FROM THE DEEP SEA TO THE ATMOSPHERE

Establishing “Best practice” data workflows in marine research

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RESEARCH FOR GRAND CHALLENGES

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Practising data management: who, when and how

- The components of data management @GEOMAR

- Examples:

    - Expeditions
    - Mesocosm experiments
    - Ocean modeling

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Central data management workflow @ GEOMAR

- Agreement on one **data management plan** (expected data, responsible persons, timeframes)
- One **information system** with metadata and linked data for exchange and monitoring deliverables
- **Versioning systems** (git/subversion)
- Accessibility and reuseability of research data based on **persistent identifiers** (DOI + handle)

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Data management plan (DMP)

- The **DMP** describes the expected data and how and when they will be handled, stored and made available
- The information system **keeps track** on the **deliverables** and sends reminder
- The result is an **overview on the outcome** of the project => data management record

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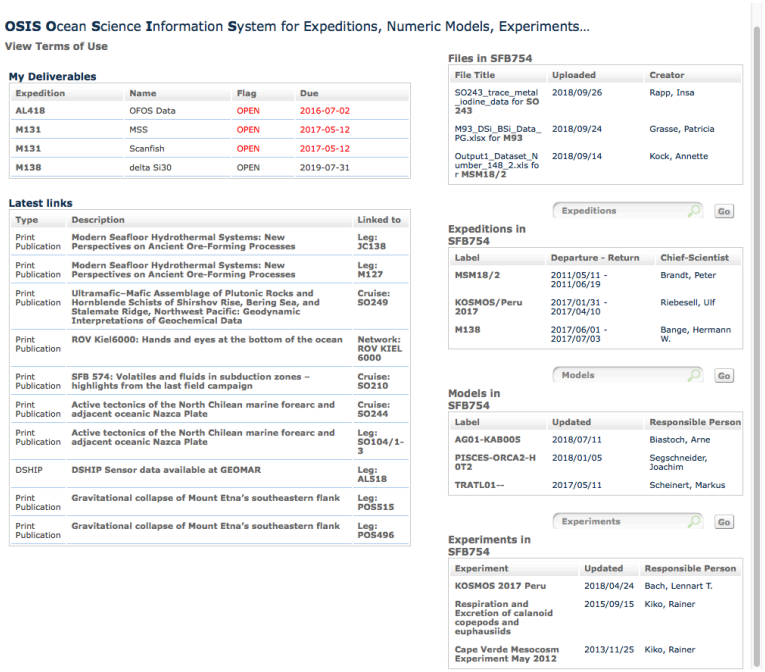
Ocean Science Information System - OSIS



OSIS Ocean Science Information System for Expeditions, Numeric Models, Experiments...

View Terms of Use

My Deliverables

Expedition	Name	Flag	Due
AL418	OFOS Data	OPEN	2016-07-02
M131	MSS	OPEN	2017-05-12
M131	Scanfish	OPEN	2017-05-12
M138	delta Si30	OPEN	2019-07-31

Latest links

Type	Description	Linked to
Print Publication	Modern Seafloor Hydrothermal Systems: New Perspectives on Ancient Ore-Forming Processes	Leg: JC138
Print Publication	Modern Seafloor Hydrothermal Systems: New Perspectives on Ancient Ore-Forming Processes	Leg: M127
Print Publication	Ultramafic–Mafic Assemblage of Plutonic Rocks and Hornblende Schists of Shirshov Rise, Bering Sea, and Stalemate Ridge, Northwest Pacific: Geodynamic Interpretations of Geochemical Data	Cruise: SO249
Print Publication	ROV Kiel6000: Hands and eyes at the bottom of the ocean	Network: ROV KIEL 6000
Print Publication	SFB 574: Volatiles and fluids in subduction zones – highlights from the last field campaign	Cruise: SO210
Print Publication	Active tectonics of the North Chilean marine forearc and adjacent oceanic Nazca Plate	Cruise: SO244
Print Publication	Active tectonics of the North Chilean marine forearc and adjacent oceanic Nazca Plate	Leg: SO104/1-3
DSHIP	DSHIP Sensor data available at GEOMAR	Leg: AL518
Print Publication	Gravitational collapse of Mount Etna's southeastern flank	Leg: POS515
Print Publication	Gravitational collapse of Mount Etna's southeastern flank	Leg: POS496

Files in SFB754

File Title	Uploaded	Creator
SO243_trace_metal_iodine_data for SO243	2018/09/26	Rapp, Insa
M93_DSi_BSi_Data_PG.xlsx for M93	2018/09/24	Grasse, Patricia
Output1_Dataset_Number_148_2.xls for MSM18/2	2018/09/14	Kock, Annette

Expeditions Go

Expeditions in SFB754

Label	Departure - Return	Chief-Scientist
MSM18/2	2011/05/11 - 2011/06/19	Brandt, Peter
KOSMOS/Peru 2017	2017/01/31 - 2017/04/10	Riebesell, Ulf
M138	2017/06/01 - 2017/07/03	Bange, Hermann W.

Models Go

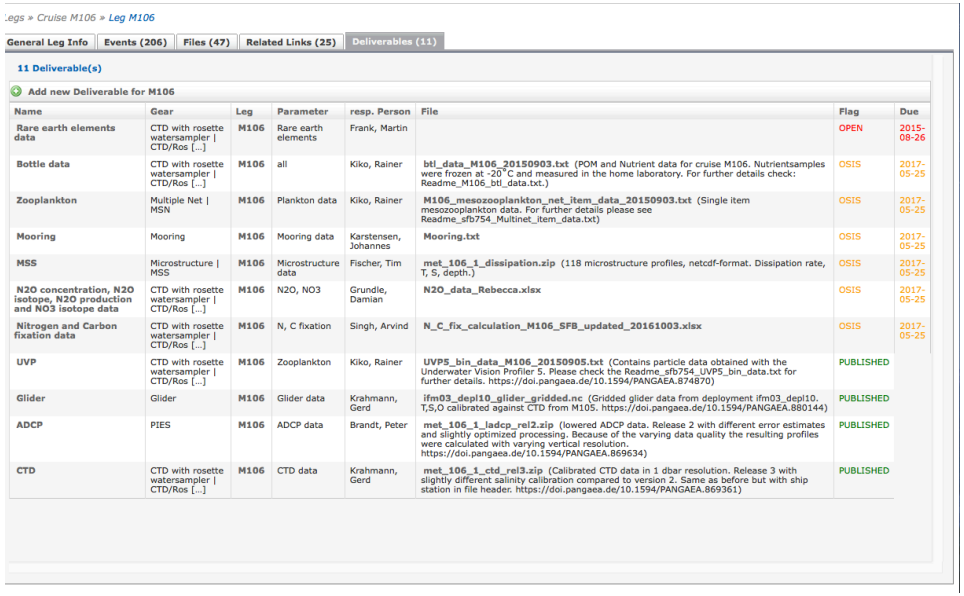
Models in SFB754

Label	Updated	Responsible Person
AG01-KAB005	2018/07/11	Biastoch, Arne
PISCES-ORCA2-H0T2	2018/01/05	Segschneider, Joachim
TRATL01--	2017/05/11	Scheinert, Markus

Experiments Go

Experiments in SFB754

Experiment	Updated	Responsible Person
KOSMOS 2017 Peru	2018/04/24	Bach, Lennart T.
Respiration and Excretion of calanoid copepods and euphausiids	2015/09/15	Kiko, Rainer
Cape Verde Mesocosm Experiment May 2012	2013/11/25	Kiko, Rainer



...egs » Cruise M106 » Leg M106

General Leg Info | Events (206) | Files (47) | Related Links (25) | Deliverables (11)

11 Deliverable(s)

Add new Deliverable for M106

Name	Gear	Leg	Parameter	resp. Person	File	Flag	Due
Rare earth elements data	CTD with rosette watersampler | CTD/Ros [...]	M106	Rare earth elements	Frank, Martin		OPEN	2015-08-26
Bottle data	CTD with rosette watersampler | CTD/Ros [...]	M106	all	Kiko, Rainer	btl_data_M106_20150903.txt (POM and Nutrient data for cruise M106. Nutrientsamples were frozen at -20°C and measured in the home laboratory. For further details check: Readme_M106_btl_data.txt.)	OSIS	2017-05-25
Zooplankton	Multiple Net | MSN	M106	Plankton data	Kiko, Rainer	M106_mesozooplankton_net_item_data_20150903.txt (Single item mesozooplankton data. For further details please see Readme_sfb754_Multinet_item_data.txt)	OSIS	2017-05-25
Mooring	Mooring	M106	Mooring data	Karstensen, Johannes	Mooring.txt	OSIS	2017-05-25
MSS	Microstructure | MSS	M106	Microstructure data	Fischer, Tim	met_106_1_dissipation.zip (118 microstructure profiles, netcdf-format. Dissipation rate, T, S, depth.)	OSIS	2017-05-25
N2O concentration, N2O isotope, N2O production and NO3 isotope data	CTD with rosette watersampler | CTD/Ros [...]	M106	N2O, NO3	Grundle, Damian	N2O_data_Rebecca.xlsx	OSIS	2017-05-25
Nitrogen and Carbon fixation data	CTD with rosette watersampler | CTD/Ros [...]	M106	N, C fixation	Singh, Arvind	N_C_fix_calculation_M106_SFB_updated_20161003.xlsx	OSIS	2017-05-25
UVP	CTD with rosette watersampler | CTD/Ros [...]	M106	Zooplankton	Kiko, Rainer	UVP5_bin_data_M106_20150905.txt (Contains particle data obtained with the Underwater Vision Profiler 5. Please check the Readme_sfb754_UVP5_bin_data.txt for further details. https://doi.pangaea.de/10.1594/PANGAEA.874870)	PUBLISHED	
Glider	Glider	M106	Glider data	Krahmann, Gerd	ifm03_depl10_glider_gridded.nc (Gridded glider data from deployment ifm03_depl10. T,S,O calibrated against CTD from M105. https://doi.pangaea.de/10.1594/PANGAEA.880144)	PUBLISHED	
ADCP	PIES	M106	ADCP data	Brandt, Peter	met_106_1_ladcp_rel2.zip (lowered ADCP data. Release 2 with different error estimates and slightly optimized processing. Because of the varying data quality the resulting profiles were calculated with varying vertical resolution. https://doi.pangaea.de/10.1594/PANGAEA.869634)	PUBLISHED	
CTD	CTD with rosette watersampler | CTD/Ros [...]	M106	CTD data	Krahmann, Gerd	met_106_1_ctd_rel3.zip (Calibrated CTD data in 1 dbar resolution. Release 3 with slightly different salinity calibration compared to version 2. Same as before but with ship station in file header. https://doi.pangaea.de/10.1594/PANGAEA.869361)	PUBLISHED	

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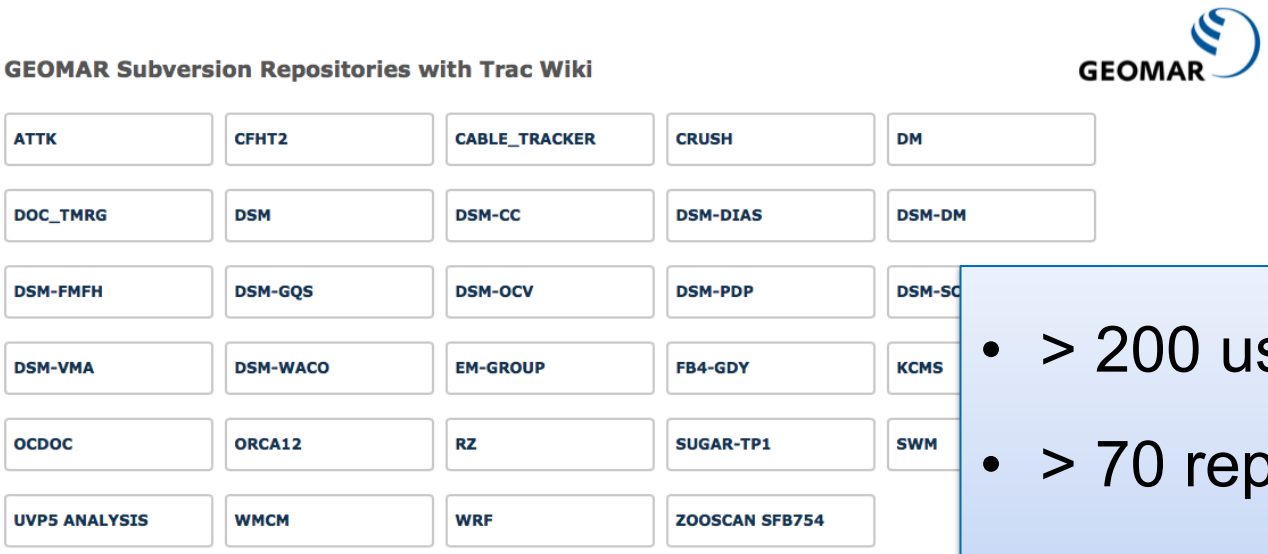
Versioning system: GEOMAR Subversion/Trac



- > 200 user
- > 70 repositories
- > 1 TB data + code

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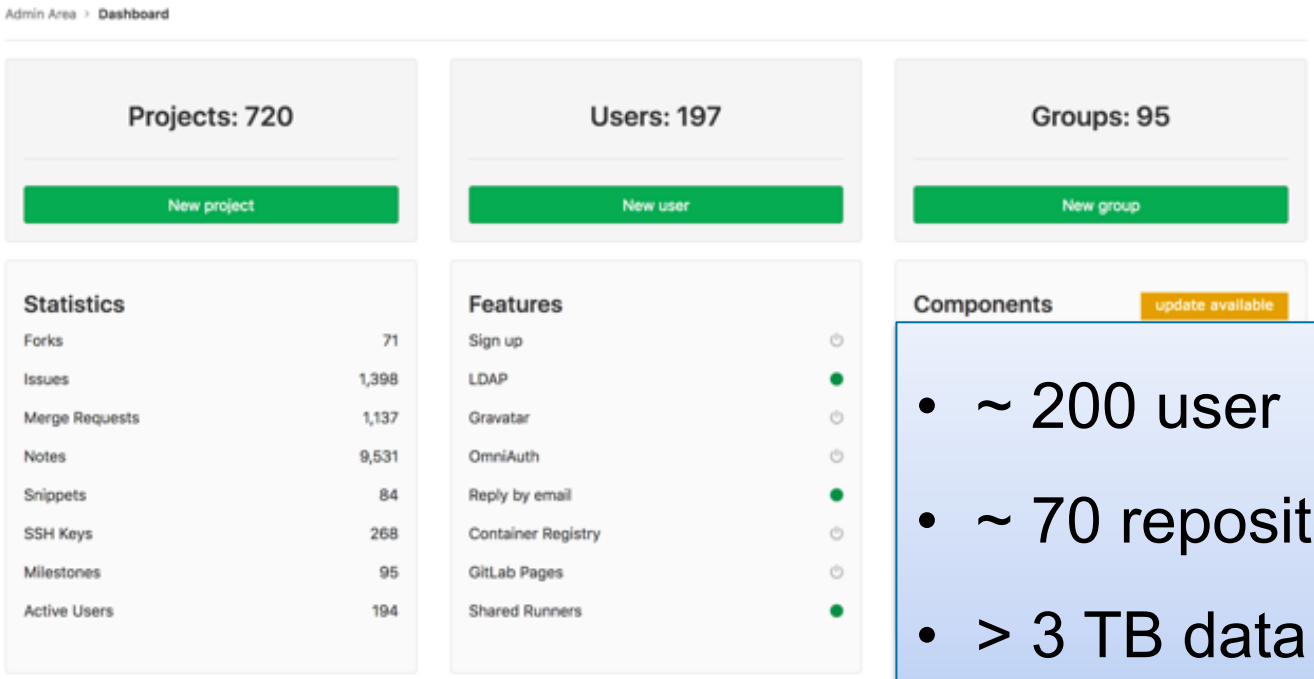
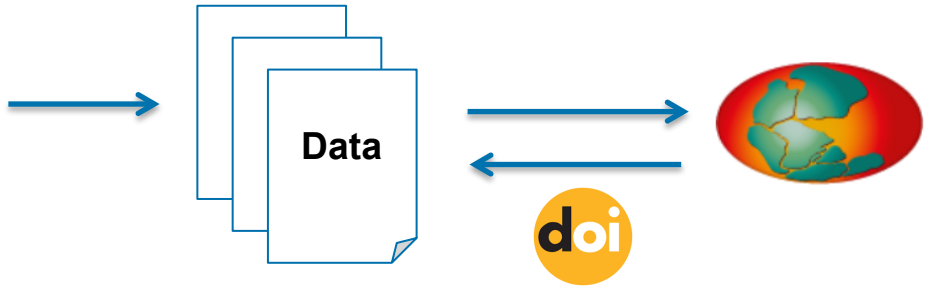
Versioning system: GEOMAR GitLab Server



- ~ 200 user
- ~ 70 repositories
- > 3 TB data + code

Persistent identifier

DOI-Registry at GEOMAR: Workflows



PANGAEA.

Data Publisher for Earth & Environmental Science

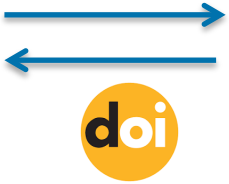
Scientists

METADATA, URL & zip-file

Software Code in (public) GitLab repository

GEOMAR Library/ OceanRep

METADATA & URL



DataCite

FIND, ACCESS, AND REUSE DATA

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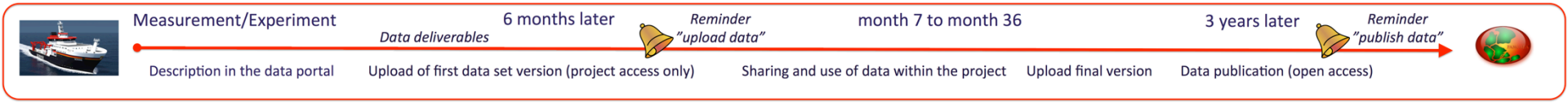
Example 1: Expedition workflow

Data curation process



- Cruise planning involves DMP components
- Data reminder in OSIS used for > 80 expeditions
- 220 deliverables done: data are openly available as data publications with DOI at PANGAEA

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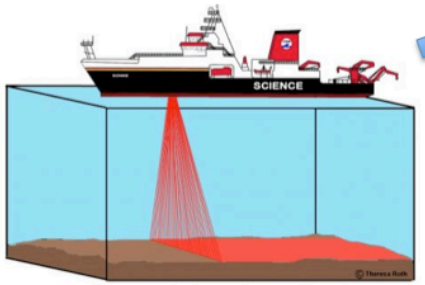
Workflow Bathymetry



http://www.oceanblogs.org ©Theresa Roth

DAVIS SHIP

Raw Data

+ Metadata

DATA

PANGAEA data sets

+ Quality Control

DATA

DATA

Data Products

Data availability:
World Data Centre
Long term archive
Public
Citable with DOI

AtlantOS

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Example 2: Mesocosm experiments

- Data policy finalised in June 2018
- Information System used for 10 experiments
- Data reminder used since June 2018
- 94 data publications with DOI at PANGAEA

Dataset Publication Year

- 2018 (17)
- 2017 (32)
- 2016 (34)
- 2015 (4)
- 2014 (2)
- 2013 (1)
- 2012 (1)
- 2010 (2)

more...

EXAMPLES

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Numerical Modeling Data - OPeNDAP Service

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Numerical Modeling Data Related to Peer Reviewed Journal Articles

2018 | 2017 | 2016 | 2015 | 2014 | 2013 | 2012 | before 2012

Biastoch et al. (2018), OM :: DOI 10.1016/j.ocemod.2017.12.002 :: Details in OceanRep

Greatbatch et al. (2018), JGR :: DOI 10.1002/2017JC013652 :: Details in OceanRep

Keller et al. (2018), GMD :: DOI 10.5194/gmd-11-1133-2018 :: Details in OceanRep

Kloewer et al. (2018), OM :: DOI 10.1016/j.ocemod.2018.09.006 :: Details in OceanRep

Rieck et al. (2018), JPO :: DOI 10.1175/JPO-D-17-0173.1 :: Details in OceanRep

Data Sets by Research Projects

Data Sets by Research Units

Software / Code

Bathymetric Data Sets

OPeNDAP based server provides access to **datasets of model experiments** published by GEOMAR researchers either via web browser for full downloads or for OPeNDAP queries on data (sub)sets.

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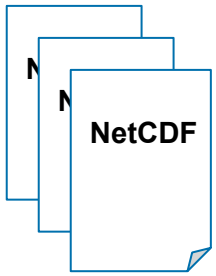
Catalog http://data.geomar.de/thredds/catalog/open_access/feng_et_al_2017_ef/catalog.html

Dataset	Size	Last Modified
Feng et al. (EF 2017)		--
README.txt	5.532 Kbytes	2017-11-13T15:45:52Z
data_processing/		--
feng_et_al_2017_ef_listing.txt	146.6 Kbytes	2017-11-15T15:01:05Z
figure_sources/		--
model_runs/		--

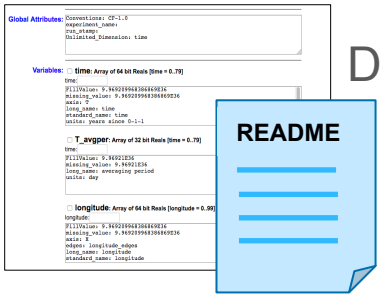
Catalog of Gridded Data at GEOMAR OPeNDAP Service see Info
THREDDS Data Server [Version 4.6.0 - 20150326.1318] Documentation

EXAMPLES

1. Preparation of model data for publication by data owner



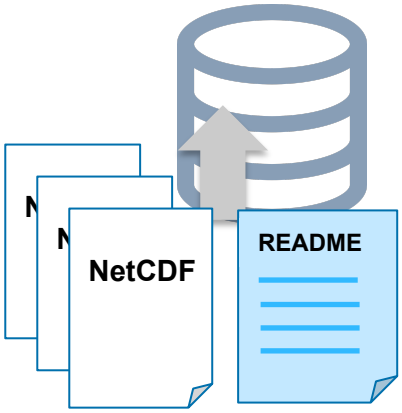
dataset organisation,
file formatting,
checksums



Metadata &
Documentation

GitLab for versioning,
project- & data management

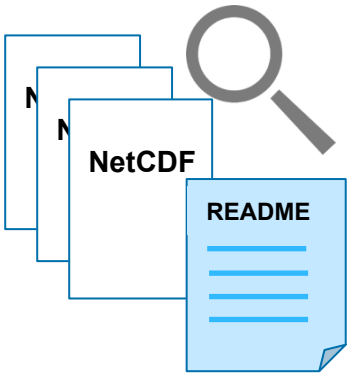
2. Dataset submission to the data management team



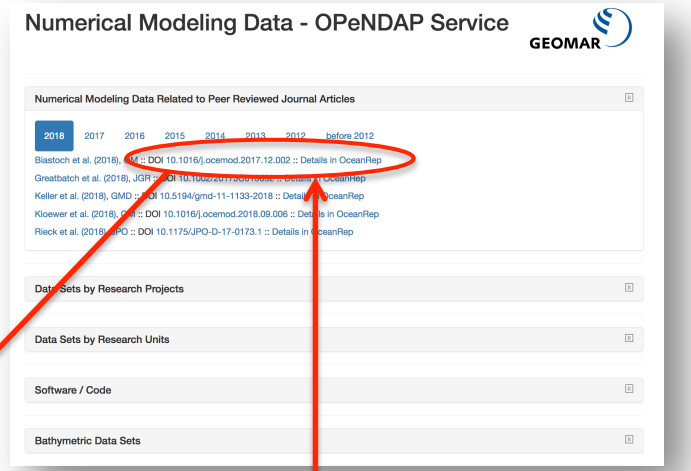
data transfer via
GEOMAR cloud or
(S)FTP server
&
data submission
information to DM
via web form

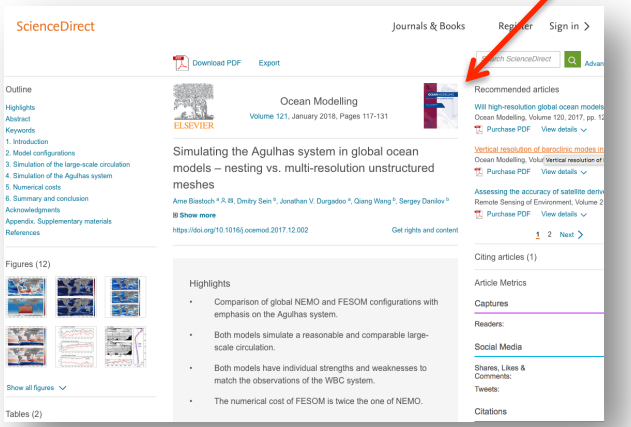
EXAMPLES

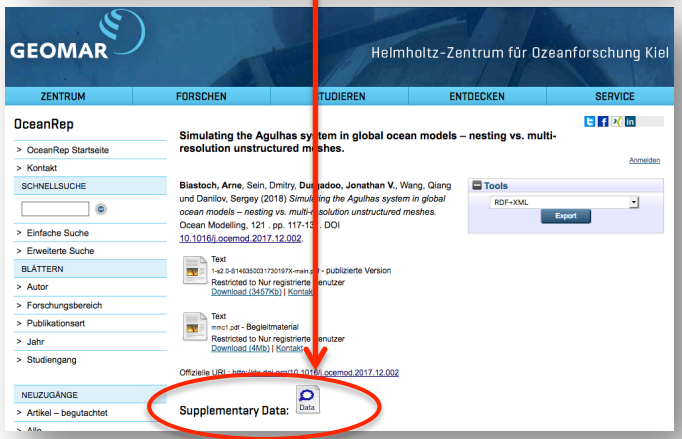
3. Data publication on data.geomar.de (OPeNDAP Service)



data integrity check
&
data dissemination
via THREDDS-Server
by data manager







Distribution of results

- OpenAire:

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Questions and comments?

Data Management Team @GEOMAR

datamanagement@geomar.de