



Adoption of Data Citation Outcomes by BCO-DMO

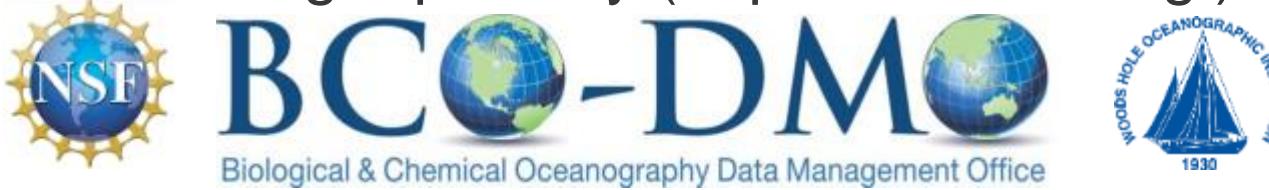
Cynthia Chandler, Adam Shepherd, David Bassendine
Biological and Chemical Oceanography Data Management Office
Woods Hole Oceanographic Institution and Blue Dot Labs

A world map is visible in the background, composed of green dots of varying sizes. These dots are concentrated in certain regions, such as North America and Europe, suggesting a global network of data sharing.

research data sharing without barriers
rd-alliance.org

A story of success enabled by RDA

- An existing repository (<http://bco-dmo.org/>)



- Research data curation for a decade
- Faced with new challenges, but no new funding
- e.g. data publication practices to support citation
- Used the outcomes from the RDA Data Citation Working Group to improve data publication and citation services

<https://www.rd-alliance.org/groups/data-citation-wg.html>

BCO-DMO Curated Data

- BCO-DMO is a thematic, domain-specific repository funded by NSF Ocean Sciences and Polar Programs
- BCO-DMO curated data are
 - Served: <http://bco-dmo.org> (URLs, URIs)
 - Published: at an Institutional Repository (CrossRef DOI)
<http://dx.doi.org/10.1575/1912/4847>
 - Archived: at NCEI, a US National Data Center
<http://data.nodc.noaa.gov/cgi-bin/iso?id=gov.noaa.nodc:0078575>

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for Linked Data URI: <http://lod.bco-dmo.org/id/dataset/3046>

| Version Date | Archive | Persistent Identifier | Date Assigned |
|--------------|---------------------------------------------------------------------------------------------------------|-----------------------------------|---------------|
| 2007-05-24 | National Oceanographic Data Center (NODC) | 0078575 | 2011-10-26 |
| 2007-05-24 | Marine Biological Laboratory/Woods Hole Oceanographic Institution Library (MBLWHOI DLA) | 10.1575/1912/4847 | 2011-10-12 |

RDA Data Citation (DC) of *evolving data*

- **DC goals:** to create identification mechanisms that:
 - allow us to identify and cite arbitrary views of data, from a single record to an entire data set in a precise, machine-actionable manner
 - allow us to cite and retrieve that data as it existed at a certain point in time, whether the database is static or highly dynamic
- **DC outcomes:** 14 recommendations and associated documentation
 - ensuring that data are stored in a versioned and timestamped manner
 - identifying data sets by storing and assigning persistent identifiers (PIDs) to timestamped queries that can be re-executed against the timestamped data store

<https://www.rd-alliance.org/groups/data-citation-wg.html>

RDA Data Citation WG Recommendations

- Preparing the Data and the Query Store
 - R1 - Data Versioning
 - R2 - Timestamping
 - R3 - Query Store Facilities
- Persistently Identifying Specific Data Sets
 - R4 - Query Uniqueness
 - R5 - Stable Sorting
 - R6 - Result Set Verification
 - R7 - Query Timestamping
 - R8 - Query PID
 - R9 - Store the Query
 - R10 - Automated Citation Texts
- Resolving PIDs and Retrieving the Data
 - R11 - Landing Page
 - R12 - Machine Actionability
- Upon modifications to the Data Infrastructure
 - R13 - Technology Migration
 - R14 - Migration Verification

- »»» **Data Versioning:** For retrieving earlier states of datasets the data need to be versioned. Markers shall indicate inserts, updates and deletes of data in the database.
- »»» **Data Timestamping:** Ensure that operations on data are timestamped, i.e. any additions, deletions are marked with a timestamp.
- »»» **Data Identification:** The data used shall be identified via a PID pointing to a timestamped query, resolving to a landing page.

Oct 2015 version w/ 14 recommendations

DC WG chairs: Andreas Rauber, Ari Asmi, Dieter van Uytvanck

BCO-DMO Dataset Landing Page

BCO-DMO
Biological & Chemical Oceanography Data Management Office

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| Datasets | 7892 |
| Instruments | 395 |
| Parameters | 1386 |
| People | 2026 |
| Affiliations | 472 |
| Funding | 79 |
| Awards | 1304 |

Dataset: larval krill pigments

[Get Data](#) [Map It](#)

Project: U.S. GLOBEC Southern Ocean (SOGLOBEC)

Principal Investigator: Dr Robin Ross (University of California-Santa Barbara, UCSB)
Dr Langdon Quetin (University of California-Santa Barbara, UCSB)

Contact: Dr Robin Ross (University of California-Santa Barbara, UCSB)

BCO-DMO Data Manager: Nancy Copley (Woods Hole Oceanographic Institution, WHOI BCO-DMO)

Validated: Yes

Data version: 2010-02-03

Version Date: 02/03/2010

Data URL: <http://www.bco-dmo.org/dataset/3300/data>

Current State: Final no updates expected

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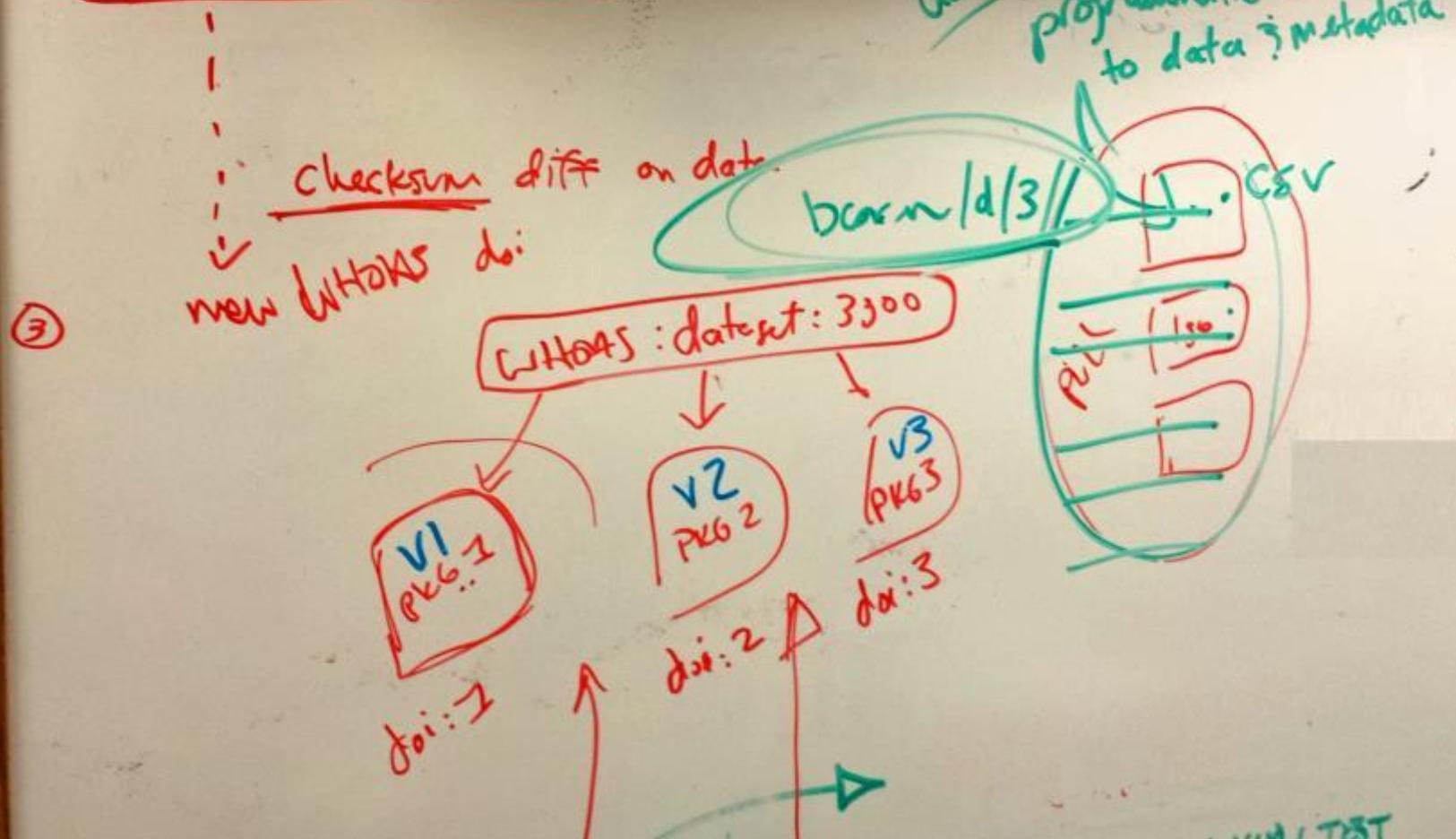
| Archive Location | Accession ID | Archive Copy URL |
|-------------------------------------------|--------------|---------------------------------------------------------------------------------------------|
| National Oceanographic Data Center (NODC) | 0112635 | http://accession.nodc.noaa.gov/0112635 |

Initial Architecture Design Considerations (Jan 2016)

7

- ① dataset: 3300
JGOF5 URL → jgofs:example-CTD
- ② Request a DOI on 9/10/15

DOI: landing page
programmatic URL
to data? metadata



Modified Architecture (March 2016)

8

BCO-DMO DATA Publication \neq CITATION

28 MAR 2016

Archive Record: Williams [mid = 567890]

DDO 90001 [150] download: DOI
doi: 10.1159/1115 / bco-dmo.567890

DDO 90002 [DATA 1]

DDO 90003 [DATA N]

Williams

[150]

[2]

[1N]

QUESTION:

supporting docs
are recorded as DDO
at Williams for
reuse w/ NCEI

Archive Record: NCEI [mid = 678901]

DDO 90001

DDO 90002

DDO 90003 [n]

Archive Record: DATAONE [mid = 789012]

DDO 90001 [150] download: DOI

DDO 90002 accession #: NCEI

DOI: 10.1159/1115 / bco-dmo.567890

DDO 90002

DDO 90003 [n]

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DDO 90229

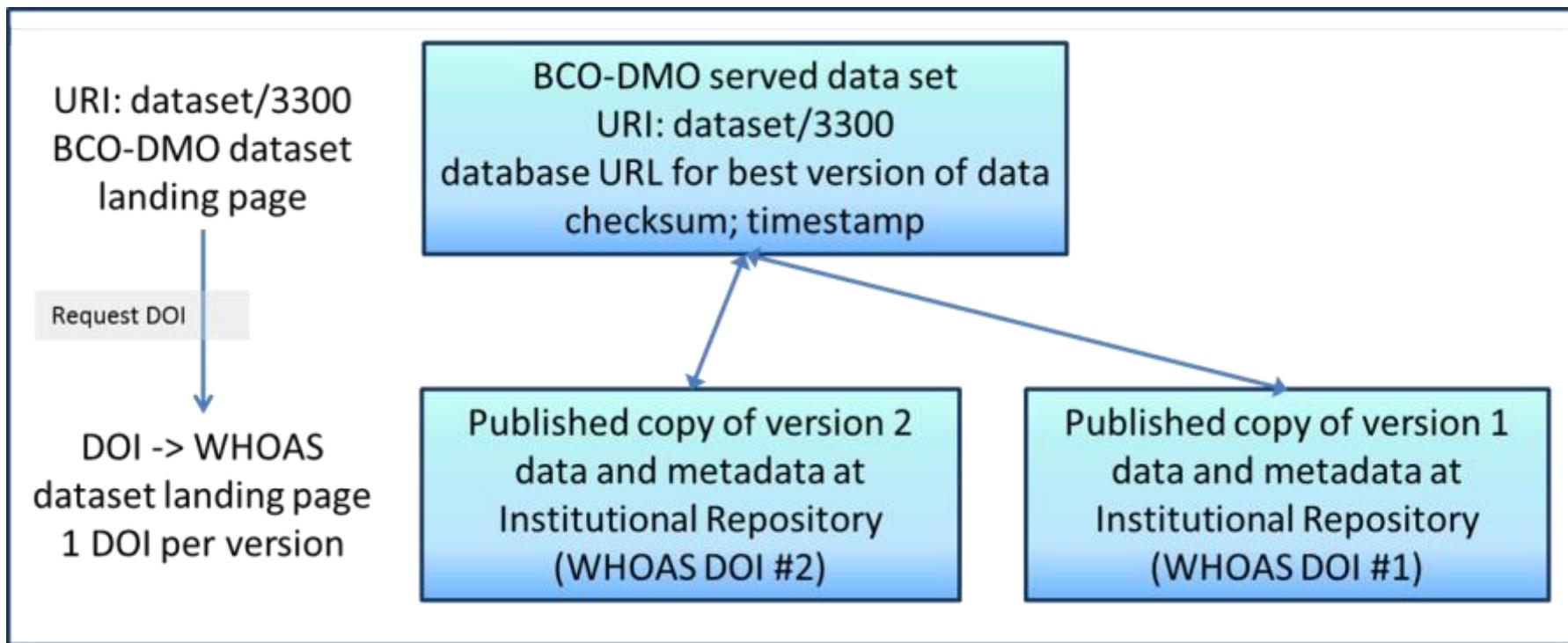
DDO 90230

DDO 90231

DDO 90232

BCO-DMO Data Publication System Components

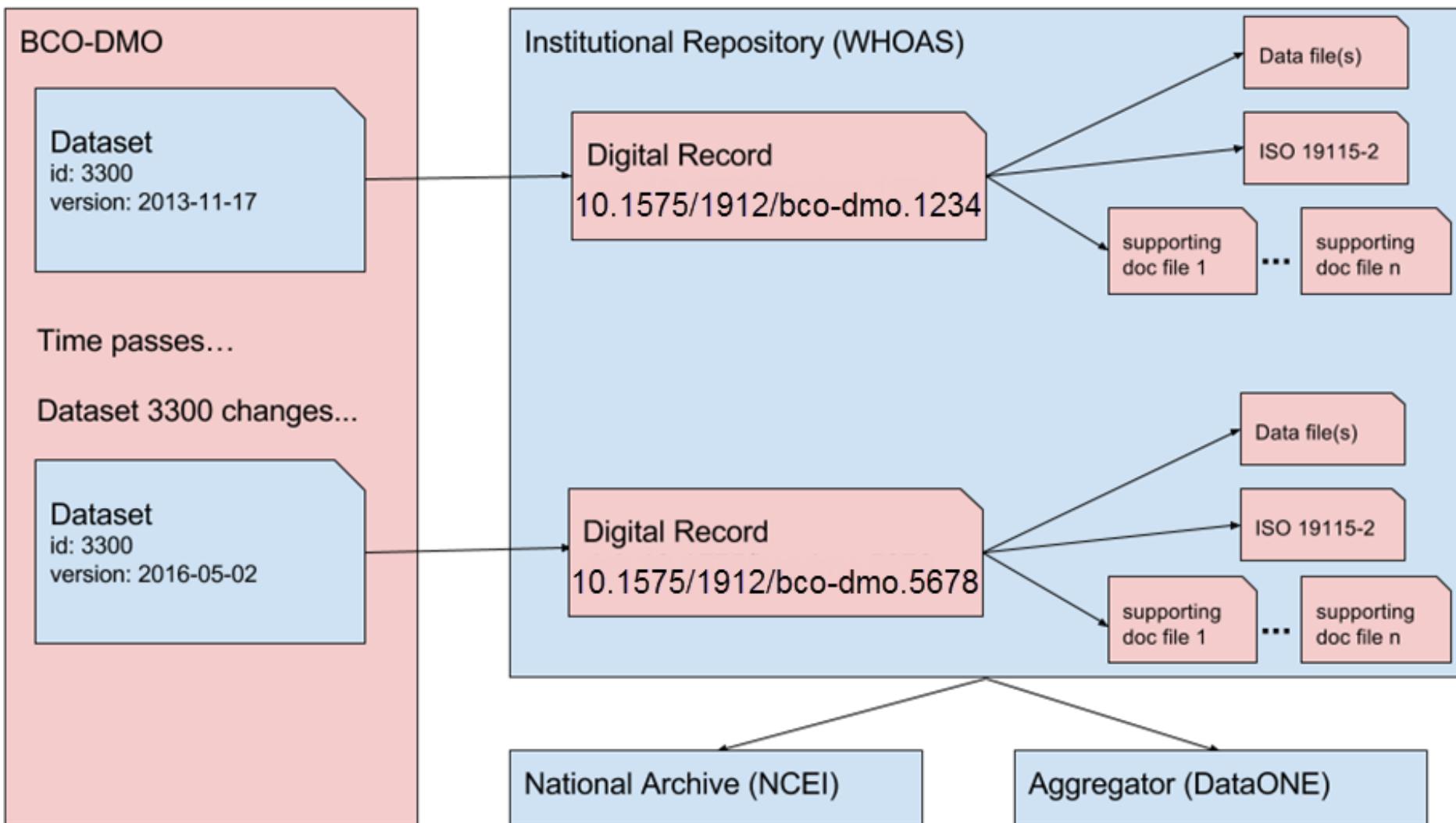
9



BCO-DMO publishes data to WHOAS and a DOI is assigned.
The BCO-DMO architecture now supports data versioning.

BCO-DMO Data Citation System Components

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BCO-DMO Data Set Landing Page

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Biological & Chemical Oceanography Data Management Office

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Dataset: Cellular element quotas: Si in Synechococcus cells

Get Data **Map It**

Project: Understanding the Role of Picocyanobacteria in the Marine Silicate Cycle (Si_in_Syn)

Principal Investigator: Dr Benjamin Twining (Bigelow Laboratory for Ocean Sciences, Bigelow)

Contact: Daniel Ohnemus (Bigelow Laboratory for Ocean Sciences, Bigelow)

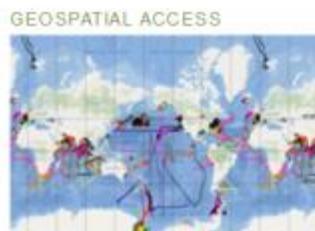
Data version: Final

Version Date: 05/06/2016

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|--------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------|
| 2016-05-06 | Marine Biological Laboratory/Woods Hole Oceanographic Institution Library (MBLWHOI DLA) | 10.1575/1912/bco-dmo.651474 | 2016-07-08 |



References:

Twining, B. S., et al. Metal contents of phytoplankton and labile particulate material in the North Atlantic Ocean. *Prog. Oceanogr.* (2015)

<http://dx.doi.org/10.1016/j.pocean.2015.07.001>

https://www.researchgate.net/publication/282626294_Metal_contents_of_phytoplankton_and_labile_particulate_material_in_the_North_Atlantic_Ocean

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Element quotas of individual *Synechococcus* cells collected during Bermuda Atlantic Time-series Study (BATS) cruises aboard the R/V Atlantic Explorer between dates 2012-07-11 and 2013-10-13

dc.description.sponsorship NSF Ocean Sciences (NSF OCE) OCE-1131139, NSF Ocean Sciences (NSF OCE) OCE-1335012, NSF Ocean Sciences (NSF OCE) OCE-1131046

dc.publisher Biological and Chemical Oceanography Data Management Office (BCO-DMO). Contact: bco-dmo-data@whoi.edu

dc.relation <http://lod.bco-dmo.org/id/dataset/644840>

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 [115-2.xml](#) (88.65Kb)
 [Featurenames.pdf](#) (12.10Kb)

31.6691

DOI
[10.1575/1912/bco-dmo.651474](https://doi.org/10.1575/1912/bco-dmo.651474)

Keyword

SXRF; Synchrotron radiation X-Ray Fluorescence; *Synechococcus*; si

By Issue Date

Authors

Titles

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| Parameters | 1373 |
| Products | 2424 |

Dataset: Cellular element quotas: Si in Synechococcus cells

[Get Data](#) [Map It](#)

Project: Understanding the Role of Picocyanobacteria in the Marine Silicate Cycle (Si_in_Syn)

Principal Investigator: Dr Benjamin Twining (Bigelow Laboratory for Ocean Sciences, Bigelow)

Contact: Daniel Ohnemus (Bigelow Laboratory for Ocean Sciences, Bigelow)

Data version: Final

Version Date: 05/06/2016

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| Version | Archive | Persistent Identifier | Date |
|---------|---------|-----------------------|------|
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References:

Twining, B.S., et al. Metal contents of phytoplankton and labile particulate material in the North Atlantic Ocean. *Prog. Oceanogr.* (2015)

<http://dx.doi.org/10.1016/j.pocean.2015.07.001>

https://www.researchgate.net/publication/282626294_Metal_contents_of_phytoplankton_and_labile_particulate_material_in_the_North_Atlantic_Ocean

are also provided.

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References:

Twining, B.S., et al. Metal contents of phytoplankton and labile particulate material in the North Atlantic Ocean. *Prog. Oceanogr.* (2015)

<http://dx.doi.org/10.1016/j.pocean.2015.07.001>

https://www.researchgate.net/publication/282626294_Metal_contents_of_phytoplankton_and_labile_particulate_material_in_the_North_Atlantic_Ocean

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Progress in Oceanography

Volume 137, Part A, September 2015, Pages 261–283



Metal contents of phytoplankton and labile particulate material in the North Atlantic Ocean

Benjamin S. Twining^a, , Sara Rauschenberg^a, Peter L. Morton^{b, 1}, Stefan Vogt^c

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doi:10.1016/j.pocean.2015.07.001

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Highlights

- First basin-wide measurements of plankton metal quotas in the N. Atlantic Ocean.
- Fe and Mn quotas significantly higher on western side of section.
- Cu and Ni quotas significantly elevated on eastern side of section.
- Evidence for Al scavenging by biogenic silica.
- Dissolved ratios not an accurate measure of cellular Fe quotas.

► Recommended articles

[Evaluation of approaches to estimate biogenic ...](#)

2015, *Marine Chemistry* [more](#)

[High-frequency sea level oscillations in the Me...](#)

2015, *Progress in Oceanography* [more](#)

[Composition of metals in suspended particulate...](#)

2016, *Regional Studies in Marine Science* [more](#)

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New Capabilities ... BCO-DMO becoming a DataONE Member Node

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Dr David Siegel and Dr Kenneth O. Buesseler. 2009. urn:node:mnTestBCODMO, <http://lod.bco-dmo.org/id/dataset-file/555907>.

Dr Carl Lamborg and Dr Kenneth O. Buesseler. 2009. urn:node:mnTestBCODMO, <http://lod.bco-dmo.org/id/dataset-file/555892>.

Dr Uta Passow. 2014. urn:node:mnTestBCODMO, <http://lod.bco-dmo.org/id/dataset-file/555897>.

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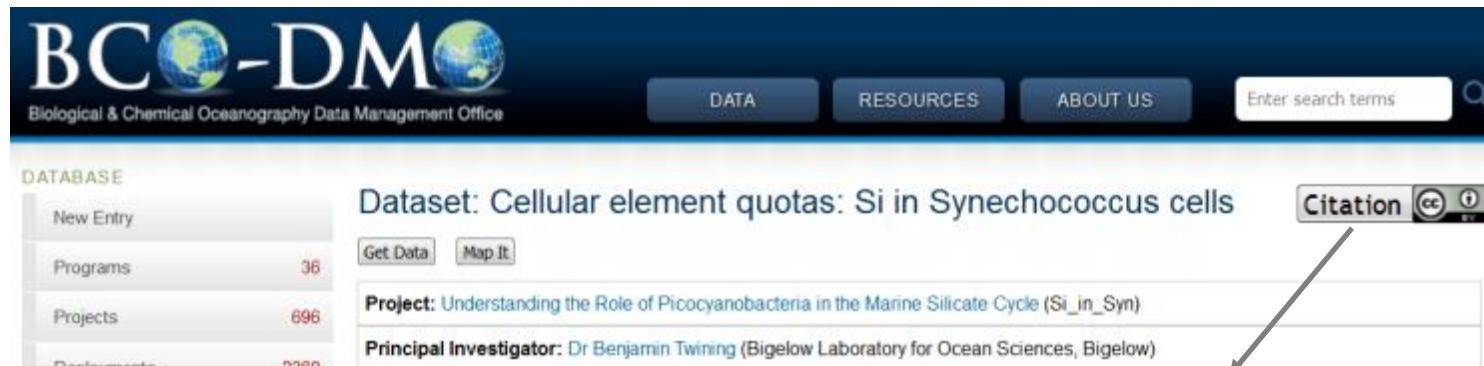
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DOC/NOAA/NESDIS/NCEI > National Centers for Environmental Information, NESDIS, NOAA, U.S.

BCO-DMO Data Set Citation (by 19 Sep 2016)



Dataset: Cellular element quotas: Si in *Synechococcus* cells

Project: Understanding the Role of Picocyanobacteria in the Marine Silicate Cycle (Si_in_Syn)

Principal Investigator: Dr Benjamin Twining (Bigelow Laboratory for Ocean Sciences, Bigelow)

Citation 

Suggested citation:

Twining, B. (2016) "Element Quotas of Individual *Synechococcus* Cells Collected During Bermuda Atlantic Time-Series Study (BATS) Cruises Aboard the R/V Atlantic Explorer Between Dates 2012-07-11 and 2013-10-13". Dataset published by Biological and Chemical Oceanography Data Management Office (BCO-DMO) doi:10.1575/1912/bco-dmo.651474

| Library (MBLWHOI DLA) | |
|-----------------------|------|
| Funding | 83 |
| Awards | 1378 |
| Contact Status | 270 |
| Archive | 187 |

Description

Brief Description: element quotas of individual *Synechococcus* cells

Field work at the Bermuda Atlantic Time Series (BATS) site was done to assess the contribution of *Synechococcus* and diatoms to total biogenic silica in surface waters. The data include information about the elemental content (Silicon, Phosphorus, and Sulfur) of *Synechococcus* cells as measured by synchrotron-based x-ray fluorescence (SBXF) microscopy. Derived mole ratios (Si:P and Si:S) are also provided.

References:

Twining, B.S., et al. Metal contents of phytoplankton and labile particulate material in the North Atlantic Ocean. *Prog. Oceanogr.* (2015) <http://dx.doi.org/10.1016/j.pocean.2015.07.001>
https://www.researchgate.net/publication/282626294_Metal_contents_of_phytoplankton_and_labile_particulate_material_in_the_North_Atlantic_Ocean

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More Information about this dataset

Thank you ...

- To the Data Citation Working Group for their efforts
<https://www.rd-alliance.org/groups/data-citation-wg.html>
- RDA US for funding this adoption project
- TIMELINE:
 - Redesign/prototype completed by 1 June
 - New citation recommendation by 19 Sep 2016
 - Report out at RDA P8 (Denver, CO) September 2016
 - Production version by 1 December 2016

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- Removed these to reduce talk to 15 minutes

Adoption of Data Citation Outputs

■ Evaluation

- Evaluate recommendations (done December 2015)
- Try implementation in existing BCO-DMO architecture (work began 4 April 2016)

■ Trial

- BCO-DMO: R1-11 fit well with current architecture; R12 doable; test as part of DataONE node membership; R13-14 are consistent with Linked Data approach to data publication and sharing

NOTE: adoption grant received from RDA US (April 2016)

New capability (implemented)

procedure: when a BCO-DMO data set is updated ...

- A copy of the previous version is preserved
- Request a DOI for the new version of data
- Publish data, and create new landing page for new version of data, with new DOI assigned
- BCO-DMO database has links to all versions of the data (archived and published)
- Both archive and published dataset landing pages have links back to best version of full dataset at BCO-DMO
- BCO-DMO data set landing page displays links to all archived and published versions

REFERENCES

- Extended description of recommendations
Identification of Reproducible Subsets for Data Citation, Sharing and Re-Use

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- Altman and Crosas. 2013. “Evolution of Data Citation ...”
- CODATA-ICSTI 2013. “Out of cite, out of mind”
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- R. E. Duerr, et al. “On the utility of identification schemes for digital earth science data”, ESI, 2011.