

Surface Ocean CO₂ Atlas -a showcase for transparent data management and international collaboration

Benjamin Pfeil, Are Olsen, Dorothee Bakker, Steven Hankin, Kevin O'Brien, Karl Smith, Alex Kozyr, Christopher Sabine, Maciej Telszewski, Michael Diepenbroek and the SOCAT group

University of Bergen/Bjerknes Centre for Climate Research,
Bergen, Norway



IMDIS, LUCCA, Italy, 25.09.2013



Motivation

- Science has changed!
- need to work more interdisciplinary
- Within climate change research, data availability, reproducibility of results and transparency is one of the key issues!



Benjamin Pfeil – Project Data Manager
Maciej Telszewski - Project Director

Towards a sustained global ocean observing network for marine biogeochemistry



Institute of Oceanology of Polish Academy of Sciences, ul. Powstańców Warszawy 55, 81-712 Sopot, Poland
Phone: +48 58 731 16 10 / Fax: +48 58 551 21 30, www.ioccp.org

IOCCP SSG 2011-13

Chair

Toste Tanhua (Germany)

Underway pCO₂:

Ute Schuster (UK)

Surface CO₂ Data:

Are Olsen (Norway)

Repeat Hydrography:

Bernadette Sloyan (Australia)

Ocean Interior Data:

Masao Ishii (Japan)

Time Series Networks:

Laura Lorenzoni (US)

Instruments and Sensors:

Todd Martz (US)

Data Management:

Alex Kozyr (US)

Benjamin Pfeil (Norway)

Nutrients

Michio Aoyama (Japan)

Ocean Acidification

Richard Feely (USA)

SOLAS/IMBER:

Andrew Lenton (Australia)

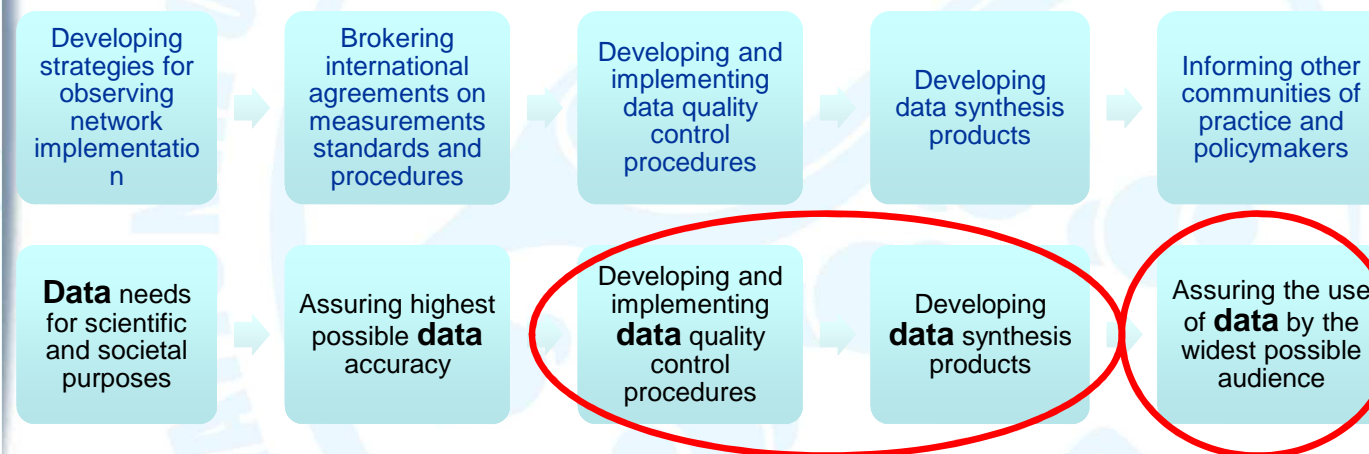
Niki Gruber (Switzerland)

Project Director:

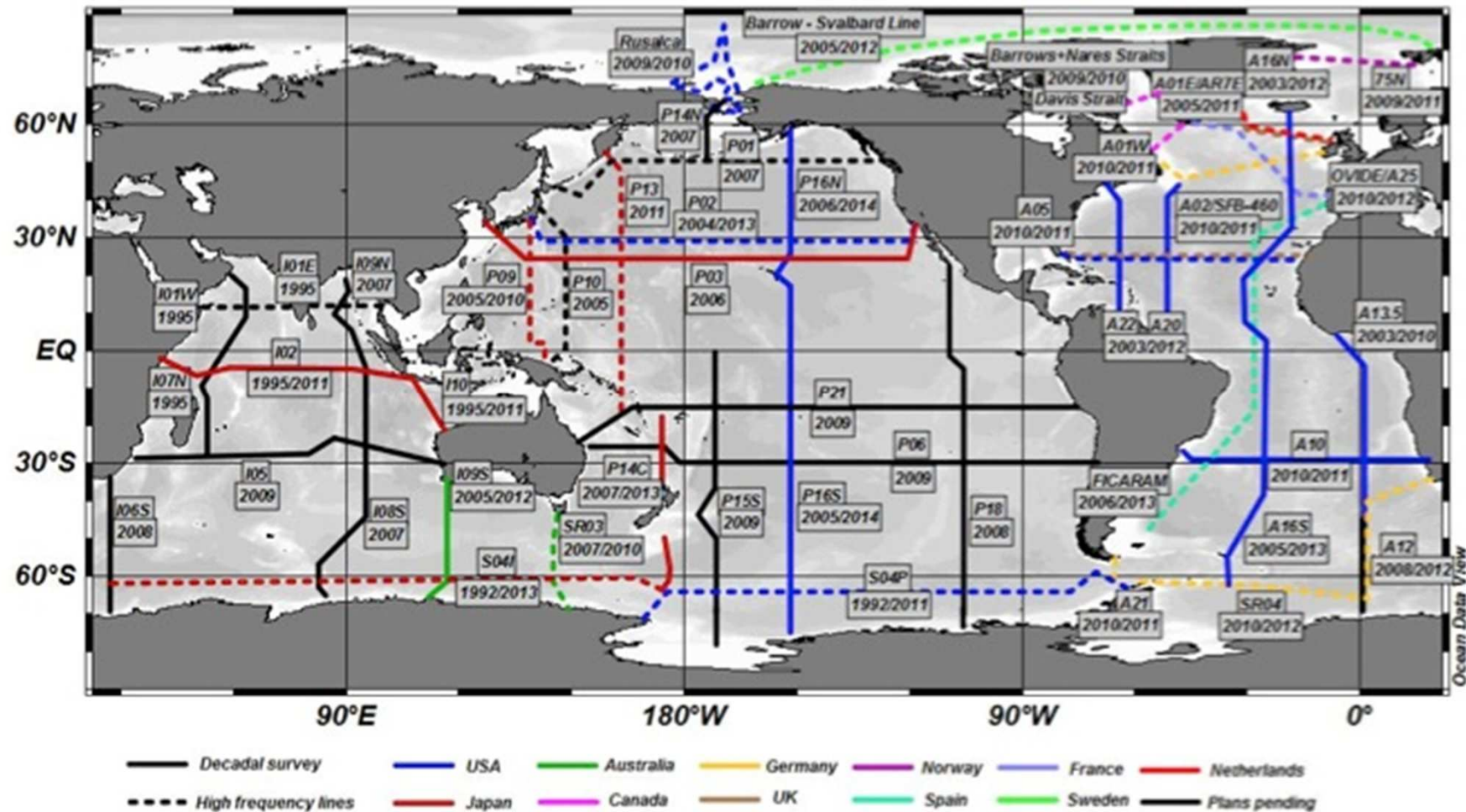
Maciej Telszewski (Poland)

IOCCP Mission and Field of Expertize

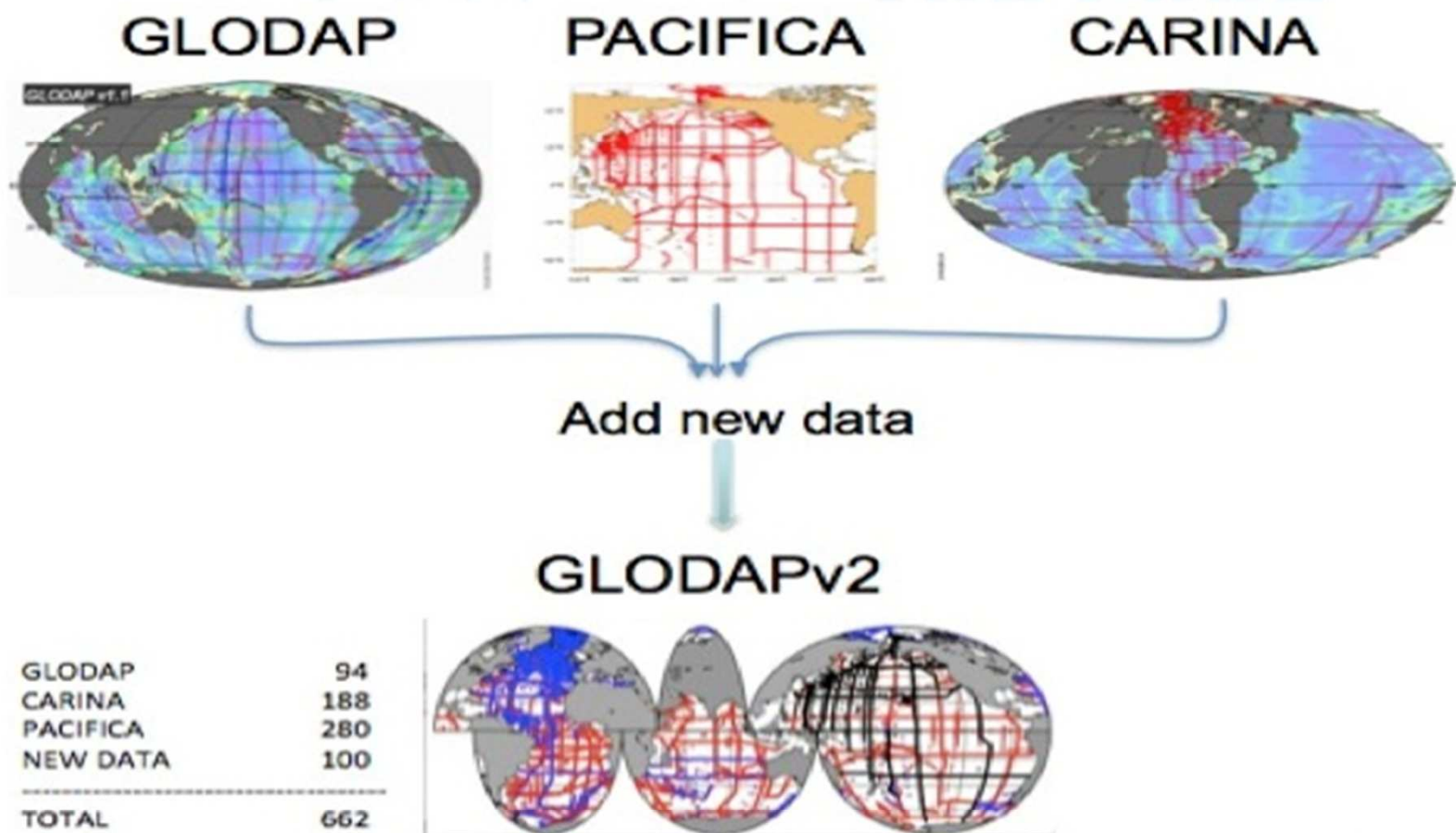
The IOCCP promotes the development of a global network of observations for marine biogeochemistry through technical coordination and communication services, international agreements on standards and methods, and advocacy and links to the global ocean observing system. In each of the fields of our interest (left) IOCCP follows the following scheme:



IOCCP Major Activities – Hydrographic Sections



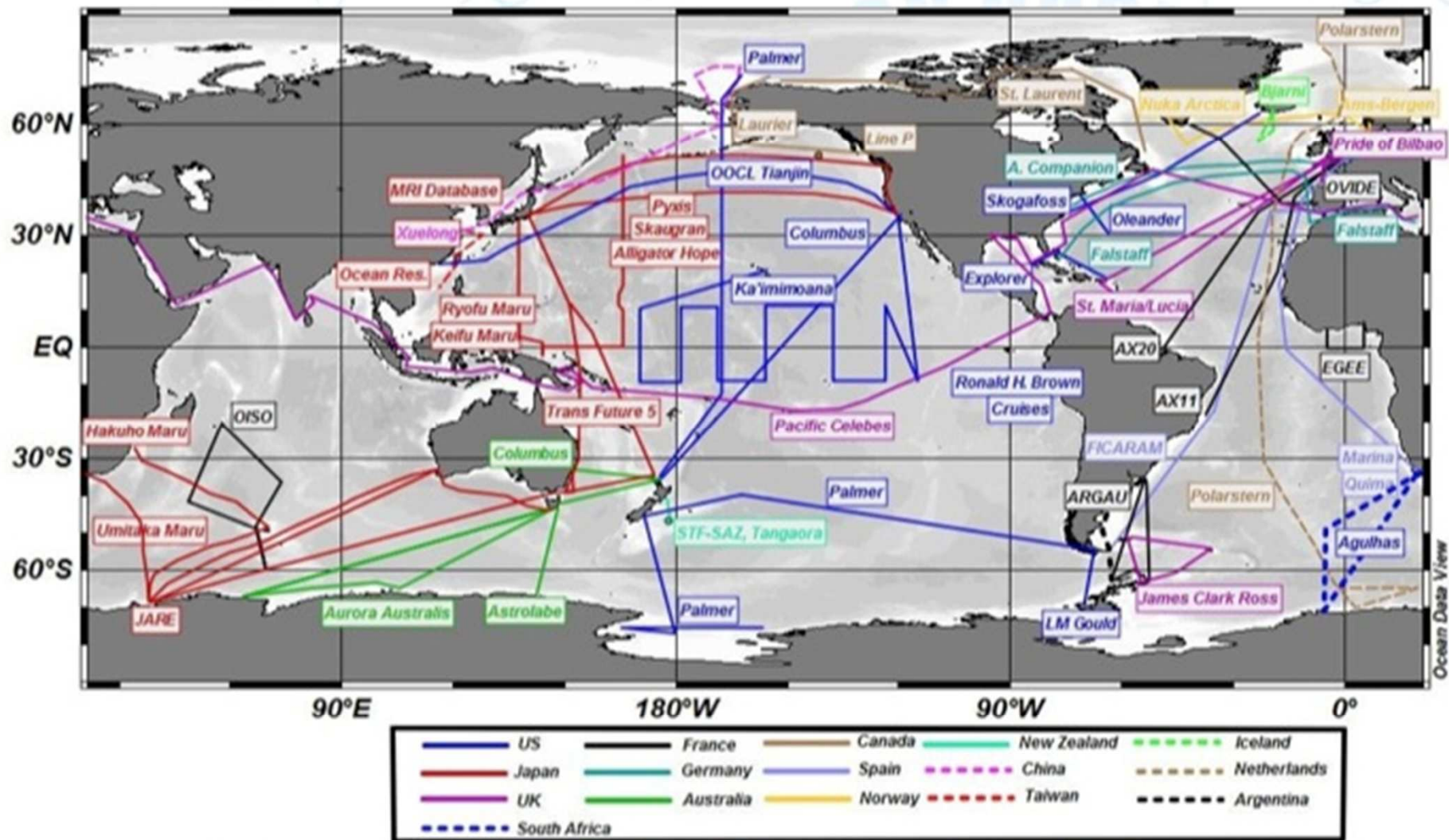
IOCCP Major Activities – Hydrographic Sections



Poster by A. Kozyr (CDIAC)



IOCCP Major Activities – Surface Ocean

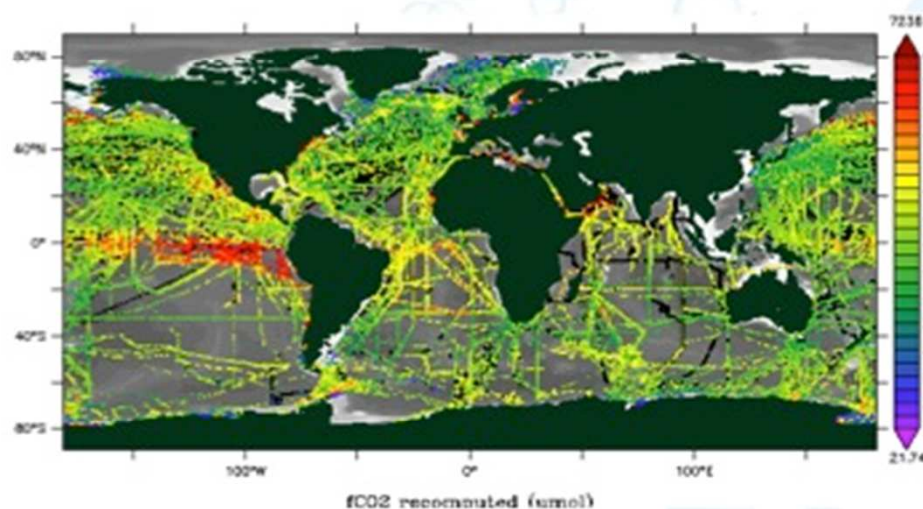


IMDIS, LUCCA, Italy, 25.09.2013

Source: CDIAC



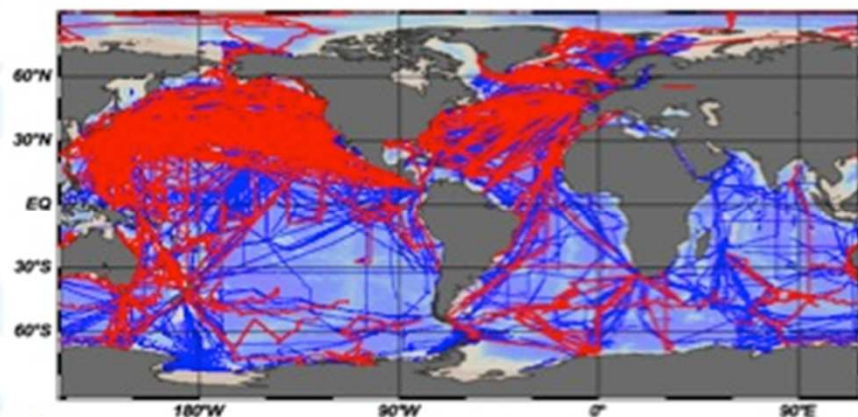
The most comprehensive sea surface CO₂ data set released! (June 2013)



We synthesized

- 10.1 million CO₂ data points
- on 2660 cruises
- from 1968 to 2011

Baseline for assessments of oceans' response to changing climate and increased levels of atmospheric CO₂



www.socat.info

Community effort!

In 2007 the international marine CO₂ community met at UNESCO

Key issues:

- Surface water CO₂ data in various formats
- Stored at different locations
- Many historic data not public
- No global fCO₂ data set publicly available

Need for two data products:

- 1) Global surface ocean data set of recalculated $f\text{CO}_2$ in a uniform format with 2nd level quality control
- 2) Global gridded product of monthly surface water $f\text{CO}_2$ means, with no temporal or spatial interpolation (i.e. bin averages).

These data products will be made publicly available.

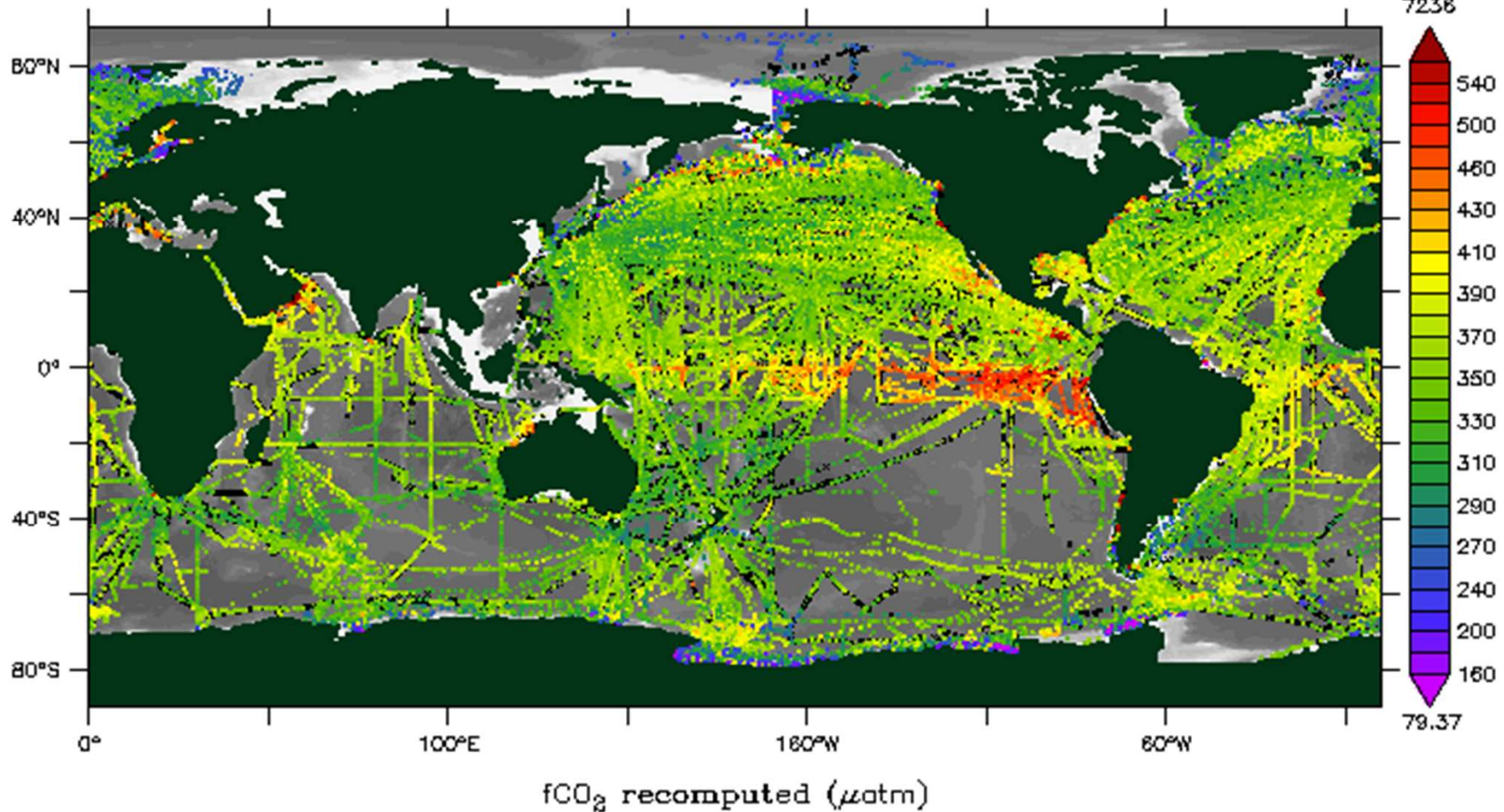
- The methods have to be transparent and fully documented.
- Technical articles have to document the methods

And **SOCAT** was born

16–Nov–1968 to 26–Dec

• SURFACE OCEAN CO₂ ATLAS •

2669 cruises
sample of 169703 (63636 missing)
sampled from 13007637 total obs
7238



What is the Surface Ocean CO₂ Atlas?

- World largest database for QCed surface ocean CO₂ data measured on research vessels, voluntary observing ships and other platforms (moored and drifting)
- Not just CO₂ but other parameters as well e.g. SST (>13 million records), SSS

SOCAT: two data products

- 1) Global surface ocean data set of recalculated $f\text{CO}_2$ in a uniform format with 2nd level quality control
- 2) Global gridded product of monthly surface water $f\text{CO}_2$ means, with no temporal or spatial interpolation (i.e. bin averages).

These data products are publicly available.

- The methods are transparent and fully documented.
- Technical articles document the methods

Data adjustments

- File formats and units have been uniformed
- EXPOCODES (ICES/NODC platform code + sailing date)
- Metadata have been collected and organized
- ETOPO2 bottom depths, NCEP/NCAR atm. pressures, WOA salinities, ship speed, GLOBALVIEW CO₂ have been added to each datum
- fCO₂ has been computed from 13 different reported surface CO₂ parameters using a single set of equations
- transparent process

Quality control

Primary QC

A WOCE flag was assigned to each individual fCO₂ datum
Matlab scripts for QC, Live Access Server

Secondary QC

A 'cruise' flag was assigned which provides information on the expected quality of each cruise based of agreed criteria (provided metadata, SoP criterias, acceptable overall data quality, etc.)

transparent process

Remember: **> 2660 cruises with > 10.1 million CO₂ data**

--> Matlab scripts by A. Olsen & D. Pierrot and 'SOCAT QC Cookbook' by A. Olsen & N. MetzI are available www.socat.info

Dickson, A.G., Sabine, C.L. and J.R. Chirstian (Eds.) 2007

Guide to best practises for ocean CO₂ measurements available

SOCAT Groups

Global group: **D. Bakker**, N. Metzl, S. Hankin, A.

Ols: A. Kozyr, D. Pierrot, M. Telszewski

North Pacific: Y. Iwano
Tropical Atlantic: N.

Arctic: J. Mathis
Indian:

Southern Ocean: B. Tilbrook and N. Metzl

Coastal Ocean: S. Alin, B. Hales, W.-J. Cai

Automation: S. Hankin, S. Jones, K. Smith, A. Kozyr,
B. Pfeil, D. Pierrot, K. O'Brien, A. Manke

Community effort: in total more than 100 people are involved!



History of SOCAT

2001

ORFOIS

Bakker & Dittert start putting all available pCO₂ data together in a uniform format
Work was not finished due to no more funding

2005

CARBOOCEAN

Pfeil and Olsen continue

2007

SOCOVV

SOLAS

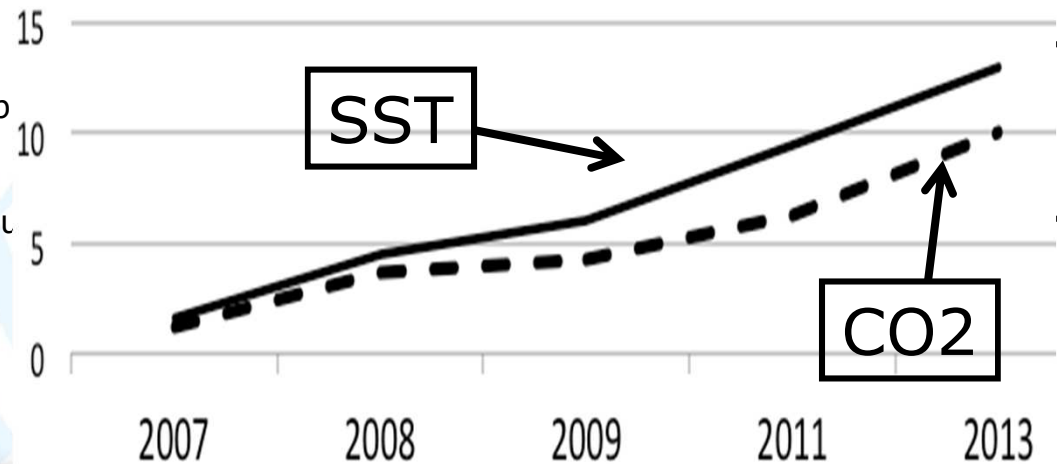
SOLAS/IMBER CARBON group
3 WGs appointed,
WG1: Metzl, "...organise availability of present and futu

2011

SOCAT
Release
V1

2013

SOCAT
Release
V2



Surface Ocean CO₂ Atlas

- SOCAT V1.5 was made public in 2011 with 6.3 million fCO₂ data on > 1850 cruises covering the period 1958-2007

Earth Syst. Sci. Data, 5, 125–143, 2013
 www.earth-syst-sci-data.net/5/125/2013/
 doi:10.5194/essd-5-125-2013
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EOS
 EARTH OBSERVATION
 SOCIETY OF AMERICAN GEOPHYSICAL PHYSICISTS

Eos, Vol. 93, No. 12, 20 March 2012

VOLUME 93 NUMBER 12
 20 MARCH 2012
 PAGES 125–132

Global Data Products Help Assess Changes to Ocean Carbon Sink

PAGES 125–126

Net oceanic uptake of the greenhouse gas carbon dioxide (CO₂) reduces global warming but also leads to ocean acidification [Intergovernmental Panel on Climate Change (IPCC), 2007]. Understanding and predicting changes in the ocean carbon sink are critical to assessments of future climate change. Surface water CO₂ measurements suggest large year-to-year variations in oceanic CO₂ uptake for several regions [Doney et al., 2009]. However, there is much debate on whether these changes are cyclical or indicative of long-term trends. Sustained, globally coordinated observations of the surface ocean carbon cycle and systematic handling of such data are essential for assessing variation and trends in regional and global ocean carbon uptake, information necessary for accurate estimates of global and national carbon budgets.

The Carbon Dioxide Information Analysis Center (CDIAC) has been assembling ocean carbon data from international contributors since 1958. A large amount of relevant data, however, cannot be found at CDIAC, having been archived at other data centers or kept private. Furthermore, the data are in varied formats and often have insufficient documentation. All these factors have been effective barriers to generating global CO₂ synthesis products essential for assessing changes in the ocean carbon sink. In response to this, the international ocean carbon research community initiated the Surface Ocean CO₂ Atlas (SOCAT; <http://www.socat.info/>) in April 2007 [International Ocean Carbon Coordination Project (IOCCP), 2007]. This project aims to improve access to surface water fugacity of CO₂ (fCO₂, similar to partial pressure) data from all ocean areas, to optimize their documentation and quality control (QC), and to ensure their long-term storage.

SOCAT Framework, Quality Control, and Products

Approximately 50 international sea-going marine carbon scientists and data

managers have generously donated their time and expertise to SOCAT. These participants were organized into seven regional groups and a global coordination group. Six international workshops were held to resolve data integration and QC issues. The scientists developed protocols, software, and an interactive Web-based tool for data QC. SOCAT procedures were designed to be transparent and fully documented. Many additional data not yet in CDIAC were retrieved from data originators, public Web sites, and other data centers. Regional group members checked the documentation accompanying the data and carried out data QC. Whenever the QC process highlighted problems, data were suspended for revision by the data provider. A quality flag was assigned to each data set, and only good-quality data were included in SOCAT products.

SOCAT version 1.5, public since September 2011, contains 6.3 million surface water CO₂ measurements from the global

oceans and coastal seas. The data originate from 1851 voyages by research vessels, commercial ships, and moored as well as drifting platforms. Two SOCAT products have been created: (1) a global data set of surface ocean fCO₂ from 1958 to 2007 (Figure 1) recalculated using a uniform procedure and subject to QC checks and (2) a global, gridded, monthly mean surface water fCO₂ data product with minimal temporal and spatial interpolation. The SOCAT data products and individual cruise files can be downloaded from PANGAEA (<http://www.pangaea.de/>), an International Council for Science World Data System, and CDIAC (<http://cdiac.ornl.gov/oceans/>). The data products can also be accessed via an interactive data visualization and analysis tool, the Live Access Server, and Ocean Data View (links available at <http://www.socat.info/>).

Applications of Products and Future SOCAT

Currently, two types of global surface ocean CO₂ synthesis products are publicly available: the SOCAT products and the Lamont-Doherty Earth Observatory (LDEO) climatologies [Takahashi

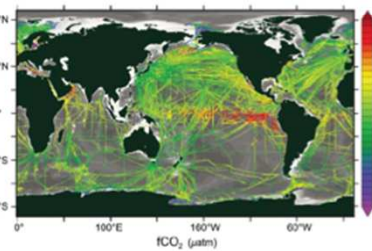


Fig. 1. Surface water fCO₂ (similar to partial pressure) measured in microatmospheres (µatm) in the global oceans and coastal seas from 1958 to 2007. Data are from Surface Ocean CO₂ Atlas (SOCAT) version 1.5. Note the uneven data distribution across the oceans and coastal seas.

3
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Open Access
 Earth System
 Science
 Data

A uniform, quality controlled Surface Ocean CO₂ Atlas (SOCAT)

B. Pfeil^{1,2,3}, A. Olsen^{1,2,4,5}, D. C. E. Bakker⁶, S. Hankin⁷, H. Koyuk⁸, N. Metz¹¹, C. L. Sabine⁷, J. Akl^{12,13}, S. R. Alin⁷, N. Bates¹⁴, R. C. J. Boutin¹¹, P. J. Brown^{6,18}, W.-J. Cai¹⁹, F. P. Chavez²⁰, A. Chen², R. A. Feely⁷, M. González-Dávila²³, C. Goyet²⁴, B. Hales²⁵, N. Hardin²⁷, M. Hood²⁷, M. Hoppema²⁸, C. W. Hunt²⁹, D. Hydes³⁰, M. Ishii¹, R. M. Key³³, A. Körtzinger³⁴, P. Landschützer⁶, S. K. Lauvset³, A. Lourantou¹¹, L. Merlivat¹¹, T. Midorikawa³⁵, L. Mintrop³⁶, A. Nakadate³⁹, Y. Nakano³⁸, S. Nakaoka⁴⁰, Y. Nojiri⁴⁰, A. M. Omar^{8,14}, K. Paterson^{12,13}, F. F. Perez⁴⁶, D. Pierrot³⁷, A. Poisson²², A. F. R. J. Salisbury²⁹, V. V. S. S. Sarma⁴³, R. Schlitzer²⁴, B. Schneider³⁹, I. Skjelvan^{1,2,16}, T. Steinhoff³⁴, T. Suzuki⁴⁵, T. Takahashi⁴¹, K. J. H. Thomas⁴⁹, B. Tilbrook^{12,13,50}, J. Tjiputra¹², D. Vandemark²⁹, A. J. Watson⁶, R. Weiss⁵², C. S. Wong⁵³, and H. Y.

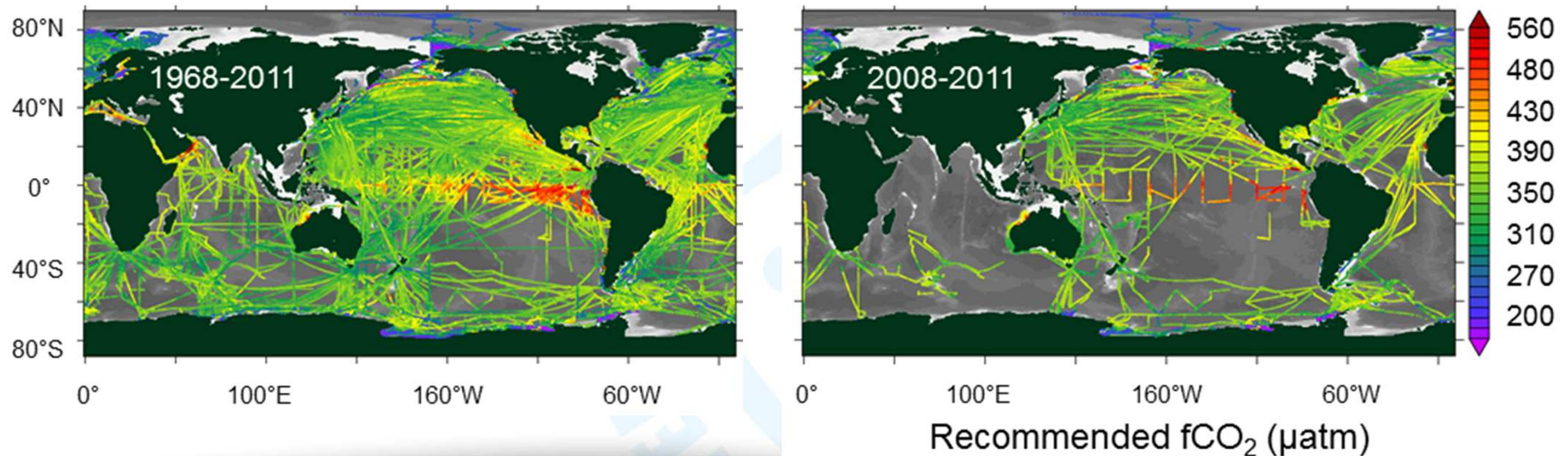
CO₂ Atlas (SOCAT) gridded data products

oyuk^{1,2}, D. C. E. Bakker³, B. Pfeil^{4,5,6}, A. Olsen^{7,8}, N. Metz⁹, A. Kozyr¹⁰, J. Malczyk¹¹, J. Akl^{12,13}, S. R. Alin¹, R. G. J. Bellerby^{14,4,*}, A. Borges¹⁵, W.-J. Cai¹⁷, F. P. Chavez¹⁸, A. Chen¹⁹, C. Cosca¹, R. A. Feely¹, C. Goyet²², N. Hardman-Mountford^{23,*}, C. Heinze^{4,5,8,14}, M. Hoppema²⁴, M. Ishii²⁷, T. Johannessen^{4,5}, R. M. Key²⁸, A. Körtzinger²⁹, P. Landschützer³, A. Lenton¹³, A. Lourantou⁹, L. Merlivat⁹, T. Midorikawa³⁰, L. Mintrop³¹, A. Nakadate³⁴, Y. Nakano³³, S. Nakaoka³⁵, Y. Nojiri³⁵, A. M. Omar^{8,14}, K. Paterson^{12,13}, F. F. Perez⁴⁶, D. Pierrot³⁷, A. Poisson²², A. F. Ríos³⁶, V. V. S. S. Sarma³⁸, R. Schlitzer²⁴, B. Schneider³⁹, U. Schuster³, T. Steinhoff²⁹, T. Suzuki⁴⁰, T. Takahashi⁴¹, K. Tedesco^{42,***}, B. Tilbrook^{12,13,45}, D. Vandemark²⁵, T. Venes¹³, A. J. Watson³, C. S. Wong⁴⁷, and H. Yoshikawa-Inoue³³

generously acknowledge the contribution of SOCAT investigators, regional ship, acknowledgment or reference to relevant papers as appropriate.

SOCAT Version 2

- Started after the release of SOCAT Version 1
- Released in 2013 and consists of 10.1 million fCO₂ data (+60 %) on > 2660 cruises covering the years 1968-2011



Data access

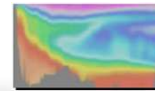
International collaboration between
the USA and Europe

Data centres involved:

- PANGAEA 
- CDIAC 

Institutes involved:

- NOAA/PMEL (LAS) 
- AWI (ODV) 



Welcome to SOCAT

A Collection of Underway Ocean CO₂ Observations
Quality Controlled by the Science Community



SOCAT Version 2 Data
Products:

Cruise Data Viewer

Gridded Data Viewer

Table of Cruises

Data Download

Publications/Presentations

SOCAT Credits

SOCAT Version 1.5

Data Product Access

SOCAT version 2 data products are available via the Interactive Cruise Data Viewer and the Gridded Data Viewer (left menu bar).
Downloadable files are available via the links below:

[Database Files from CDIAC SOCAT V2](#)



[Gridded Files from CDIAC SOCAT V2](#)



[ODV collection of SOCAT V2](#)



[Individual cruise files from PANGAEA SOCAT V2](#)

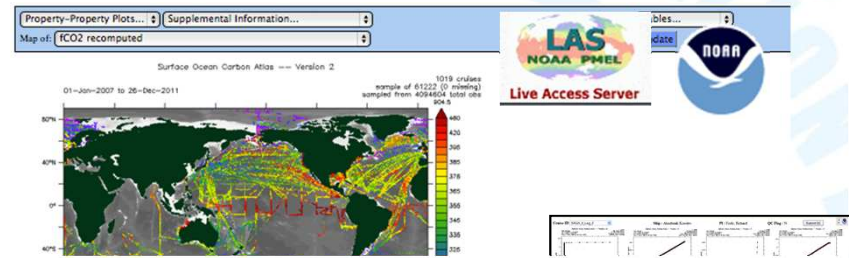
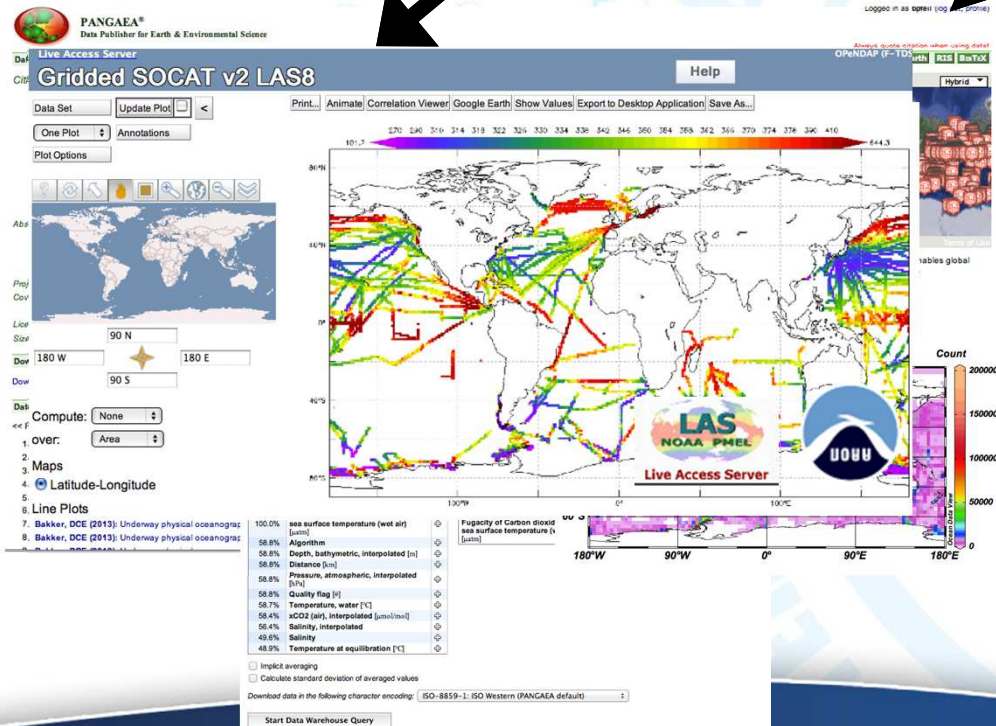


For a detailed description of data products, file formats and tools, please, see p138 of Pfeil et al.: A uniform, quality controlled Surface Ocean CO₂ Atlas (SOCAT), Earth Syst. Sci. Data, 5, 125-143, [doi:10.5194/essd-5-125-2013](https://doi.org/10.5194/essd-5-125-2013), 2013.

Frequently Asked Questions

SOCAT Products

Gridded data



Index of /ftp/oceans/SOCATv2/SOCATv2_Gridded_Data

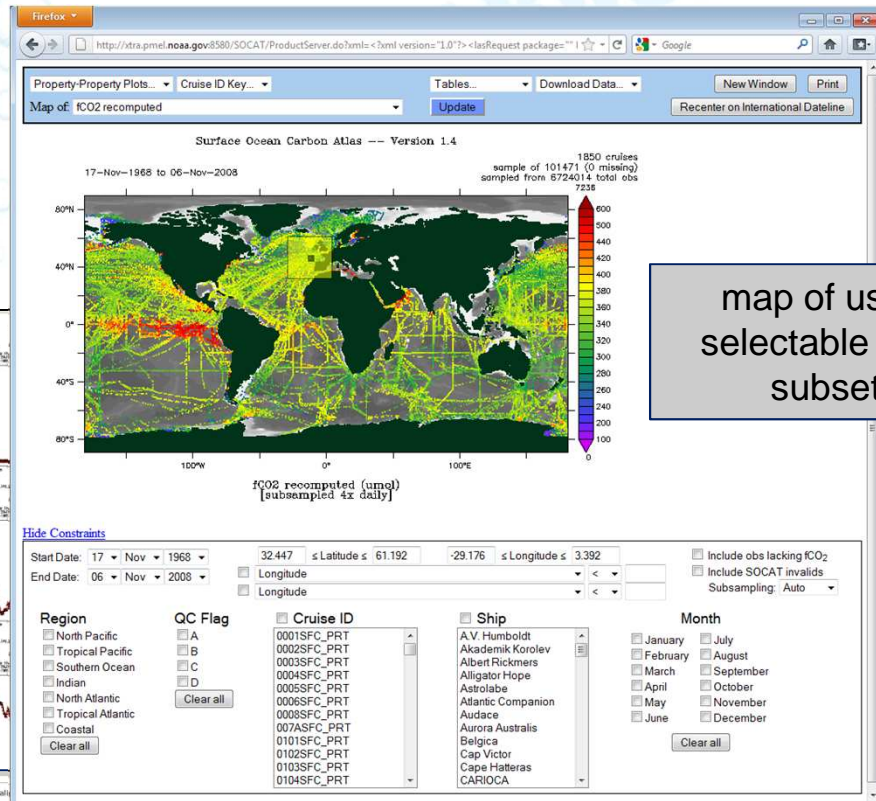
Name	Last modified	Size	Description
Parent Directory			
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SOCAT_tracks_gridded_decades_v2.nc.zip	30-May-2013 10:59	1.0M	
SOCAT_tracks_gridded_month_clim_v2.nc.zip	30-May-2013 11:00	2.3M	
SOCAT_tracks_gridded_monthly_v2.nc.zip	30-May-2013 11:00	8.2M	
SOCAT_tracks_gridded_yearly_v2.nc.zip	30-May-2013 11:01	2.9M	

Please, cite the gridded SOCAT products as:

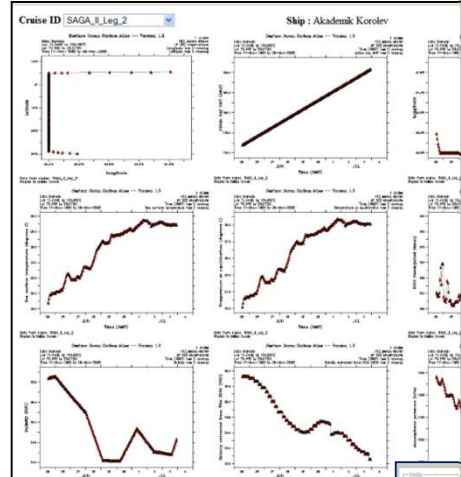
Bakker, D. C. E., B. Pfeil, K. Smith, S. Hankin, A. Olsen, S. R. Alin, C. Cosca, B. Hales, S. B. Tilbrook, C. Wada, J. Akl, L. Barbero, N. Bates, J. Boutin, W.-J. Cai, R. D. Castle, F. P. O. R. A. Feely, A. Fransson, Z. Gao, N. Hardman-Mountford, M. Hoppema, W.-J. Huang, C. W. Hunt, B. Sara Jutterstrom, V. Kitidis, A. Kortzinger, S. K. Lauvaet, N. Lefevre, A. B. Manke, J. T. Matl, G.-H. Park, K. Paterson, D. Pierrot, A. F. Rios, C.L. Sabine, S. Saito, J. Salisbury, V. V. S. S. C. Sutherland, T. Suzuki, A. J. Sutton, C. Sweeney, T. Takahashi, J. Tjiputra, N. Tsurushima, R. Wanninkhof and A. J. Watson (2013) An update to the Surface Ocean CO₂ Atlas (SOCAT version 2.0)



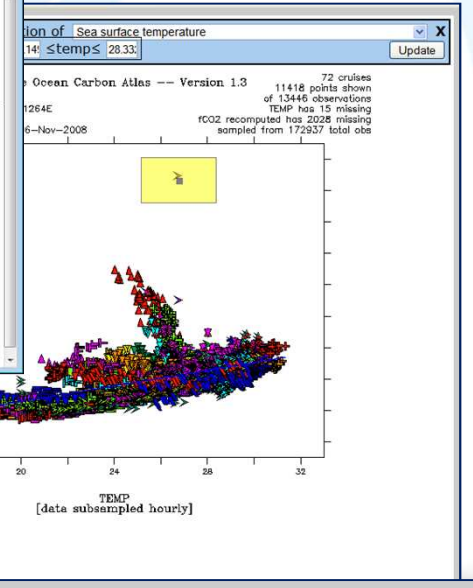
Cruise Data Viewer



map of user-selectable data subset



individual cruise overview plot



property-property viewer

audit of QC evaluations

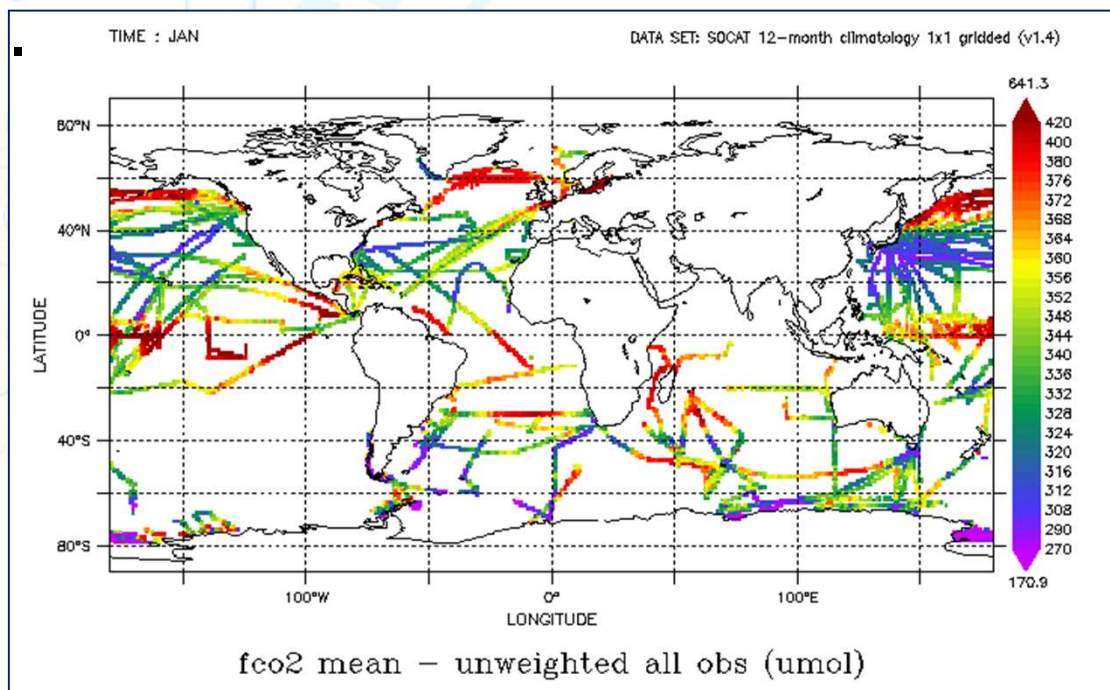
Courtesy of D. Bakker (UEA)



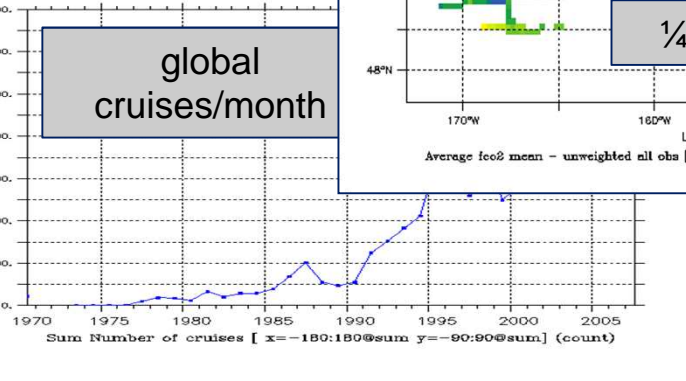
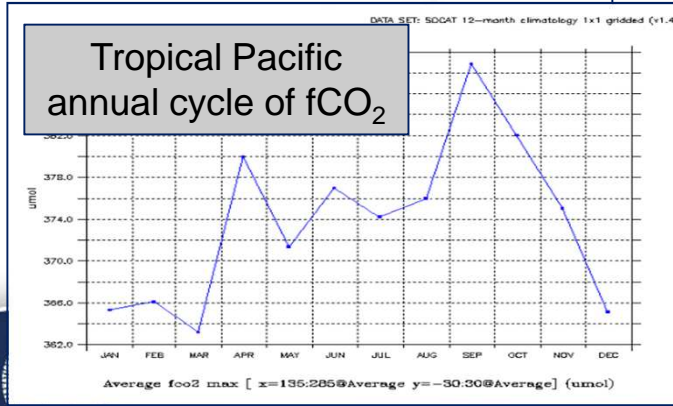
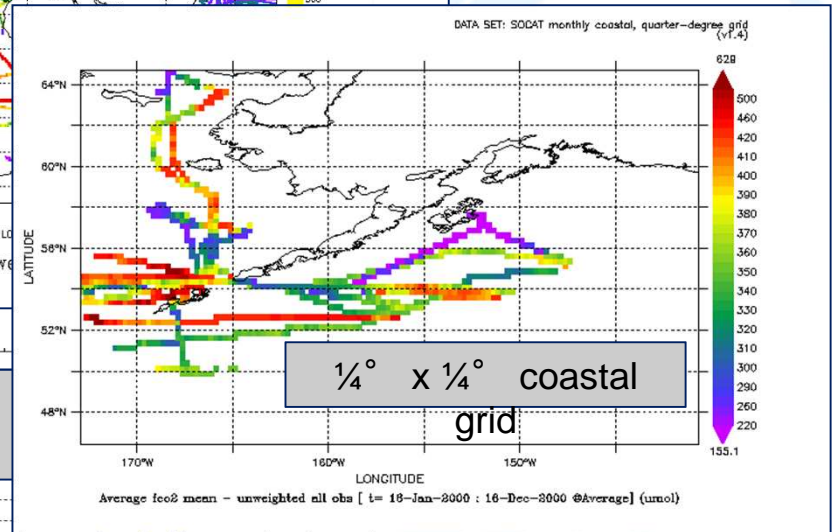
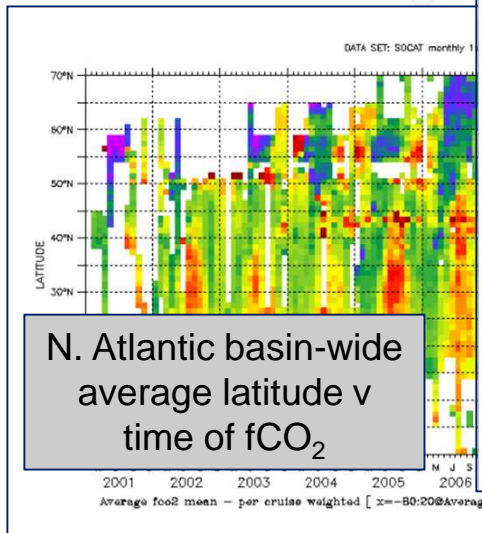
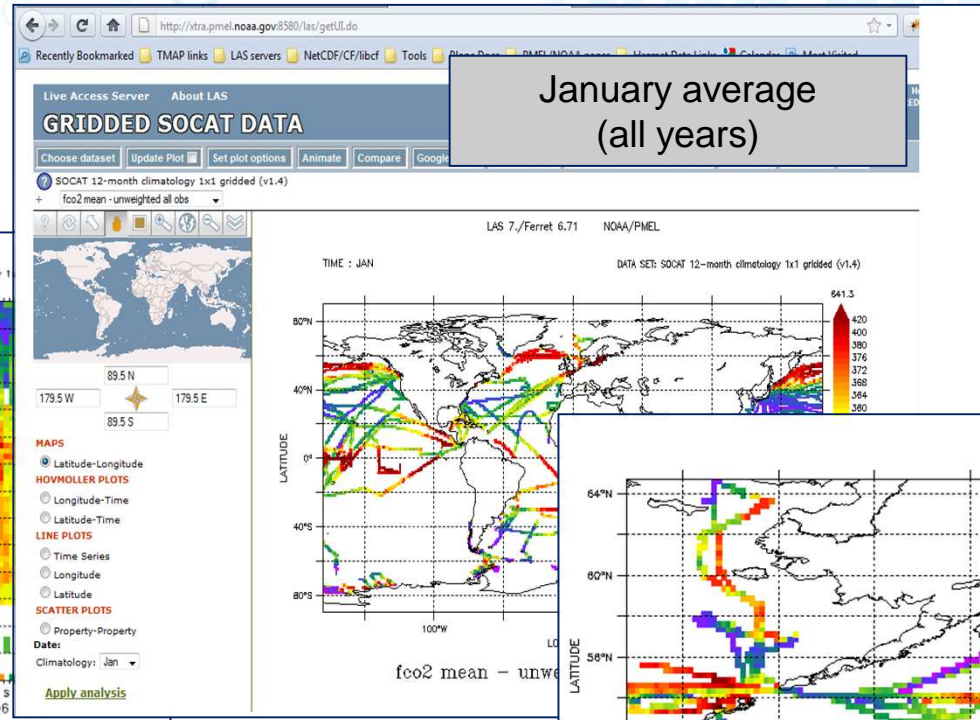
Global gridded fCO₂

Monthly fCO₂ means, no temporal or spatial interpolation.

Open ocean 1° x 1° & coastal waters 1/4° x 1/4°

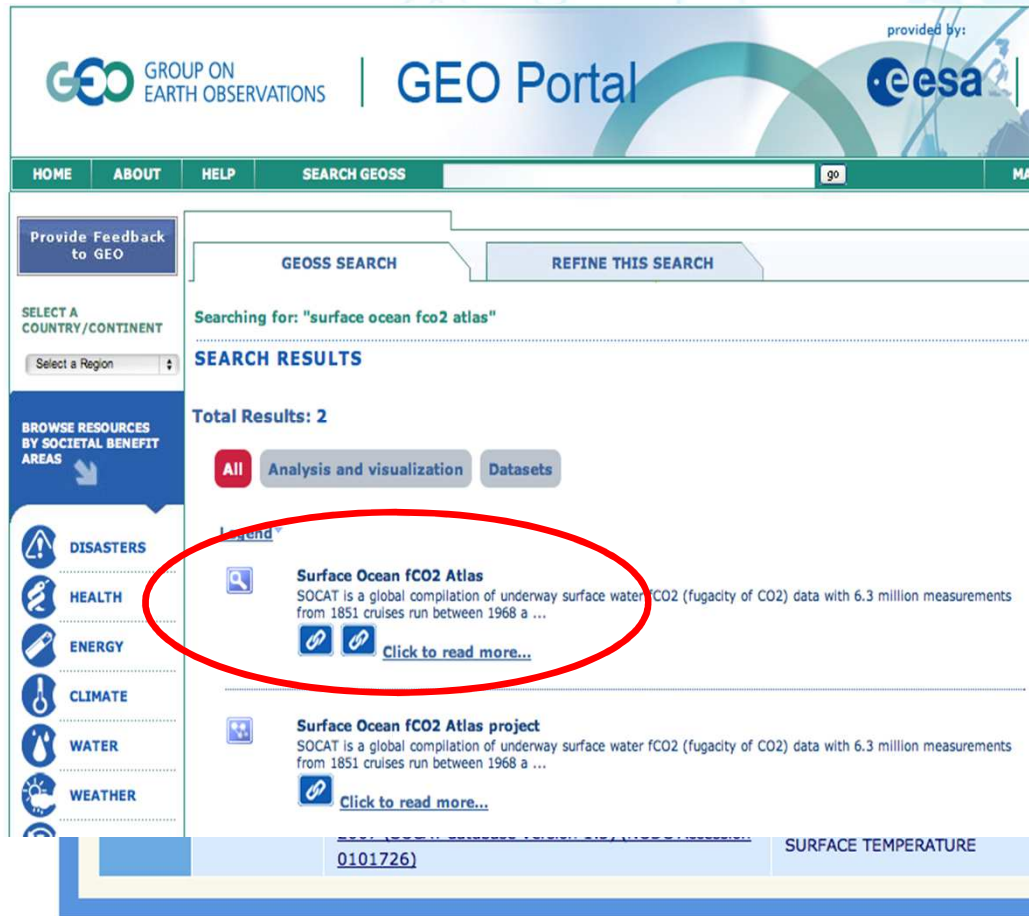




Gridded Data Viewer



Courtesy of D. Bakker (UEA)

Data is also available



provided by:  GROUP ON EARTH OBSERVATIONS | **GEO Portal** 

HOME ABOUT HELP SEARCH GEOSS go MAP

Provide Feedback to GEO

SELECT A COUNTRY/CONTINENT
Select a Region

BROWSE RESOURCES BY SOCIETAL BENEFIT AREAS

- DISASTERS
- HEALTH
- ENERGY
- CLIMATE
- WATER
- WEATHER

GEOS SEARCH REFINES THIS SEARCH

Searching for: "surface ocean fco2 atlas"

SEARCH RESULTS

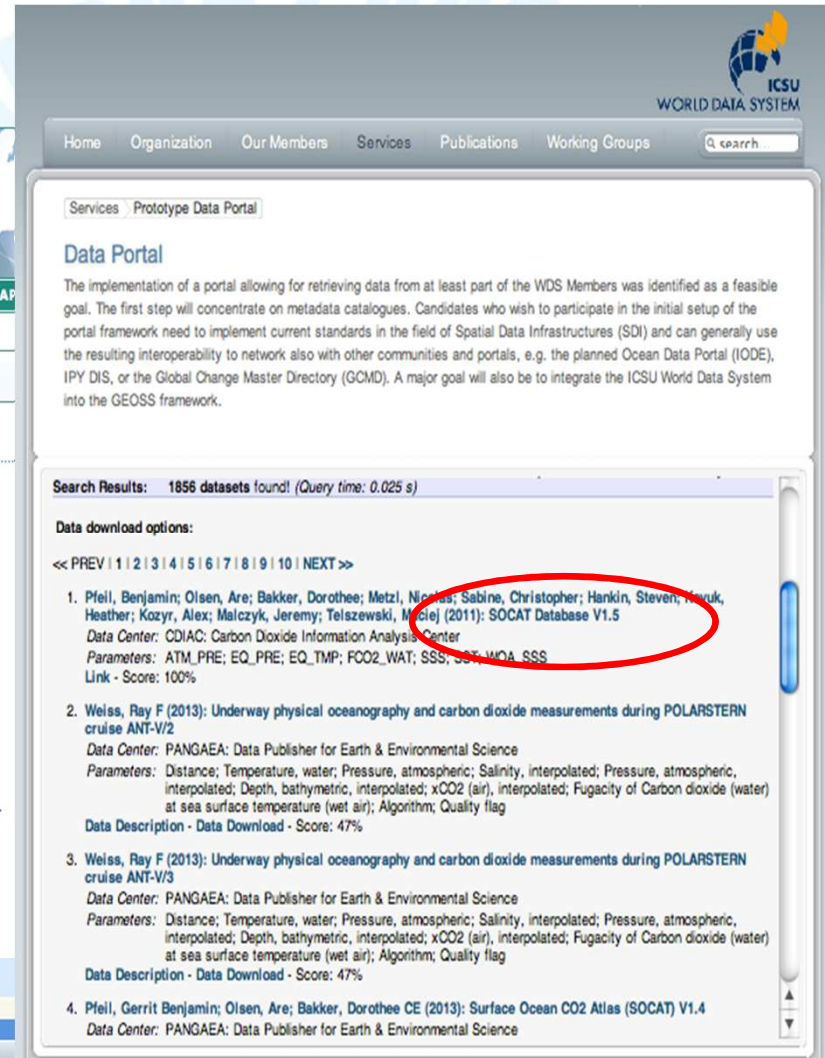
Total Results: 2

All Analysis and visualization Datasets

Surface Ocean fCO₂ Atlas
SOCAT is a global compilation of underway surface water fCO₂ (fugacity of CO₂) data with 6.3 million measurements from 1851 cruises run between 1968 a ...
[Click to read more...](#)

Surface Ocean fCO₂ Atlas project
SOCAT is a global compilation of underway surface water fCO₂ (fugacity of CO₂) data with 6.3 million measurements from 1851 cruises run between 1968 a ...
[Click to read more...](#)

0101726 SURFACE TEMPERATURE



ICSU WORLD DATA SYSTEM

Home Organization Our Members Services Publications Working Groups search

Services Prototype Data Portal

Data Portal

The implementation of a portal allowing for retrieving data from at least part of the WDS Members was identified as a feasible goal. The first step will concentrate on metadata catalogues. Candidates who wish to participate in the initial setup of the portal framework need to implement current standards in the field of Spatial Data Infrastructures (SDI) and can generally use the resulting interoperability to network also with other communities and portals, e.g. the planned Ocean Data Portal (IODE), IPY DIS, or the Global Change Master Directory (GCMD). A major goal will also be to integrate the ICSU World Data System into the GEOSS framework.

Search Results: 1856 datasets found! (Query time: 0.025 s)

Data download options:

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

- Pfeil, Benjamin; Olsen, Are; Bakker, Dorothee; Metz, Nicolas; Sabina, Christopher; Hankin, Steven; Heuck, Heather; Kozyr, Alex; Malczyk, Jeremy; Teiszewski, Kiej (2011): SOCAT Database V1.5
Data Center: CDIAC: Carbon Dioxide Information Analysis Center
Parameters: ATM_PRE; EQ_PRE; EQ_TMP; FCO2_WAT; SSS; SST; WOA_SSS
Link - Score: 100%
- Weiss, Ray F (2013): Underway physical oceanography and carbon dioxide measurements during POLARSTERN cruise ANT-V/2
Data Center: PANGAEA: Data Publisher for Earth & Environmental Science
Parameters: Distance; Temperature, water; Pressure, atmospheric; Salinity, interpolated; Pressure, atmospheric, interpolated; Depth, bathymetric, interpolated; xCO2 (air), interpolated; Fugacity of Carbon dioxide (water) at sea surface temperature (wet air); Algorithm; Quality flag
Data Description - Data Download - Score: 47%
- Weiss, Ray F (2013): Underway physical oceanography and carbon dioxide measurements during POLARSTERN cruise ANT-V/3
Data Center: PANGAEA: Data Publisher for Earth & Environmental Science
Parameters: Distance; Temperature, water; Pressure, atmospheric; Salinity, interpolated; Pressure, atmospheric, interpolated; Depth, bathymetric, interpolated; xCO2 (air), interpolated; Fugacity of Carbon dioxide (water) at sea surface temperature (wet air); Algorithm; Quality flag
Data Description - Data Download - Score: 47%
- Pfeil, Gerrit Benjamin; Olsen, Are; Bakker, Dorothee CE (2013): Surface Ocean CO₂ Atlas (SOCAT) V1.4
Data Center: PANGAEA: Data Publisher for Earth & Environmental Science

Use of DOIs within SOCCAT

All data is citable using DOIs

- individual cruise files
- synthesis products (both observational and gridded products)

News

Digital object identifier (DOI) becomes an ISO standard

by Elizabeth Gasiorowski-Denis on 10 May 2012



A new International Standard that provides a system for assigning a unique international identification code to objects for use on digital networks is expected to bring benefits for publishers, information managers, multi-media distributors, archive and cultural heritage communities, and the internet technology industry.

Published by ISO (International Organization for Standardization), **ISO 26324:2012, Information and documentation -- Digital object identifier system**, is an efficient means of identifying an entity over the Internet and used primarily for sharing with an interested user community or managing as intellectual property.

A DOI name is an identifier of an entity – physical, digital or abstract – on digital networks. It provides information about that object, including where the object, or information about it, can be found on the internet.

SOCAT Version 2 Transparency

14	15	16	17	18
xCO ₂ water_equ_dry [μmol/mol]	pCO ₂ water_SST_wet [μatm]	fCO ₂ water_SST_wet [μatm]	Algorithm	Flag [#]
245.700	240.600	239.965	1	2
247.200	242.600	241.430	1	2
248.100	243.300	242.309	1	2
248.600	243.700	242.797	1	2
250.100	245.000	244.262	1	2
251.100	246.100	245.239	1	2
251.400	246.500	245.507	1	2
253.500	248.600	247.558	1	2
254.800	250.000	248.827	1	2
255.300	250.300	249.291	1	2
256.000	251.000	249.974	1	2
256.100	250.900	250.072	1	2
256.100	250.900	250.047	1	2
256.400	251.000	250.339	1	2

Property-Proxy

Map

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Start

Hide

Start 1

1 of 2

Description of Underway pCO₂ System onboard the NOAA Ship *Ka'imimoana* 1996 through 2004

The CO₂ group at NOAA/PMEL installed an underway pCO₂ system onboard the NOAA Ship *moana* in June 1996, just prior to the ship's commissioning. The *Ka'imimoana* is designed and equipped to maintain the TAO buoy array (www.pmel.noaa.gov/tao/), in the equatorial Pacific.

The CO₂ group has maintained an underway pCO₂ system on the *Ka'imimoana* from 1996 to the present. This document describes the system that was on board from June 1996 through December 2004, and the buoy data collected during 44 cruises during that time period. Details of the pCO₂ system installed after December 2004 are described in separate documents.

Principal Investigator:
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Installation, Maintenance, Calibration, Quality Assurance, Shooting, Data Processing and QC:
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Technicalicians / pCO₂ system operators on *Ka'imimoana*:
 Richard Feely (1996-1997), Dennis Swanson (May '97 - May '01), Jason Poe (Mar '02 - Feb '03), Randy Gentry (Mar '03 - Dec '03), Scott Gendron (Mar '04 - Aug '04)

Ship Name: Ka'imimoana
 Internal ID: WTT11

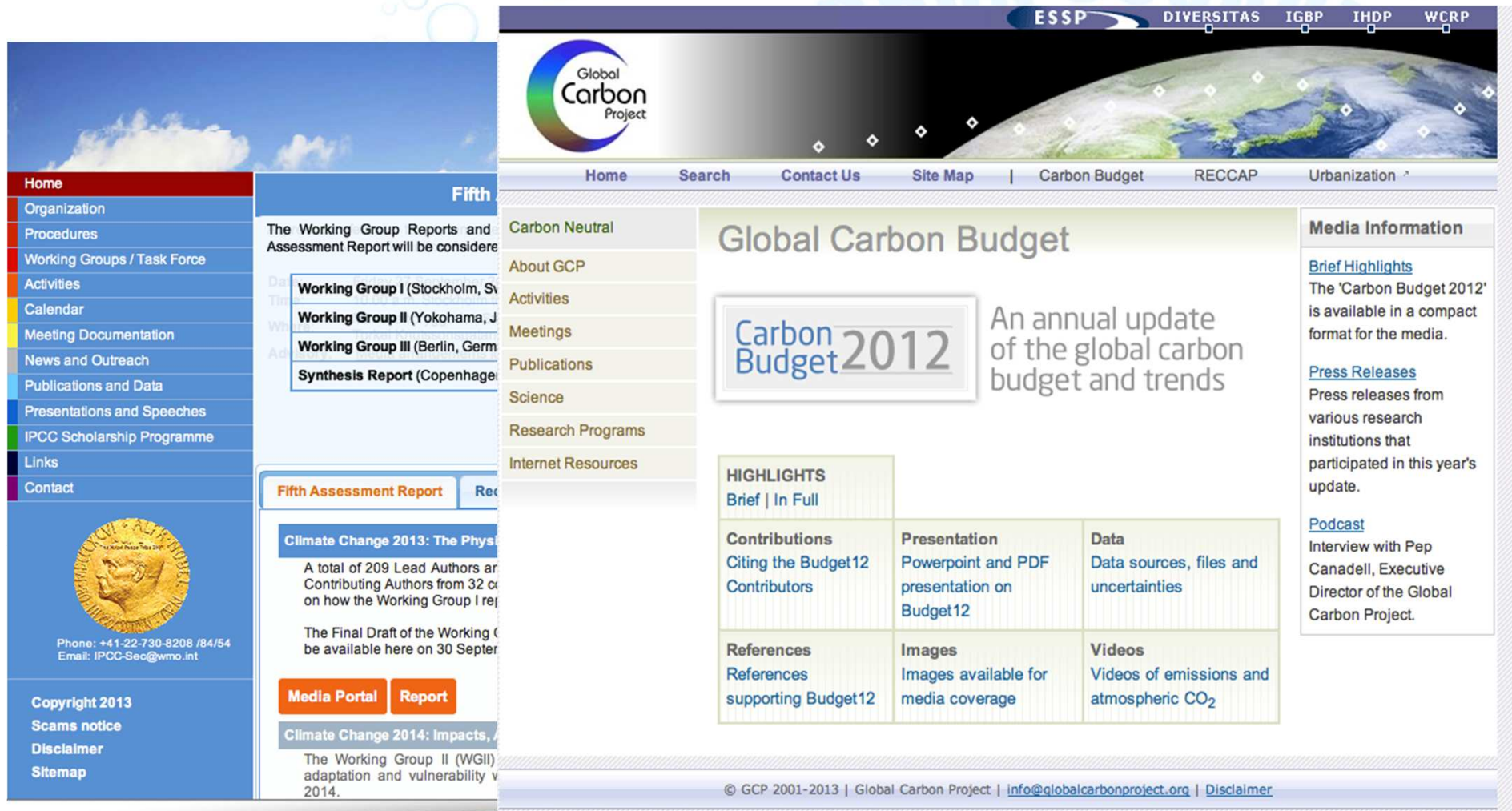
Measurements during:
 1996-12-13T11:24:00
 1996-09-28T20:01:00

Event(s): 06AQ19860928-track
 * Latitude Start: -36.265000 * Longitude Start: 17.048000 * Latitude End: -36.740000 * Longitude End: 16.412000 * Date/Time Start: 1986-09-28T20:01:00 * Date/Time End: 1986-12-13T11:24:00 * Campaign: ANT-V/3 (PS10) * Basis: Polarstern * Device: Underway cruise track measurements

Comment: Cruise QC flag: D (see further details)

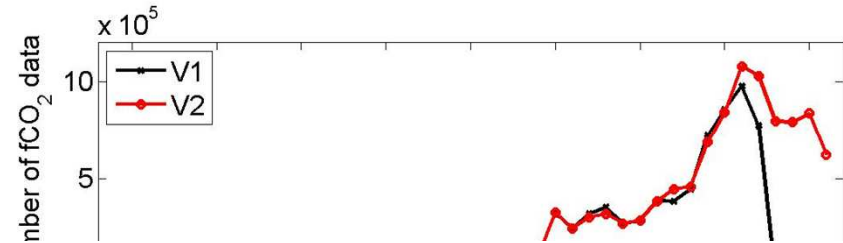
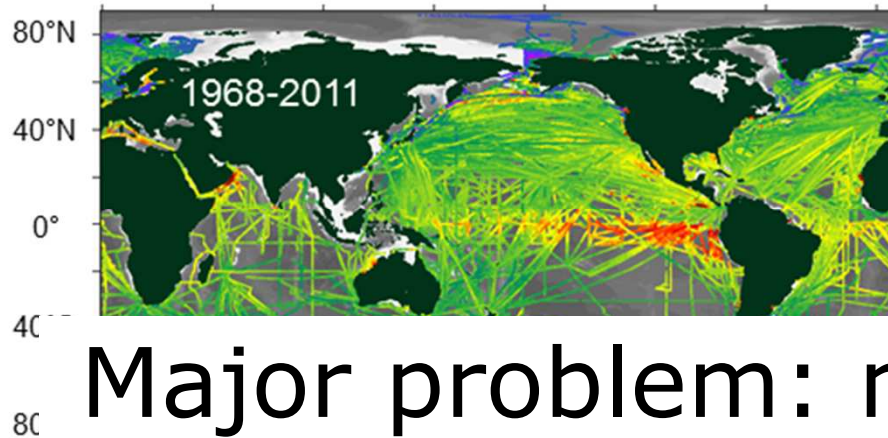


Special use of SOCAT



The screenshot displays the Global Carbon Project website. The main navigation bar includes links for Home, Search, Contact Us, Site Map, Carbon Budget, RECCAP, and Urbanization. The central content area features a large banner for the 'Global Carbon Budget 2012', described as an annual update of the global carbon budget and trends. Below this banner, there are sections for 'HIGHLIGHTS' (Brief | In Full), 'Contributions' (Citing the Budget12 Contributors), 'References' (References supporting Budget12), 'Presentation' (Powerpoint and PDF presentation on Budget12), 'Images' (Images available for media coverage), and 'Data' (Data sources, files and uncertainties). A 'Media Information' sidebar on the right provides links for 'Brief Highlights', 'Press Releases', and 'Podcast'. The footer contains copyright information for GCP 2001-2013 and contact details for the Global Carbon Project.

Towards future releases



Major problem: no central funding!
But several funding sources!

Time frame for SOCAT Version 3

December 2013 : Close data submission to CDIAC

Jan-March 2014 : Data submission via automation system (invitation only)

October 2014 : Quality control complete

June 2015 : Release (provisional)

Welcome to SOCAT

A Collection of Underway Ocean CO₂ Observations
Quality Controlled by the Science Community



SOCAT Version 2 Data Products:

[Cruise Data Viewer](#)

[Gridded Data Viewer](#)

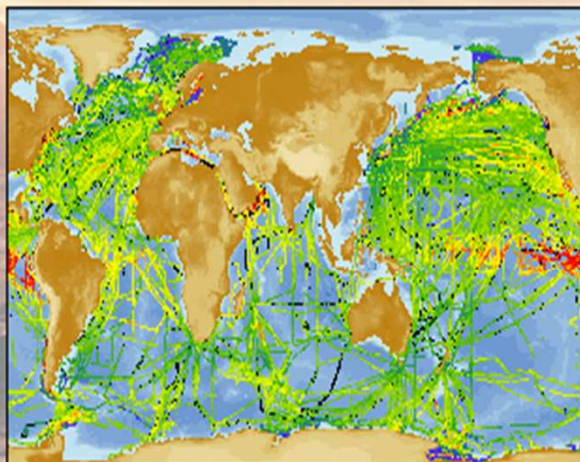
[Table of Cruises](#)

[Data Download](#)

[Publications/Presentations](#)

[SOCAT Credits](#)

[SOCAT Version 1.5](#)



SOCAT Documentation:

[About](#)

[News](#)

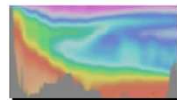
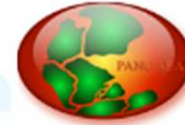
[Meetings](#)

[Data Use Policy](#)

SOCAT Help:

[Videos](#)

[Frequently Asked Questions](#)



Thank you to all data contributors,
 the SOCAT team especially
 regional and global group leader,
 members, data centers involved
 and funding agencies!