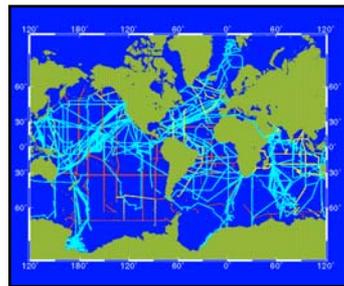
atmospheric CO₂



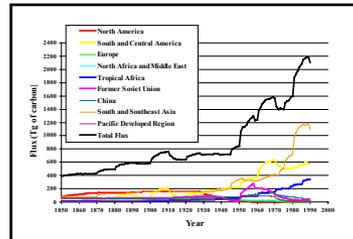
fossil-fuel CO₂ emissions



carbon in ecosystems



ocean carbon



land-use carbon fluxes



terrestrial-atmospheric carbon fluxes



vegetation response to elevated CO₂

Topics covered

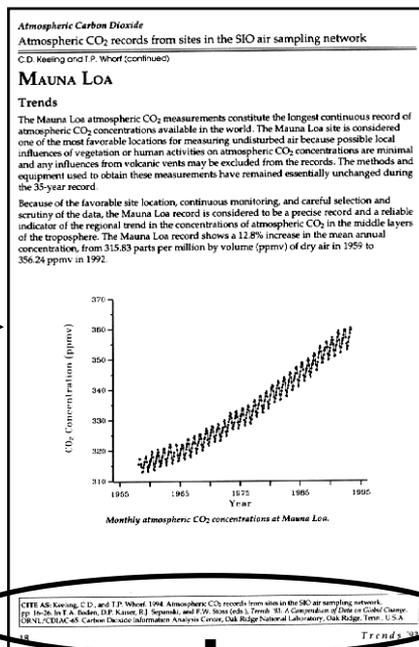
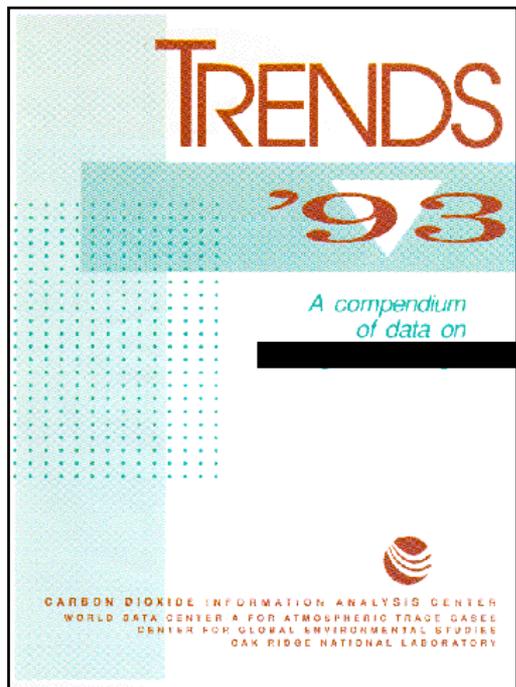
- 
- atmospheric trace gases (CO₂, methane, nitrous oxide, CFCs, and aerosols)
 - global carbon cycle
 - long-term climate records
 - coastal vulnerability to rising sea level
 - demographics
 - land use and ecosystems
 - oceanic trace gases
 - solar and atmospheric radiation
 - trace gas emissions
 - vegetation response to CO₂ and climate



CDIAC's philosophy

- **Unrestricted, free distribution of data products**
- **Serve all users, across the technological spectrum**
- **Credit the data contributors**
- **Be more than a “virtual data center” or “Web pointer”**
- **Enhance the usefulness of data through:**
 - *quality assurance*
 - *documentation - the “20-year” rule*
 - *integration*

Credit the data contributors



Why do this?

It's the right thing to do!

If we don't, PIs won't send data to us!

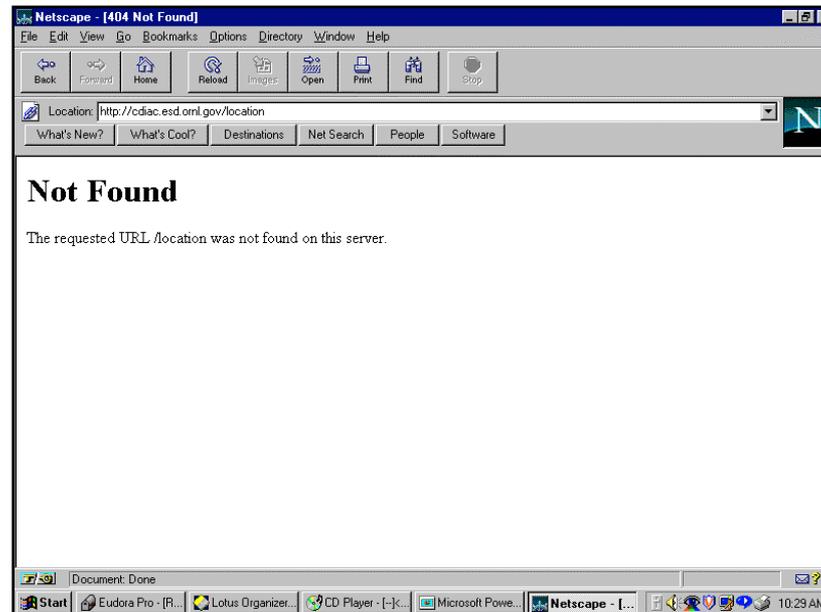
CITE AS: Keeling, C.D., and T.P. Whorf. 1994. Atmospheric CO₂ records from sites in the SIO air sampling network. pp. 16-26. In T.A. Boden, D.P. Kaiser, R.J. Sepanski, and F.W. Stoss (eds.), *Trends '93: A Compendium of Data on Global Change*. ORNL/CDIAC-65. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, Oak Ridge, Tenn., U.S.A.



Be more than a “virtual data center” or a “Web pointer”

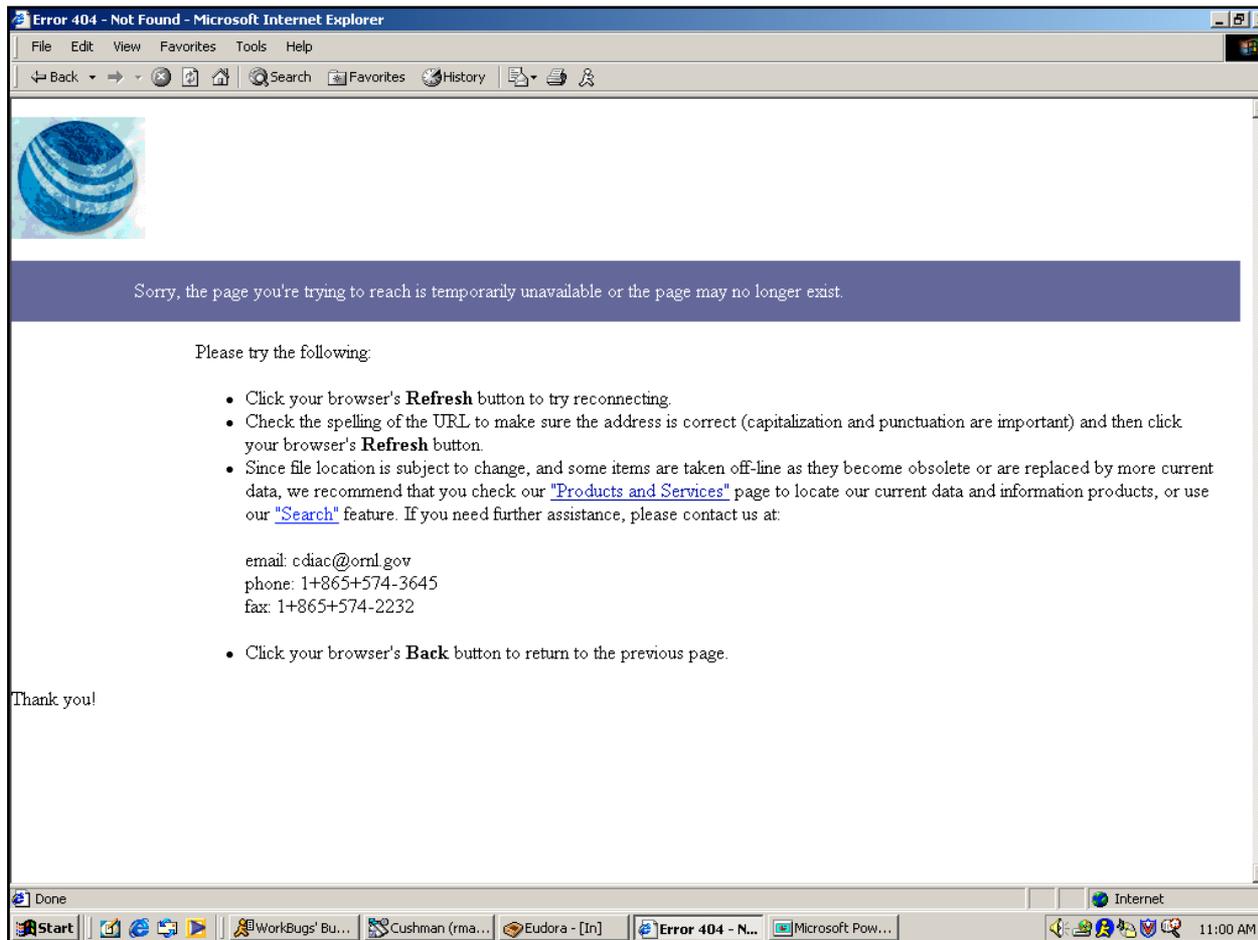
Who adds value to the data?

Who guarantees long-term archive?





“Sorry, the page you’re trying to reach...”





Enhancing the usefulness of data

■ quality assurance

- *assume that no data base arrives in perfect shape*
- *outliers, keypunch errors, unlikely combinations of values*

■ documentation - the “20-year” rule

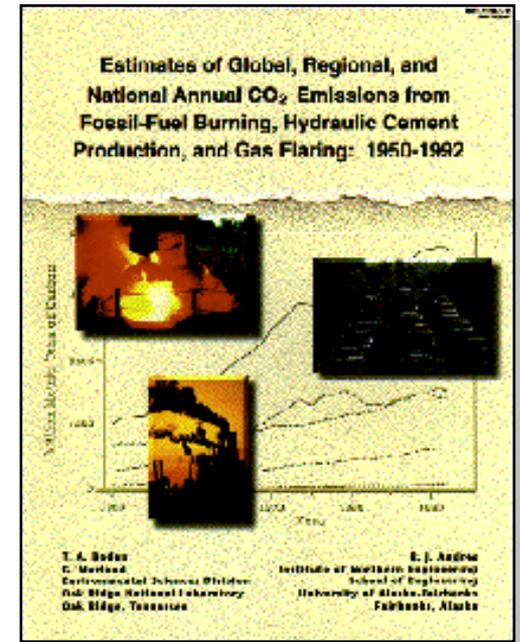
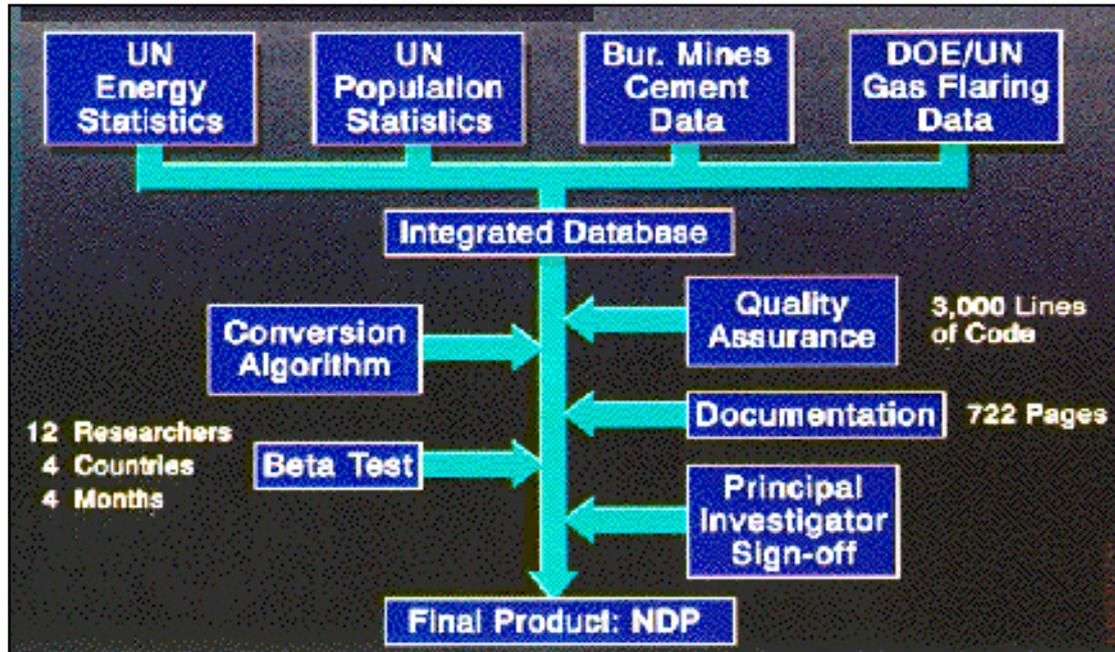
- *Can a user, especially one not an expert in the particular discipline of the data base, understand and use the data 20 years from now?*
 - *variable names, units, missing values versus zero*
 - *how the data were obtained*
 - *data reduction algorithms*
 - *appropriate applications for the data*

■ integration

- *bring together separate data bases, on a common basis, to meet the needs of the users*

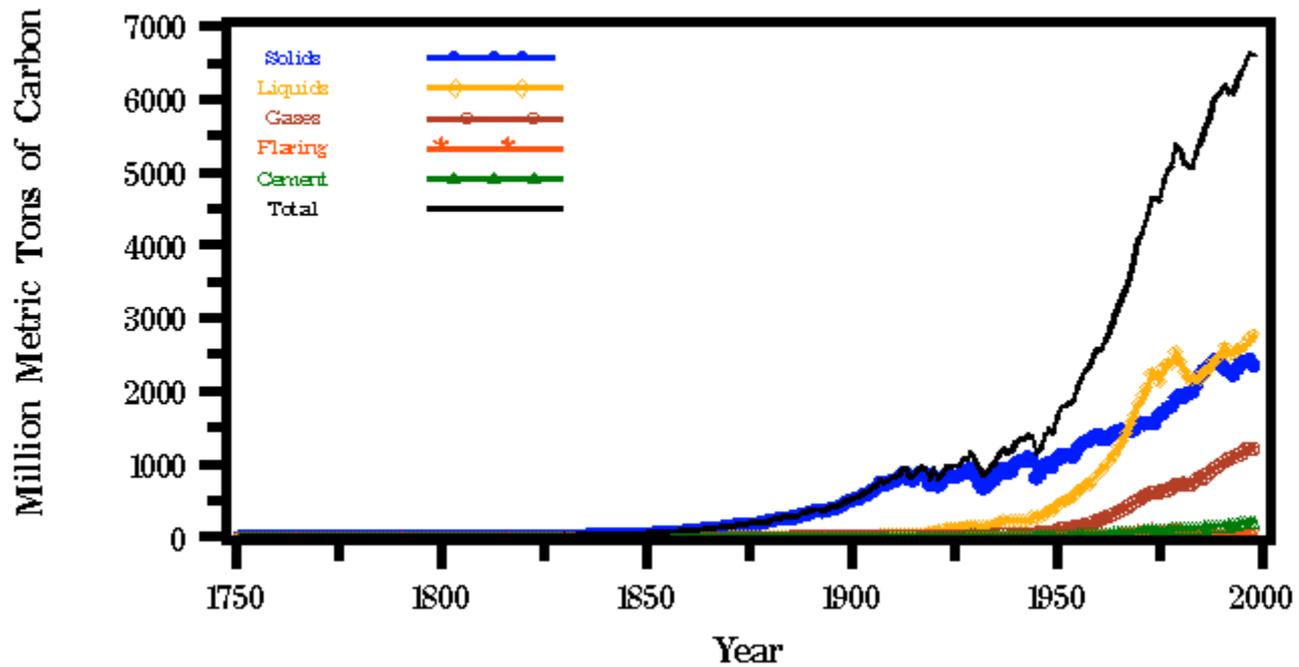


Development of CDIAC's global CO₂ emissions data base



Data on fossil-fuel production, gas flaring, cement manufacture, and population from a variety of sources were integrated into a single data base

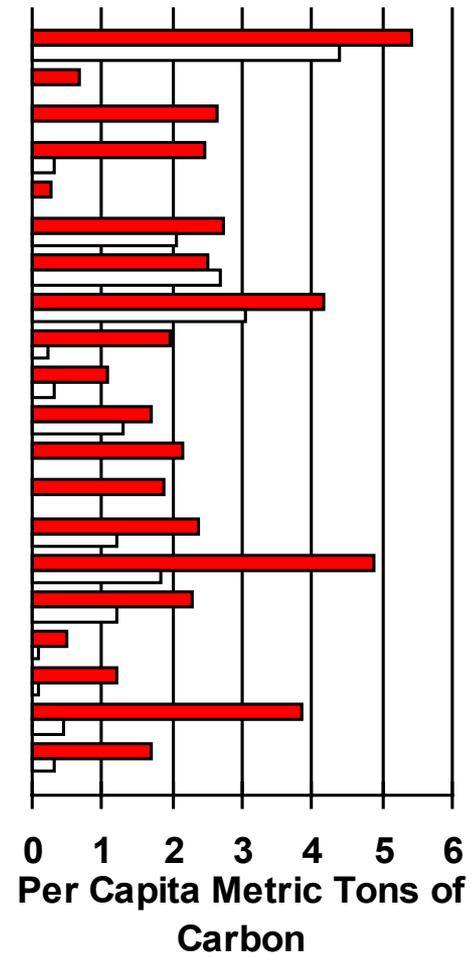
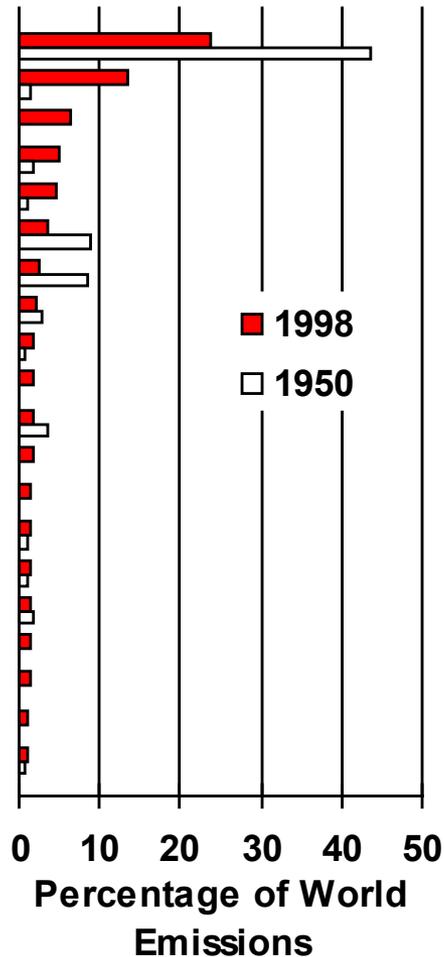
Global total CO₂ emissions from fossil fuels



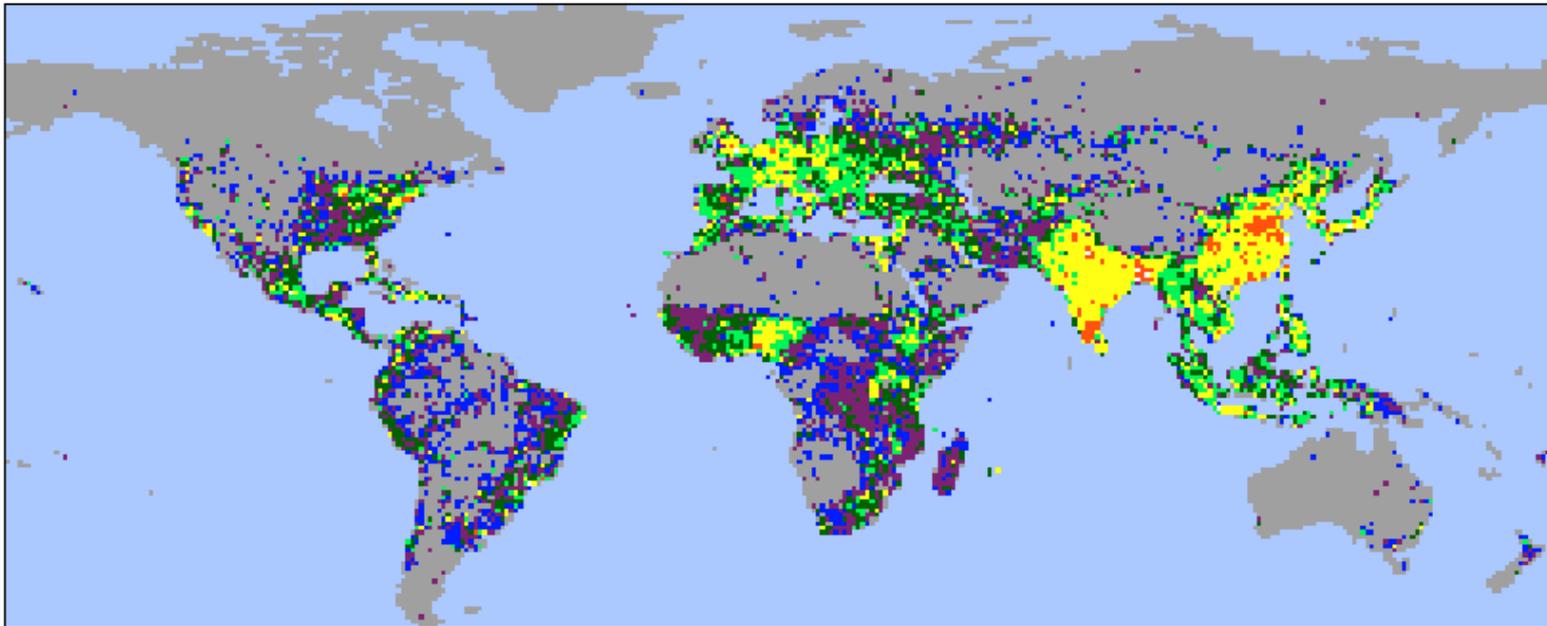
Top 20 (1998 total CO₂ emissions)



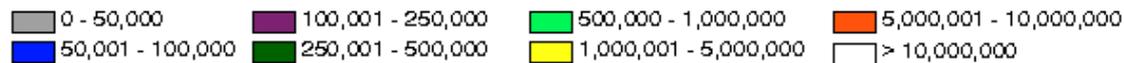
1998 Rank	Country	1950 Rank
(1)	USA	(1)
(2)	China	(9)
(3)	Russia	(FSU=2)
(4)	Japan	(8)
(5)	India	(12)
(6)	Germany	(3)
(7)	UK	(4)
(8)	Canada	(6)
(9)	Italy	(16)
(10)	Mexico	(19)
(11)	France	(5)
(12)	South Korea	(58)
(13)	Ukraine	(FSU=2)
(14)	South Africa	(13)
(15)	Australia	(14)
(16)	Poland	(7)
(17)	Brazil	(24)
(18)	Iran	(28)
(19)	Saudi Arabia	(47)
(20)	Spain	(18)



1990 gridded population

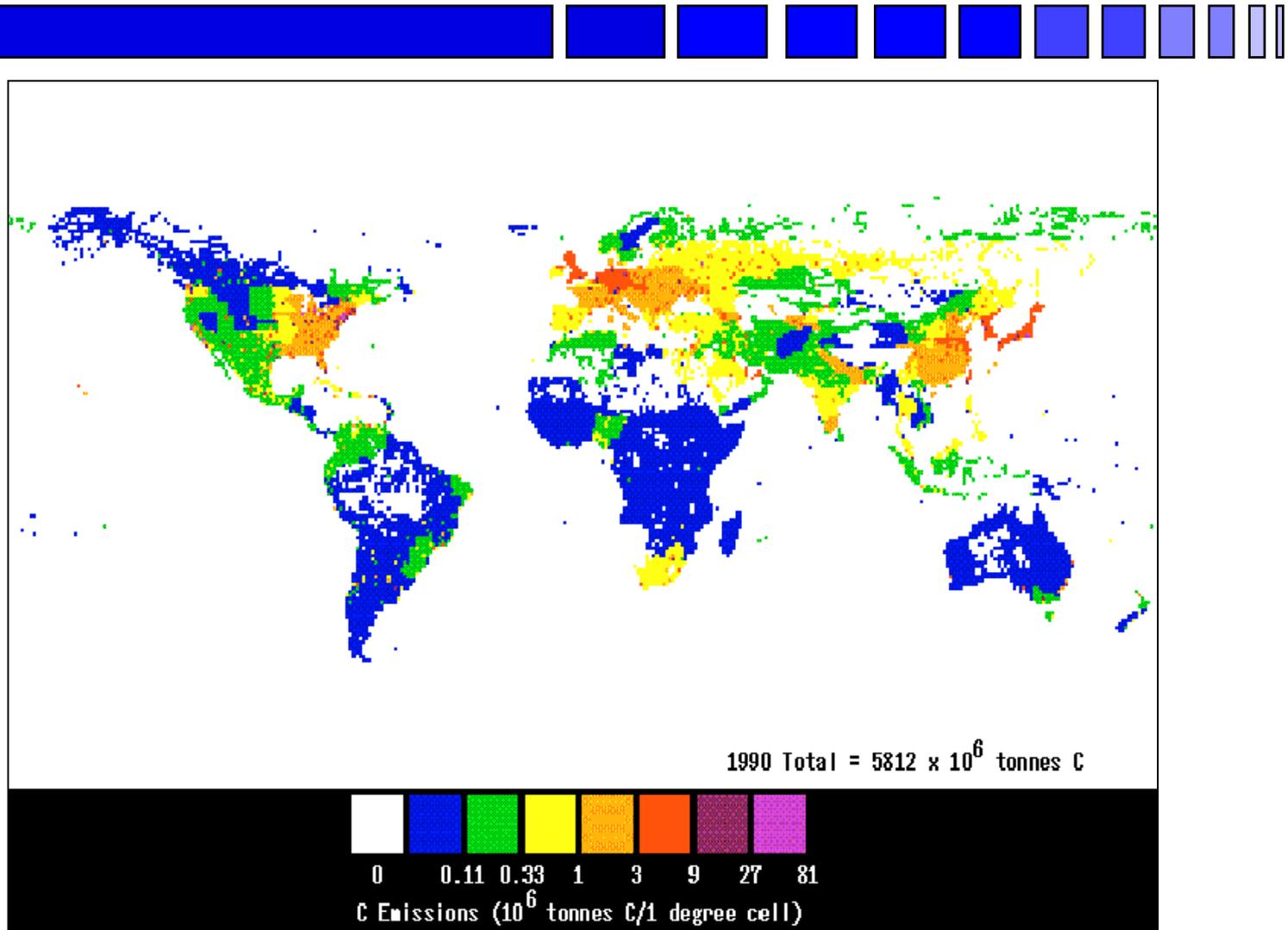


Population: Number of People per One Degree by One Degree Grid Cell

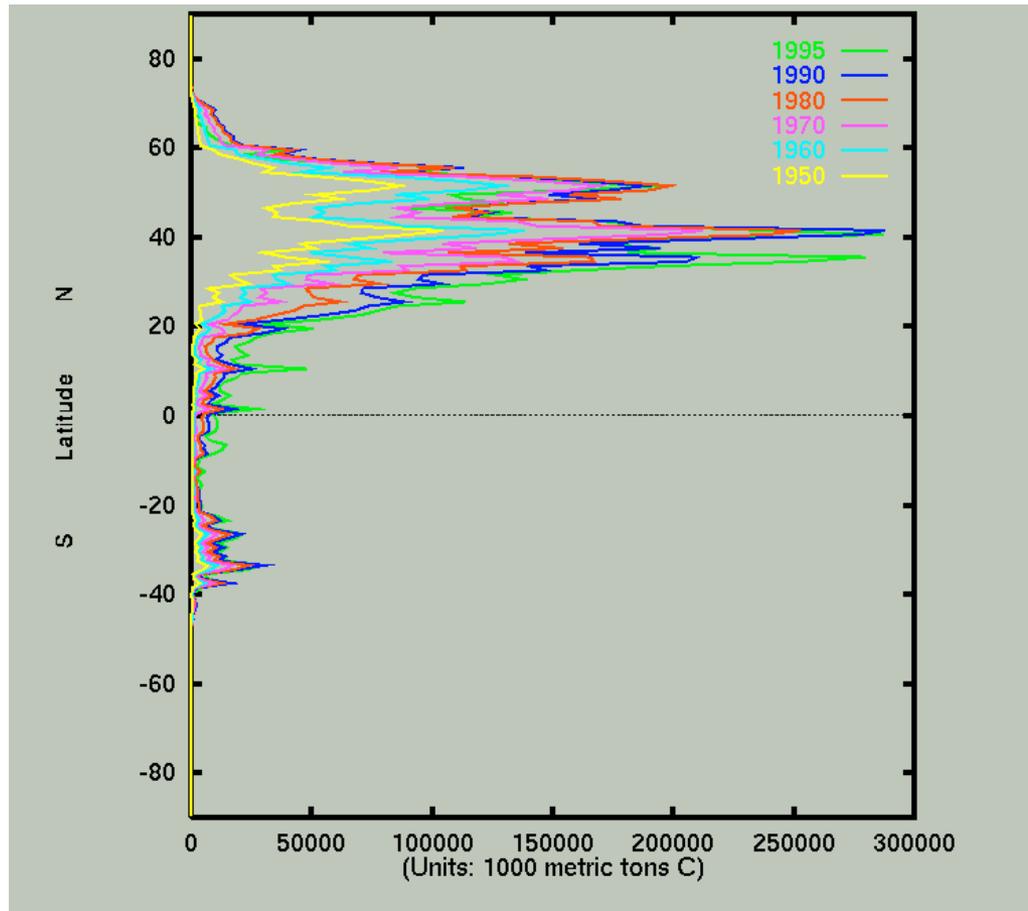


(data from Li, CDIAC DB1016)

Gridded global CO₂ emissions

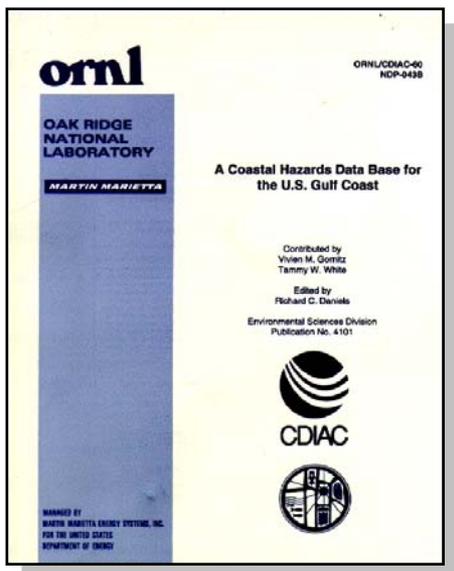
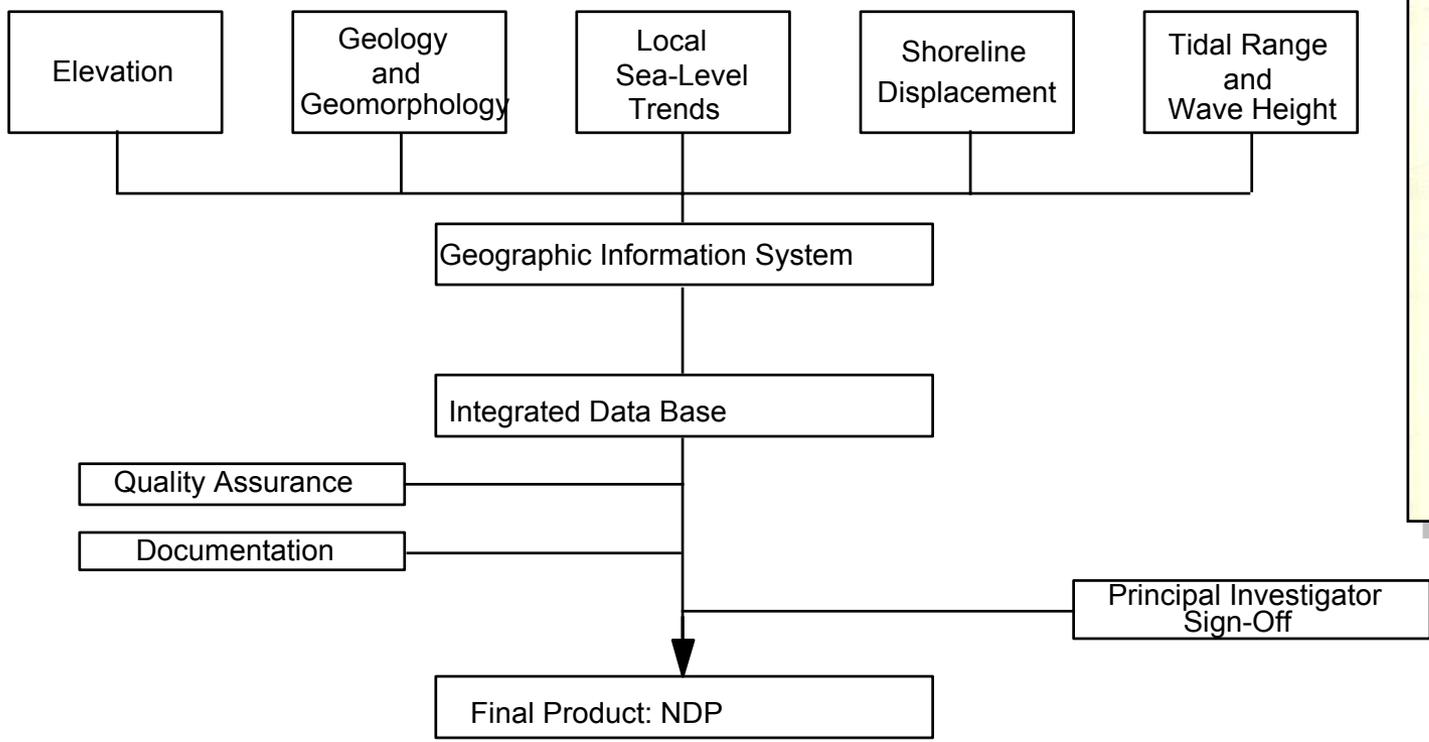


Latitudinal distribution of CO₂ emissions

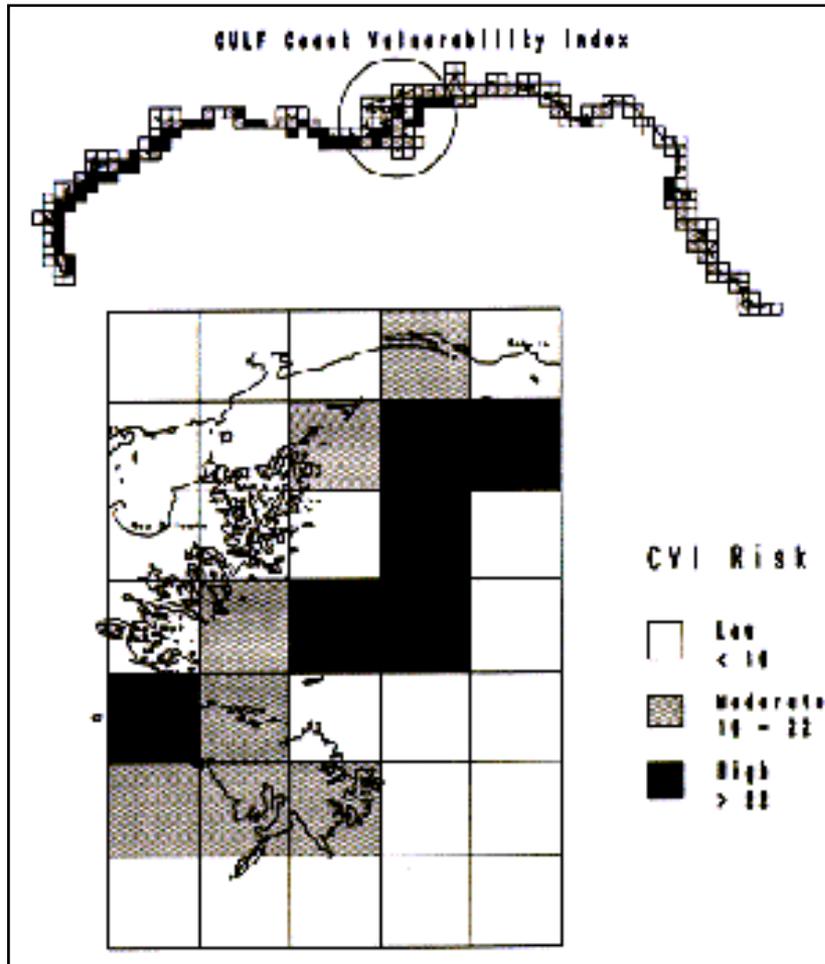




Coastal Hazards Data Base



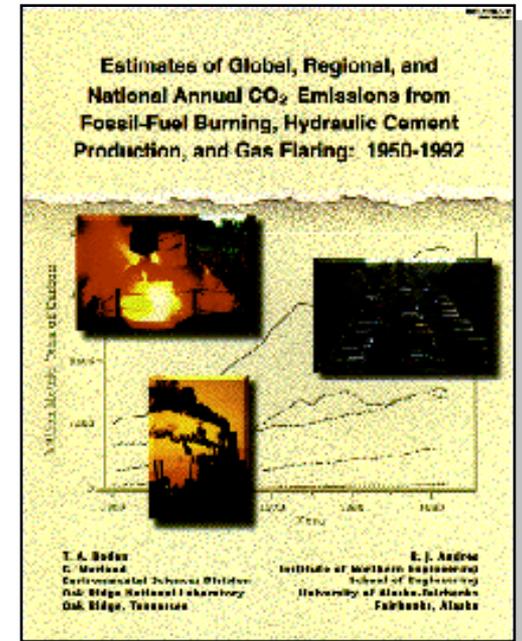
Assessment of coastal vulnerability



Use of Coastal Hazards Data Base and Coastal Vulnerability Index (CVI) to identify areas in Mississippi Delta at risk from rising sea level

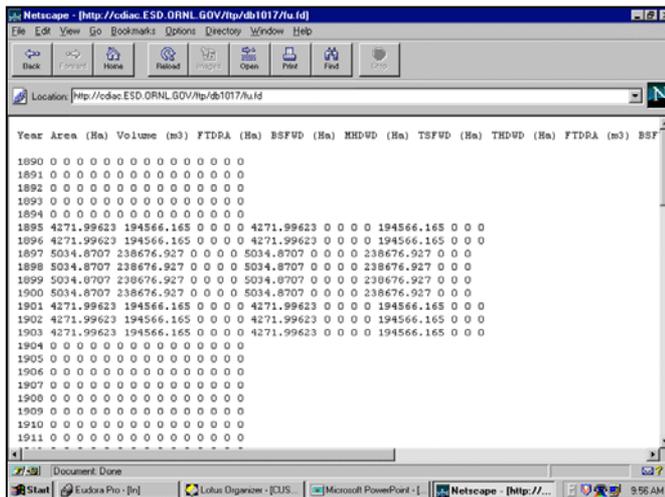
Contents of a typical Numeric Data Package

- name/affiliation of contributors
- ASCII data files (ARC/INFO export files or spreadsheet files where appropriate)
- SAS and FORTRAN data retrieval programs
- methodology (e.g., sampling, calibration)
- applications and limitations
- description of CDIAC's quality assurance checks
- partial data listings, integrity checks for data transport
- full reprints of pertinent literature

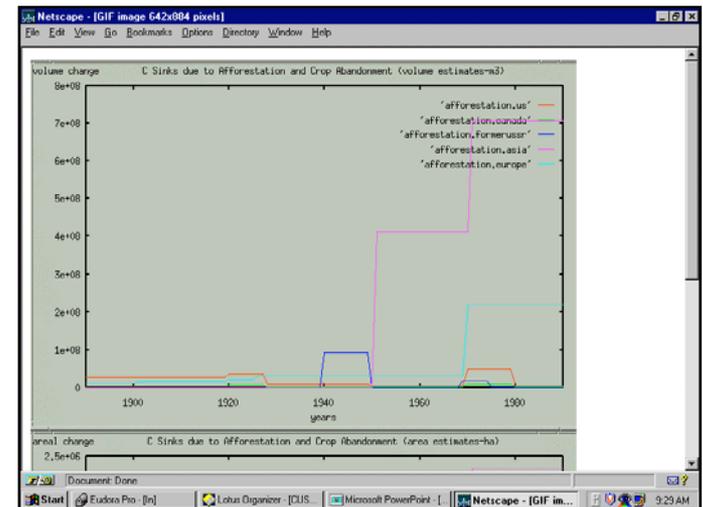


Contents of a typical online data base

- name/affiliation of contributors
- ASCII data files
- graphics
- readme file



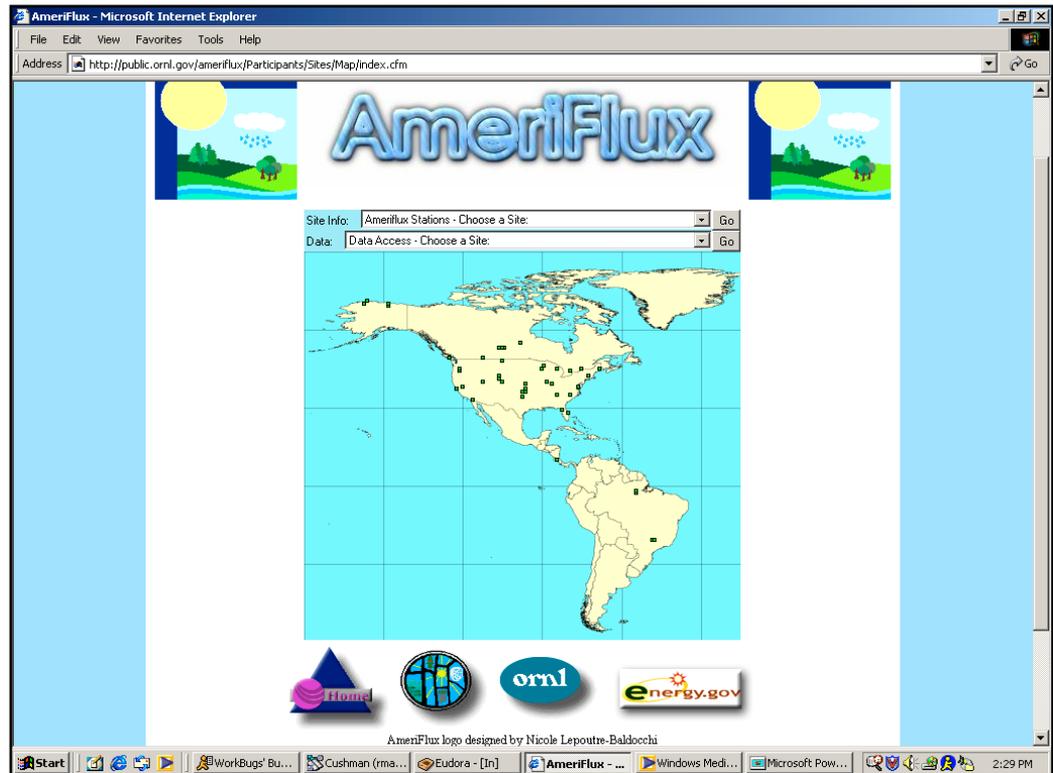
Year	Area (Ha)	Volume (m3)	FTDR (Ha)	BSFVD (Ha)	MHDVD (Ha)	TSFVD (Ha)	THDVD (Ha)	FTDR (m3)	BSF
1890	0	0	0	0	0	0	0	0	0
1891	0	0	0	0	0	0	0	0	0
1892	0	0	0	0	0	0	0	0	0
1893	0	0	0	0	0	0	0	0	0
1894	0	0	0	0	0	0	0	0	0
1895	4271.99623	194566.165	0	0	4271.99623	0	0	194566.165	0
1896	4271.99623	194566.165	0	0	4271.99623	0	0	194566.165	0
1897	5034.8707	238676.927	0	0	5034.8707	0	0	238676.927	0
1898	5034.8707	238676.927	0	0	5034.8707	0	0	238676.927	0
1899	5034.8707	238676.927	0	0	5034.8707	0	0	238676.927	0
1900	5034.8707	238676.927	0	0	5034.8707	0	0	238676.927	0
1901	4271.99623	194566.165	0	0	4271.99623	0	0	194566.165	0
1902	4271.99623	194566.165	0	0	4271.99623	0	0	194566.165	0
1903	4271.99623	194566.165	0	0	4271.99623	0	0	194566.165	0
1904	0	0	0	0	0	0	0	0	0
1905	0	0	0	0	0	0	0	0	0
1906	0	0	0	0	0	0	0	0	0
1907	0	0	0	0	0	0	0	0	0
1908	0	0	0	0	0	0	0	0	0
1909	0	0	0	0	0	0	0	0	0
1910	0	0	0	0	0	0	0	0	0
1911	0	0	0	0	0	0	0	0	0





AmeriFlux: A dynamic, online database

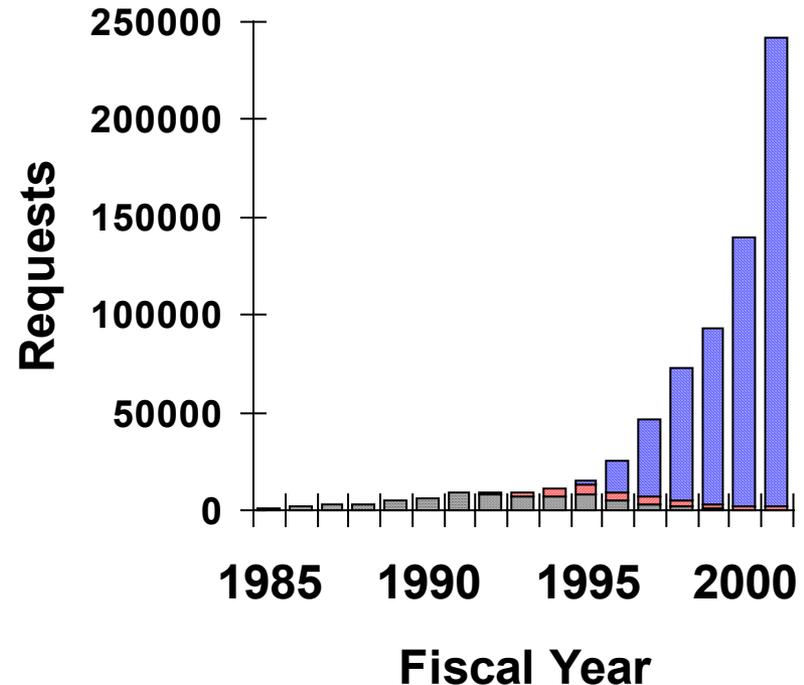
*Providing access to data
on biosphere-atmosphere
CO₂ flux measurements
in the Americas*





Request statistics

Since 1992, an increasing number of requests have been handled by means of the Internet (ftp and World-Wide Web)

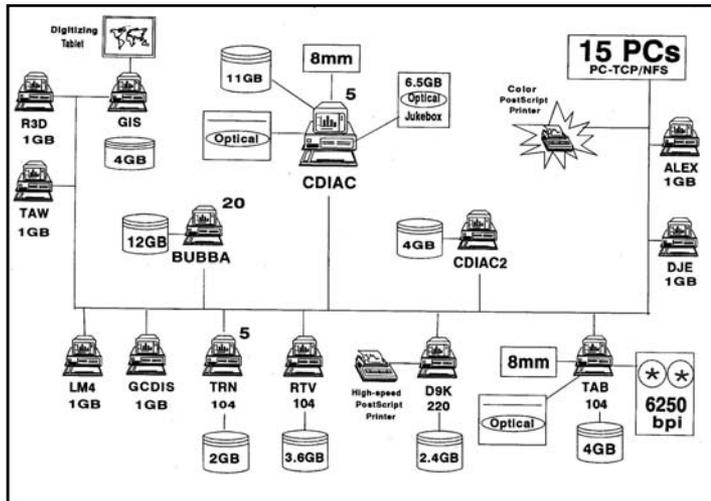


700,000 requests since FY85!

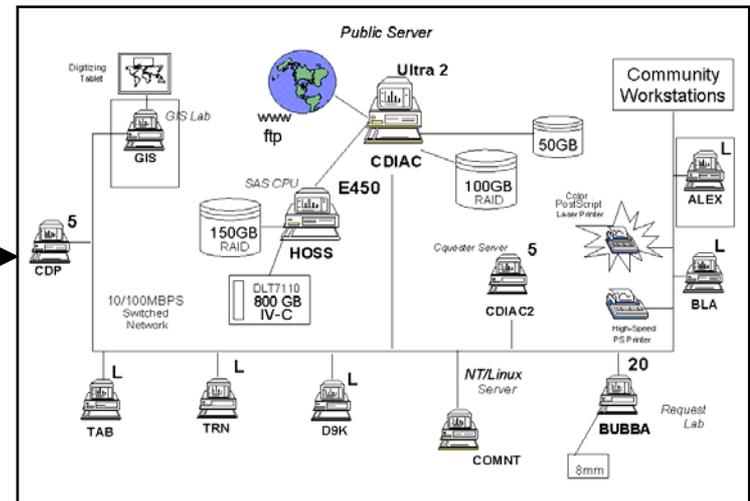


Technology upgrades & media migrations

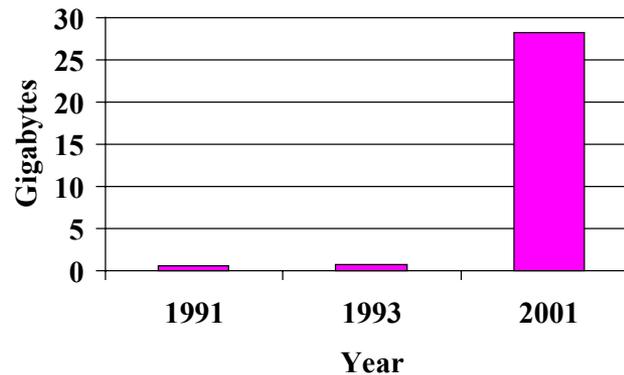
1993

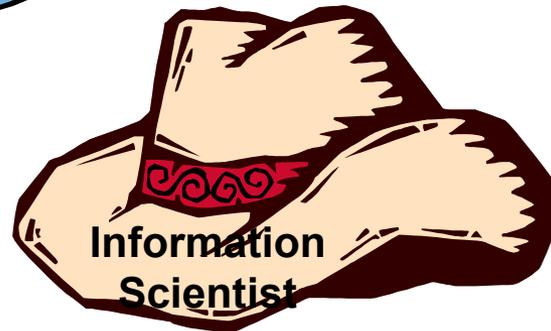
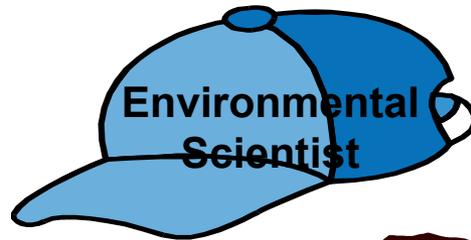
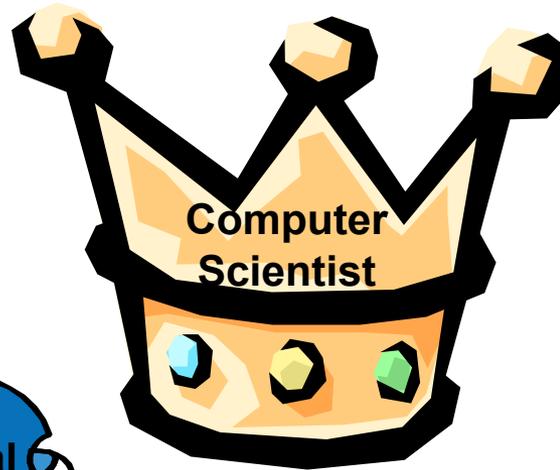


2001



Data product volume







CDIAC's World-Wide-Web Home Page



<http://cdiac.ornl.gov>