

GEOMAR Guide for Handling Supplementary Data

Contact

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1. Which data access services are available

The DRS team support the sharing and publication of research data from disciplines that do not fit into a specific [repository](#) (like e.g. [PANGAEA](#)). We will provide a **unique handle as a Persistent Identifier** (PID) for your data which will always redirect users to the proper site at GEOMAR services providing access to data and metadata! GEOMAR researchers have the opportunity to foster the [FAIR](#) process and comply with its principles by taking advantage of the GEOMAR Data Management support.

The official printable citation of such a handle is for e.g.:

hdl:20.500.12085/ec430a5c-1930-4a87-bb1f-973162c2a135

which results then in a clickable Link/URL:

<https://hdl.handle.net/20.500.12085/ec430a5c-1930-4a87-bb1f-973162c2a135>

Following the handle link leads first to a **landing page where your data is accessible for download**. [Data-centric services](#) may be available where applicable and are then shown on this page as well (e.g. WMS, THREDDS,...).

The screenshot shows the GEOMAR dataset landing page. At the top, the handle `hdl:20.500.12085/ec430a5c-1930-4a87-bb1f-973162c2a135` is displayed. Below this, there are tabs for 'Handle ID', 'Related Publication', 'OceanRep', 'THREDDS', and 'ISO XML'. The 'Handle ID' tab is active. The page provides the handle for the dataset, a citation for the dataset, and a list of related publications. A 'Data' section is visible, showing a table of files and folders. The table has columns for 'Name', 'Last modified', and 'Size'. The files listed include 'ARIANE_EXP_16N', 'ARIANE_EXP_min', 'ARIANE_EXP_var', 'DERIVED_DATA', 'PARCELS_TTD_EXPS', 'PYTHON_NOTEBOOKS', 'ec430a5c-1930-4a87-bb1f-973162c2a135.metadata.xml', 'ec430a5c-1930-4a87-bb1f-973162c2a135.simple-metadata.json', 'LICENSE.txt', and 'README.md'. The page also includes a 'Filter/Search files and folders' section and a footer with the GEOMAR logo and contact information.

Name	Last modified	Size
ARIANE_EXP_16N	2021-03-11 08:32	2.8 GB
ARIANE_EXP_min	2021-03-11 08:32	79.7 MB
ARIANE_EXP_var	2021-03-11 08:33	7.6 GB
DERIVED_DATA	2021-03-11 08:34	1.7 GB
PARCELS_TTD_EXPS	2021-03-11 08:34	731 KB
PYTHON_NOTEBOOKS	2021-03-11 08:34	2.3 MB
ec430a5c-1930-4a87-bb1f-973162c2a135.metadata.xml	2021-07-05 12:12	22 KB
ec430a5c-1930-4a87-bb1f-973162c2a135.simple-metadata.json	2021-03-11 10:21	843 B
LICENSE.txt	2021-03-11 08:34	19 KB
README.md	2021-03-11 08:30	5 KB

Hereby you will have the following choices for sharing your data:

- Open Access** - listed in public overview pages - full visibility e.g. data.geomar.de
- Access only for collaboration partners** in ongoing research projects - no visibility in any catalog or web page - you need to know the URL
- Access only for reviewers until publication** of peer reviewed articles / data - no visibility in any catalog or web page - they need to know the URL

The datasets related to journal articles will be interlinked in [OceanRep GEOMAR](#) for better findability.

NOTICE: Please **use always the CITATION variant of your handle** when citing your data!

The syntax for the displayed/printed **CITATION variant** is for example:

hdl:20.500.12085/4e104bfe-aa9e-4d1e-99fa-5a7d1b9f9313

The URL syntax for the clickable **HTML variant** is then the following:

<https://hdl.handle.net/20.500.12085/ec430a5c-1930-4a87-bb1f-973162c2a135>

2. What you need to do

2.1 Prepare your data for sharing or publication

Before you request a handle for your data you have to prepare your datasets by taking in account the following points.

2.1.1 Prepare metadata and documentation

Complete metadata are crucial for long-term archiving and subsequent data reuse.

1. We recommend you to set global attributes and variable standard names in NetCDF files following the **NetCDF Climate and Forecast (CF) Metadata Convention** (<http://cfconventions.org/>) (recommended standard by [Unidata](#)). Information about the CF are well summarized by CEDA: <https://help.ceda.ac.uk/article/4507-the-cf-metadata-convention>.

(There is also a CF-Checker to test your files for compliance with the CF Convention: Visit the [CF-checker website](#) to use this service or alternatively download and install the [CF-checker software](#).)

2. Create a **README file** for your dataset.

2.1.2 Structure your dataset and prepare your files

1. **Label your files, directories and data** for making reuse and proper citation possible.
 - a. Special characters and spaces in file and directory names should be replaced by underscores and/or hyphens or appropriate substitutions (e.g. ü -> ue).
 - b. Label your data with the controlled vocabulary (your community or project standard).
2. Check that the **file formats** are sustainable: Only non-proprietary data formats
 - Containers: TAR, GZIP, ZIP

- Databases: XML, CSV
- Geospatial: SHP, DBF, GeoTIFF, NetCDF
- Moving images: MOV, MPEG, AVI, MXF
- Sounds: WAVE, AIFF, MP3, MXF
- Statistics: ASCII, DTA, POR, SAS, SAV
- Still images: TIFF, JPEG 2000, PDF, PNG, GIF, BMP
- Tabular data: CSV
- Text: XML, PDF/A, HTML, ASCII, UTF-8

and for model data **Network Common Data Format (NetCDF)** – „NetCDF is a set of software libraries and self-describing, machine-independent data formats that support the creation, access, and sharing of array-oriented scientific data.“ (<https://www.unidata.ucar.edu/software/netcdf/>)– **GRIB** or **HDF** are accepted.

3. Check that the file names have a proper **file name extension**.
4. **Calculate the overall size** of the data to be shared and provide this information to the data management team.
5. **Create checksums** (see blue box) for each file before your data submission (please provide sha256 checksums). That will help us to guard data integrity during the data submission workflow and in the long run when published.

Create checksums on command line

Command to create SHA256 checksum of a file:

Linux: `sha256sum FILE_NAME`

MAC: `shasum -a 256 FILE_NAME`

WINDOWS: find appropriate tool

Start at the top level of your folder containing all data and other files and calculate checksums for each file of your dataset (including all subdirectories) and write them to a single text file with extension "sha256":

Linux: `cd YOUR_DATA_DIRECTORY`

```
find ./ -type f -exec sha256sum {} \; >> Checksums.sha256
```

MAC: `cd YOUR_DATA_DIRECTORY`

```
find ./ -type f -exec shasum -a 256 {} \; >> Checksums.sha256
```

WINDOWS: find appropriate tool

2.2 Submit your dataset for sharing or publication

After the preparation of your datasets you need to submit your data for publication to the data management team.

For data exchange there are the following options to choose:

1. Upload the dataset you want to publish to the **GEOMAR FTP-Server**: contact helpdesk@geomar.de
2. Or alternatively upload the dataset to a **Git-LFS repository** for your project, which will be provided by the data management team (contact the data management team: datamanagement@geomar.de). For more information about Git see our [Git Tutorial](#). By this, the data management team will have access to your data to process the publication request.
3. Or alternatively via a **SSH accessible storage** (GEOMAR Ceph, HPC Uni Kiel...)
4. Or alternatively via the **GEOMAR Cloud** (only if the other sharing options are not possible - limited space)

Fill in the data submission form <https://portal.geomar.de/thredds-data-submission> to **request a handle for your data!**

3. Overview of available services using handles and THREDDS for (model) data sharing

3.1 Direct Download

You can download single files or select multiple files in the "H5AI" browser view (see also filter button in the top line).



3.2 Options for accessing single NetCDF files:

Clicking on the THREDDS button will take you to the THREDDS browser based overview..

hdi:20.500.12085/04eebf69-5509-430b-90c9-467169aba218

Supplementary Dataset

Handle for this dataset: [hdi:20.500.12085/04eebf69-5509-430b-90c9-467169aba218](https://doi.org/10.12085/04eebf69-5509-430b-90c9-467169aba218)

Please cite this dataset as:
Feng, Yuming, Kovee, Wolfgang, Keller, David P., and Oschlies, Andreas (2017). Supplementary Data to "Model-based Assessment of the CO2 Sequestration Potential of Coastal Ocean Alkalinization" [Supplementary Dataset]. [hdi:20.500.12085/04eebf69-5509-430b-90c9-467169aba218](https://doi.org/10.12085/04eebf69-5509-430b-90c9-467169aba218)

Copy Data Citation

Supplement to IOpen Access:
Feng, Yuming, Kovee, Wolfgang, Keller, David P., and Oschlies, Andreas (2017). Model-based Assessment of the CO2 Sequestration Potential of Coastal Ocean Alkalinization. *Earth's Future*, 5, 1252-1266. doi:10.1002/2017EF000659

Data

Name	Last modified	Size
data_processing	2017-11-13 15:32	2.7 GB
figure_sources	2017-11-13 15:32	232.7 MB

Thredds browser view:

GEOMAR Catalog <https://data.geomar.de/thredds/20.500.12085/04eebf69-5509-430b-90c9-467169aba218/catalog.html>

Dataset	Size	Last Modified
Supplementary Data to "Model-based Assessment of the CO2 Sequestration Potential of Coastal Ocean Alkalinization" (hdi:20.500.12085/04eebf69-5509-430b-90c9-467169aba218)		
README.txt	5,532 Kbytes	2017-11-13T14:45:52Z
data_processing/		
figure_sources/		
model_runs/		

GEOMAR THREDDS Server at GEOMAR Helmholtz Centre for Ocean Research Kiel see [Info](#)
THREDDS Data Server (Version 4.6.15 - 2020-06-16T13:36:16-0600) [Documentation](#)

Clicking on a *.nc entry gives you further access options:

GEOMAR Catalog https://data.geomar.de/thredds/20.500.12085/04eebf69-5509-430b-90c9-467169aba218/model_runs/oliv1000_Omega3.4/results/catalog.html

Dataset	Size	Last Modified
results		
avg_02021.01.01.nc	2,384 Gbytes	2017-11-13T14:42:45Z
tsi_02021.01.01.nc	54,57 Kbytes	2017-11-13T14:42:45Z

GEOMAR THREDDS Server at GEOMAR Helmholtz Centre for Ocean Research Kiel see [Info](#)
THREDDS Data Server (Version 4.6.15 - 2020-06-16T13:36:16-0600) [Documentation](#)

Overview of options for accessing single NetCDF files:

GEOMAR THREDDS Server
THREDDS Data Server

Catalog https://data.geomar.de/thredds/20.500.12085/04eebf69-5509-430b-90c9-467169aba218/model_runs/oliv1000_Omega3.4/results/catalog.html

Dataset: results/avg.02021.01.01.nc

- Data format: netCDF
- Data size: 2,384 Gbytes
- Data type: GRIB
- Named Authority: de:geomar
- DOI: 10.500.12085/04eebf69-5509-430b-90c9-467169aba218/model_runs/oliv1000_Omega3.4/results/avg.02021.01.01.nc

Documentation:

- Model-based Assessment of the CO2 Sequestration Potential of Coastal Ocean Alkalinization (doi:10.1002/2017EF000659)
- Model-based Assessment of the CO2 Sequestration Potential of Coastal Ocean Alkalinization (http://www.geomar.de/04eebf69-5509-430b-90c9-467169aba218)
- Figure: see, by, 4, 9
- Summary: The potential of Coastal Ocean Alkalinization (COA), as ocean decadal removal (CDR), ocean engineering strategy that chemically increases ocean carbon uptake and storage, is investigated with an Earth system model of intermediate complexity. The CDR potential and possible environmental side effects are estimated for various COA deployment scenarios, assuming saline as the salinity source in the coastal waters (about 3.0‰ of the global ocean's surface area), with alkalinity ratio being a function of grain size, ambient seawater temperature and pH. Our results indicate that for a large enough saline deployment of small enough grain sizes (10 Tera, assuming CO2 could be released by more than 100 GtC by the year 2100), however, COA with coarse saline grains (1000 Tera) has the CO2 sequestration potential on this time scale. Ambitious CDR with fine saline grains would increase coastal upwelling and thus in turn may have negative effects on the marine ecosystem. When trapping super levels for ammonia saturation levels (SML) in the grid boxes subject to COA (SML > 2.5 and 2.0 above sea level), COA still has the potential to reduce atmospheric CO2 by 200 GtC (SML > 3.0 by 700 GtC (SML > 3.0 and increase open

Access:

- OPENDAP: hdi:20.500.12085/04eebf69-5509-430b-90c9-467169aba218/model_runs/oliv1000_Omega3.4/results/avg.02021.01.01.nc
- HTTPServer: hdi:20.500.12085/04eebf69-5509-430b-90c9-467169aba218/model_runs/oliv1000_Omega3.4/results/avg.02021.01.01.nc
- WCS: hdi:20.500.12085/04eebf69-5509-430b-90c9-467169aba218/model_runs/oliv1000_Omega3.4/results/avg.02021.01.01.nc
- WMS: hdi:20.500.12085/04eebf69-5509-430b-90c9-467169aba218/model_runs/oliv1000_Omega3.4/results/avg.02021.01.01.nc
- NetCDFServer: hdi:20.500.12085/04eebf69-5509-430b-90c9-467169aba218/model_runs/oliv1000_Omega3.4/results/avg.02021.01.01.nc
- NetCDF: hdi:20.500.12085/04eebf69-5509-430b-90c9-467169aba218/model_runs/oliv1000_Omega3.4/results/avg.02021.01.01.nc
- UDOC: hdi:20.500.12085/04eebf69-5509-430b-90c9-467169aba218/model_runs/oliv1000_Omega3.4/results/avg.02021.01.01.nc
- ISO: hdi:20.500.12085/04eebf69-5509-430b-90c9-467169aba218/model_runs/oliv1000_Omega3.4/results/avg.02021.01.01.nc

Keywords:

- ocean circulation
- ocean circulation
- ocean circulation
- ocean circulation
- ocean circulation

Dates:

- 2017-11-13T14:42:45Z (modified)
- 2017-12-01 (issue)

Projects:

- IPF 1000
- IPF 1000
- IPF 1000
- IPF 1000
- IPF 1000

https://hdi:20.500.12085/04eebf69-5509-430b-90c9-467169aba218/model_runs/oliv1000_Omega3.4/results/avg.02021.01.01.nc

3.2.1 OPeNDAP Data Link

By clicking on the OPeNDAP-Link, you will get the OPeNDAP Dataset Access Form. Via OPeNDAP you can work on a subset of the dataset file without the need to download it to your computer. You can copy the **'Data URL'** and use it with your favorite software like Matlab etc. . In the other form fields, all variables of the dataset are listed.

The screenshot shows the OPeNDAP Dataset Access Form. At the top, there are three buttons: 'Get ASCII', 'Get Binary', and 'Show Help'. Below them is a 'Data URL' field containing the URL: `https://data.geomar.de/thredds/dodsC/20.500.12085/04eebf69-5509-430b-90c9-4671`. Underneath is a 'Global Attributes' section with a text area containing metadata: `Conventions: ACDD 1.3, Unidata Dataset Discovery v1.0`, `experiment_name:`, `run_stamp:`, `Metadata_Conventions: ACDD 1.3, Unidata Dataset Discovery v1.0`, and `title: Supplementary Data to "Model-based Assessment of the CO2 Sequestration Potential of Coastal Ocean Alkalinization"`. Below this is a 'Variables' section with four checked variables: 'time' (Array of 64 bit Reals [time = 0.79]), 'T_avgper' (Array of 32 bit Reals [time = 0.79]), 'longitude' (Array of 64 bit Reals [longitude = 0.89]), and 'Q_dsk' (Array of 64 bit Reals [longitude = 0.89]). Each variable has a text area showing its properties like fill value, missing value, axis, long name, standard name, and units.

You can get one subset of the data by checking the box of the interested variable (here e.g. L_soiltemp).

This screenshot shows the selection interface for the 'L_soiltemp' variable. A checkbox next to 'L_soiltemp: Grid' is checked. Below it are three input fields for 'time: 0:1:0', 'latitude: 0:1:0', and 'longitude: 0:1:0'. A large text area below these fields contains the following metadata: `valid_range: -1.0E20, 1.0E20`, `FillValue: 9.96921E36`, `missing_value: 9.96921E36`, `long_name: soil temperature`, `standard_name: soil_temperature`, and `units: C`.

Then click on the **'Get ASCII'** button at the top of the form.

This screenshot shows the OPeNDAP Dataset Access Form with a red arrow pointing to the 'Get ASCII' button. The 'Data URL' field is the same as in the previous screenshot. The 'Global Attributes' and 'Variables' sections are also visible, with the 'time' variable selected. The 'Get ASCII' button is highlighted with a red arrow.

You will get the following result:

```
Dataset {
  Grid {
    ARRAY:
      Float32 L_soiltemp[time = 1][latitude = 1][longitude = 1];
    MAPS:
      Float64 time[time = 1];
      Float64 latitude[latitude = 1];
      Float64 longitude[longitude = 1];
  } L_soiltemp;
} 20.500.12085/04ee6b69-5509-430b-90c9-467169aba218/model_runs/oliv1000_Omega3.4/results/tavg.02021.01.01.nc;
-----
L_soiltemp.L_soiltemp[1][1][1]
[0][0], 9.96921E36

L_soiltemp.time[1]
2020.5

L_soiltemp.latitude[1]
-89.0999984741211

L_soiltemp.longitude[1]
1.7999999523162842
```

If you have a look at the Data URL again, you will see that your subset of interest was added to the URL: e.g.


[https://data.geomar.de/thredds/dodsC/20.500.12085/04ee6b69-5509-430b-90c9-467169aba218/model_runs/oliv1000_Omega3.4/results/tavg.02021.01.01.nc?L_soiltemp\[0:1:0\]\[0:1:0\]\[0:1:0\]](https://data.geomar.de/thredds/dodsC/20.500.12085/04ee6b69-5509-430b-90c9-467169aba218/model_runs/oliv1000_Omega3.4/results/tavg.02021.01.01.nc?L_soiltemp[0:1:0][0:1:0][0:1:0])

You can also use this URL with your favorite software and you will get your subset of interest.

3.2.2 NetcdfSubset (NCSS)

If you follow the link "4. NetcdfSubset" on the Thredds overview of a Netcdf file, you will get to the NCSS interface. Here you can select which variables you would like to have and in which region. It may be worth taking a look at the NCSS documentation (link at the bottom of the page), where you can compile a URL for individual, customized downloads (parameters minx,miny,maxx,maxy) and build a *wget* script, for example.

NCSS for Grids (Grid as Point Dataset)



THREDDS data server NetCDF Subset Service

Dataset: /thredds/ncss/20.500.12085/04ee6b69-5509-430b-90c9-467169aba218/model_runs/oliv1000_Omega3.4/results/tavg.02021.01.01.nc (Dataset Description)

Base Time: 2021-11-03T20:42:11.881Z


Select Variable(s):

- G_areaT = tracer grid area
- G_areaU = velocity grid area
- G_depth = ocean grid depth level
- G_latT = tracer grid latitude
- G_latU = velocity grid latitude
- G_lonT = tracer grid longitude
- G_lonU = velocity grid longitude
- G_maskr = horizontal region mask
- G_maskt = ocean mask
- L_elev = land elevation and ocean depth
- L_rivers = river basin number
- O_mvisc = meridional viscosity
- O_visc = zonal viscosity

Variables with available Times: 2020.5 2021.5 2022.5 2023.5 2024.5 2025.5 2026.5 2027.5 2028.5 2029.5 2030.5 2031.5 2032.5 2033.5 2034.5 2035.5 2036.5 2037.5 2038.5 2039.5 2040.5 2041.5 2042.5 2043.5 2044.5 2045.5 2046.5 2047.5 2048.5 2049.5 2050.5 2051.5 2052.5 2053.5 2054.5 2055.5 2056.5 2057.5 2058.5 2059.5 2060.5 2061.5 2062.5 2063.5 2064.5 2065.5 2066.5 2067.5 2068.5 2069.5 2070.5 2071.5 2072.5 2073.5 2074.5 2075.5 2076.5 2077.5 2078.5 2079.5 2080.5 2081.5 2082.5 2083.5 2084.5 2085.5 2086.5 2087.5 2088.5 2089.5 2090.5 2091.5 2092.5 2093.5 2094.5 2095.5 2096.5 2097.5 2098.5 2099.5 years since 0-1-1

- A_albalm = atmospheric albedo
- A_albopl = planetary albedo
- A_albsur = surface albedo
- A_apress = anomalous surface pressure
- A_avgstl = running average sea level atmospheric temperature
- A_aveirc = eastward wind anomaly
- A_aveircy = northward wind anomaly
- A_diffK = eastward diffusion for humidity
- A_diffT = northward diffusion for humidity
- A_diffK = eastward diffusion for temperature
- A_diffT = northward diffusion for temperature
- A_sst = atmospheric surface temperature
- A_sst = atmospheric surface specific humidity
- A_sst = sea level atmospheric temperature
- A_windx = eastward wind for advection of humidity
- A_windxY = northward wind for advection of humidity
- A_windsd = surface wind speed
- A_windx = eastward wind for advection of temperature
- A_windxY = northward wind for advection of temperature
- F_sfc = surface downward alkalinity flux
- F_dc = surface downward carbon flux
- F_dhswr = surface net downward shortwave (absorbed)
- F_evap = upward evaporation plus sublimation

Choose Spatial Subset:



Lat/Lon subset: Coordinate subset
Bounding box, in decimal degrees (initial extents are approximate):

north: 90.0000
west: 1.7999 360.0000 east
-89.0999
south

Disable horizontal subsetting
reset to full extension

Horizontal Stride: 1

Choose Time Subset:

Time range: Single time
Start: 2021-11-03T20:42:11.881Z
End: 2100-11-22T23:54:43.883Z
Stride: 1
reset to full extension

Choose Vertical Level:

Single Level Vertical Stride
Level: _____

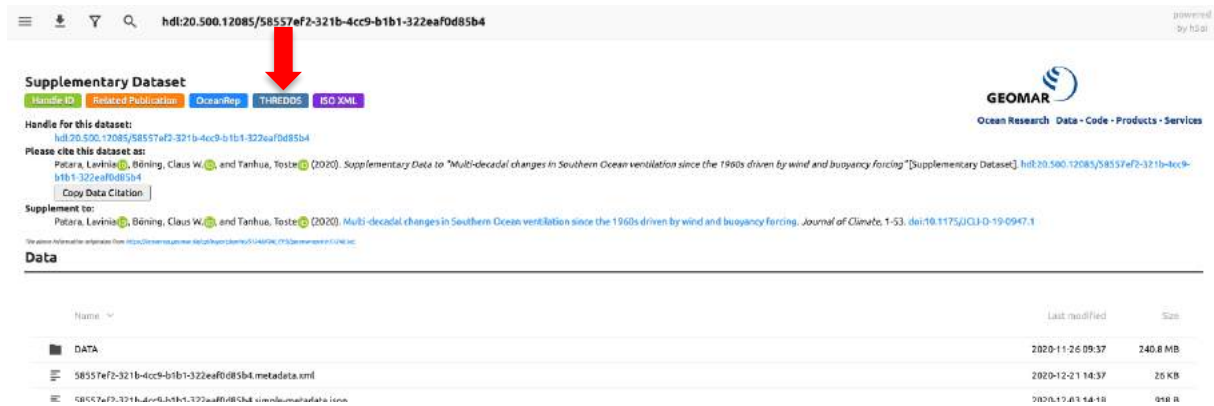
Add 2D Lat/Lon to file (if needed for CF compliance)
 Add Lat/Lon variables

Choose Output Format:
Format: netcdf

3.2.3 GODIVA2

Go to the Thredds overview of a Netcdf file and click on the first link "Godiva2" under "Viewers".

e.g. <https://hdl.handle.net/20.500.12085/58557ef2-321b-4cc9-b1b1-322eaf0d85b4>



hdl:20.500.12085/58557ef2-321b-4cc9-b1b1-322eaf0d85b4

powered by hdl

Supplementary Dataset

Handle for this dataset: [hdl:20.500.12085/58557ef2-321b-4cc9-b1b1-322eaf0d85b4](https://hdl.handle.net/20.500.12085/58557ef2-321b-4cc9-b1b1-322eaf0d85b4)

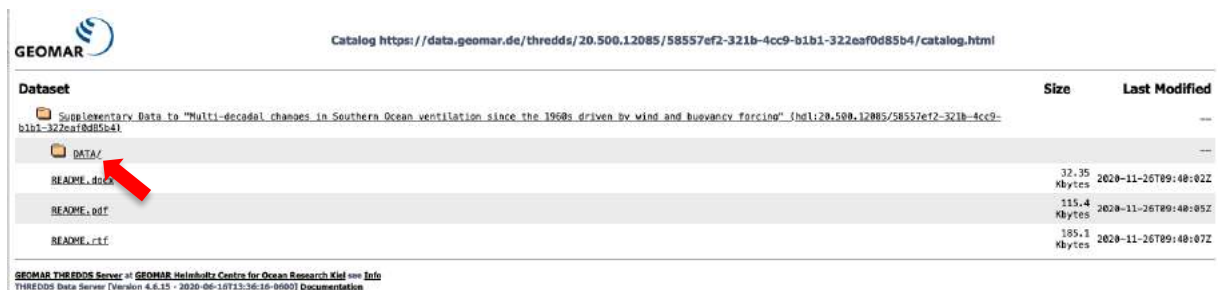
Please cite this dataset as: Patara, Levhia, Böning, Claus W., and Tanhua, Toste (2020). Supplementary Data to "Multi-decadal changes in Southern Ocean ventilation since the 1960s driven by wind and buoyancy forcing" [Supplementary Dataset]. [hdl:20.500.12085/58557ef2-321b-4cc9-b1b1-322eaf0d85b4](https://hdl.handle.net/20.500.12085/58557ef2-321b-4cc9-b1b1-322eaf0d85b4)

Supplement to: Patara, Levhia, Böning, Claus W., and Tanhua, Toste (2020). Multi-decadal changes in Southern Ocean ventilation since the 1960s driven by wind and buoyancy forcing. *Journal of Climate*. 1-53. doi:10.1175/JCLI-D-19-0947.1

Data

Name	Last modified	Size
DATA	2020-11-26 09:37	240.8 MB
58557ef2-321b-4cc9-b1b1-322eaf0d85b4.metadata.xml	2020-12-21 14:37	26 KB
58557ef2-321b-4cc9-b1b1-322eaf0d85b4.viewmetadata.html	2020-12-21 14:18	918 B

THREDDS browser view:

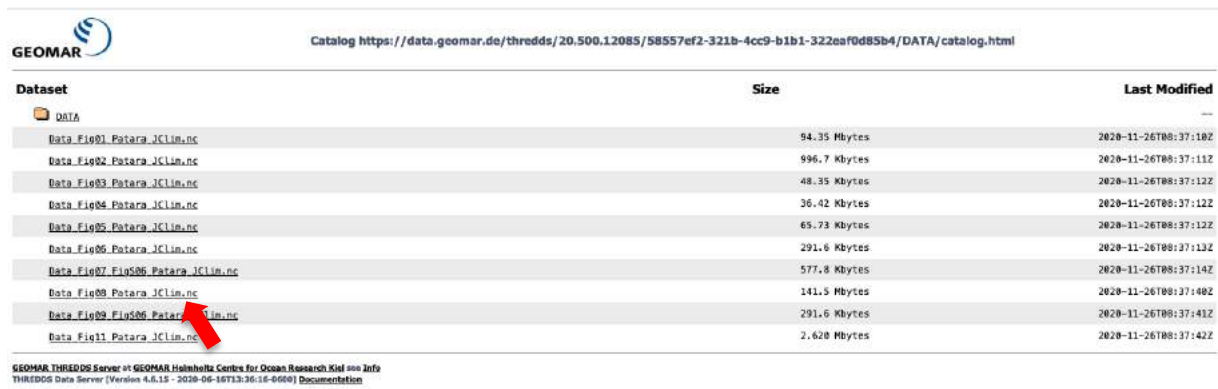


Catalog <https://data.geomar.de/thredds/20.500.12085/58557ef2-321b-4cc9-b1b1-322eaf0d85b4/catalog.html>

Dataset	Size	Last Modified
Supplementary Data to "Multi-decadal changes in Southern Ocean ventilation since the 1960s driven by wind and buoyancy forcing" (hdl:20.500.12085/58557ef2-321b-4cc9-b1b1-322eaf0d85b4)		
DATA		
README.docx	32.35 Kbytes	2020-11-26T09:40:02Z
README.pdf	115.4 Kbytes	2020-11-26T09:40:05Z
README.rtf	185.1 Kbytes	2020-11-26T09:40:07Z

GEOMAR THREDDS Server at GEOMAR Helmholtz Centre for Ocean Research Kiel
THREDDS Data Server [Version 4.6.15 - 2020-06-10T13:36:16-0600] [Documentation](#)

Clicking on a *.nc entry gives you the different viewers access options:



Catalog <https://data.geomar.de/thredds/20.500.12085/58557ef2-321b-4cc9-b1b1-322eaf0d85b4/DATA/catalog.html>

Dataset	Size	Last Modified
DATA		
Data_Fig01_Patara_JCLim.nc	94.35 Mbytes	2020-11-26T08:37:18Z
Data_Fig02_Patara_JCLim.nc	996.7 Kbytes	2020-11-26T08:37:11Z
Data_Fig03_Patara_JCLim.nc	48.35 Kbytes	2020-11-26T08:37:12Z
Data_Fig04_Patara_JCLim.nc	36.42 Kbytes	2020-11-26T08:37:12Z
Data_Fig05_Patara_JCLim.nc	65.73 Kbytes	2020-11-26T08:37:12Z
Data_Fig06_Patara_JCLim.nc	291.6 Kbytes	2020-11-26T08:37:13Z
Data_Fig07_Fig06_Patara_JCLim.nc	577.8 Kbytes	2020-11-26T08:37:14Z
Data_Fig08_Patara_JCLim.nc	141.5 Mbytes	2020-11-26T08:37:40Z
Data_Fig09_Fig06_Patara_JCLim.nc	291.6 Kbytes	2020-11-26T08:37:41Z
Data_Fig11_Patara_JCLim.nc	2.620 Mbytes	2020-11-26T08:37:42Z

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THREDDS Data Server [Version 4.6.15 - 2020-06-10T13:36:16-0600] [Documentation](#)

Click on **Godiva2'** viewer at the bottom of the page.

GEOMAR THREDDS Server
THREDDS Data Server
 Catalog <https://data.geomar.de/thredds/Z0.500.12085/58557e2-321b-4cc9-b1b1-322ae0f0d85b4/DATA/catalog.html>
 Dataset: DATA/Data_Fig08_Patara_JClim.nc

- Data format: netCDF
- Data size: 141.5 Mbytes
- Data type: GRIB
- Nothing Available: de.globe4p
- ID: Z0.500.12085/58557e2-321b-4cc9-b1b1-322ae0f0d85b4/DATA/Data_Fig08_Patara_JClim.nc

Documentation:

• Multi-decadal changes in Southern Ocean ventilation since the 1960s driven by wind and buoyancy forcing (doi:10.1175/JCLI-D-15-0541.1)
 • Multi-decadal changes in Southern Ocean ventilation since the 1960s driven by wind and buoyancy forcing (https://www.giss.nasa.gov/content/20160414)
 • Summary: Enhanced Southern Ocean ventilation in recent decades has been suggested to be a relevant modulator of the ocean's carbon uptake. This study focuses on the Southern Ocean mid-latitude ventilation changes from the 1950s to the 2010s. A global 10° configuration of the NEMO-LIM2 ocean model including the inert tracer CFC-12 (a proxy of ocean ventilation) is combined with the CORE-B and JMAN-BuOBS datasets. Simulated experiments, where the variability of wind stress and the buoyancy forcing is experimentally varied, are used to separate the mechanisms driving ventilation changes. Ventilation changes are estimated by computing CFC-12 interior inventories along the 10°E zonal cross-section. All simulations suggest a multi-decadal fluctuation of Southern Ocean ventilation, with a decrease until the 1980s-1990s and a subsequent increase. This evolution is related to the atmospheric forcing and is caused by the (often counteracting) effects of wind stress and buoyancy forcing. Buoyancy gain is crucial for the ventilation increase, whereas the subsequent ventilation increase was driven by strengthened wind stress causing deeper mixed layers and a stronger meridional overturning circulation. Wind stress emerges as the main driver of ventilation changes, even though buoyancy forcing modulates its trend and decadal variability. The three Southern Ocean times lags in CFC-12 in distinct decadal intervals but overall respond similarly to the atmospheric forcing. This study suggests that Southern Ocean ventilation is expected to increase as long as the effect of increasing Southern Ocean negative wind stress overweighs that of increased stratification.

Access:

1. OPENURL: https://data.geomar.de/Z0.500.12085/58557e2-321b-4cc9-b1b1-322ae0f0d85b4/DATA/Data_Fig08_Patara_JClim.nc
2. HTTPHeader: https://data.geomar.de/Z0.500.12085/58557e2-321b-4cc9-b1b1-322ae0f0d85b4/DATA/Data_Fig08_Patara_JClim.nc
3. WCS: https://data.geomar.de/Z0.500.12085/58557e2-321b-4cc9-b1b1-322ae0f0d85b4/DATA/Data_Fig08_Patara_JClim.nc
4. WMS: https://data.geomar.de/Z0.500.12085/58557e2-321b-4cc9-b1b1-322ae0f0d85b4/DATA/Data_Fig08_Patara_JClim.nc
5. NetCDFURL: https://data.geomar.de/Z0.500.12085/58557e2-321b-4cc9-b1b1-322ae0f0d85b4/DATA/Data_Fig08_Patara_JClim.nc
6. NDLML: https://data.geomar.de/Z0.500.12085/58557e2-321b-4cc9-b1b1-322ae0f0d85b4/DATA/Data_Fig08_Patara_JClim.nc
7. UDDC: https://data.geomar.de/Z0.500.12085/58557e2-321b-4cc9-b1b1-322ae0f0d85b4/DATA/Data_Fig08_Patara_JClim.nc
8. SDO: https://data.geomar.de/Z0.500.12085/58557e2-321b-4cc9-b1b1-322ae0f0d85b4/DATA/Data_Fig08_Patara_JClim.nc

Dates:

- 2025-11-24 10:58:57 (local time)
- 2025-12-01 (local time)

Projects:

- Future Ocean

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Viewers:

- Godiva2 (browser-based)
- NetCDF-Java 3.6.0.0 (webGUI)
- Integrated Data Viewer (IDV) (webGUI)



Godiva2' viewer:

Auto-zoom on select

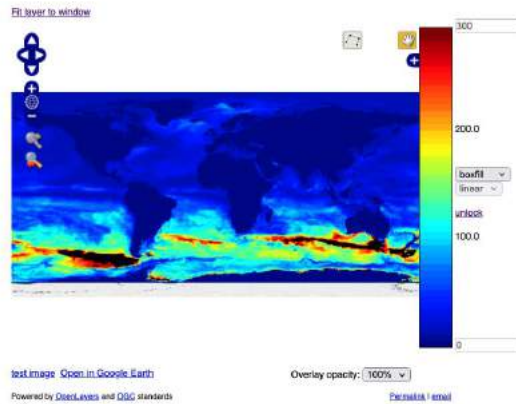
GEOMAR THREDDS Server

Supplementary Data to 44034/Multi-decadal changes in Southern Ocean ventilation since the 1960s driven by wind and buoyancy forcing#034;

- CORE_CLIM_mid_1996_2005_clim_sep
- CORE_CLIM_Qw_1996_2005_clim_yy
- CORE_CLIM_QH_1996_2005_clim_yy
- CORE_CLIM_QB_1996_2005_clim_yy
- CORE_CLIM_gamma_1996_2005_clim_yy
- CORE_HIND_mid_1996_2005_clim_sep
- CORE_HIND_Qw_1996_2005_clim_yy
- CORE_HIND_QH_1996_2005_clim_yy
- CORE_HIND_QB_1996_2005_clim_yy
- CORE_HIND_gamma_1996_2005_clim_yy

User guide

Layer: GEOMAR THREDDS Server > Supplementary Data to "Multi-decadal changes in Southern Ocean ventilation since the 1960s driven by wind and buoyancy forcing" > CORE_CLIM_mid_1996_2005_clim_sep
 Units:



Select the variable and the time and modify the graphic. There is also a Google Earth link at the bottom of the graphics window and the animation function if you define the first and last frame via the drop-down menus and the links next to it. Additionally you can create an animation and a kmz file via the Google-Earth link and open it in Google-Earth.

If you have other questions or comments please contact the data management team:

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E-Mail: datamanagement@geomar.de

Location: Eastshore / Building 1/ Entrance 2/ Room 110 - 112

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