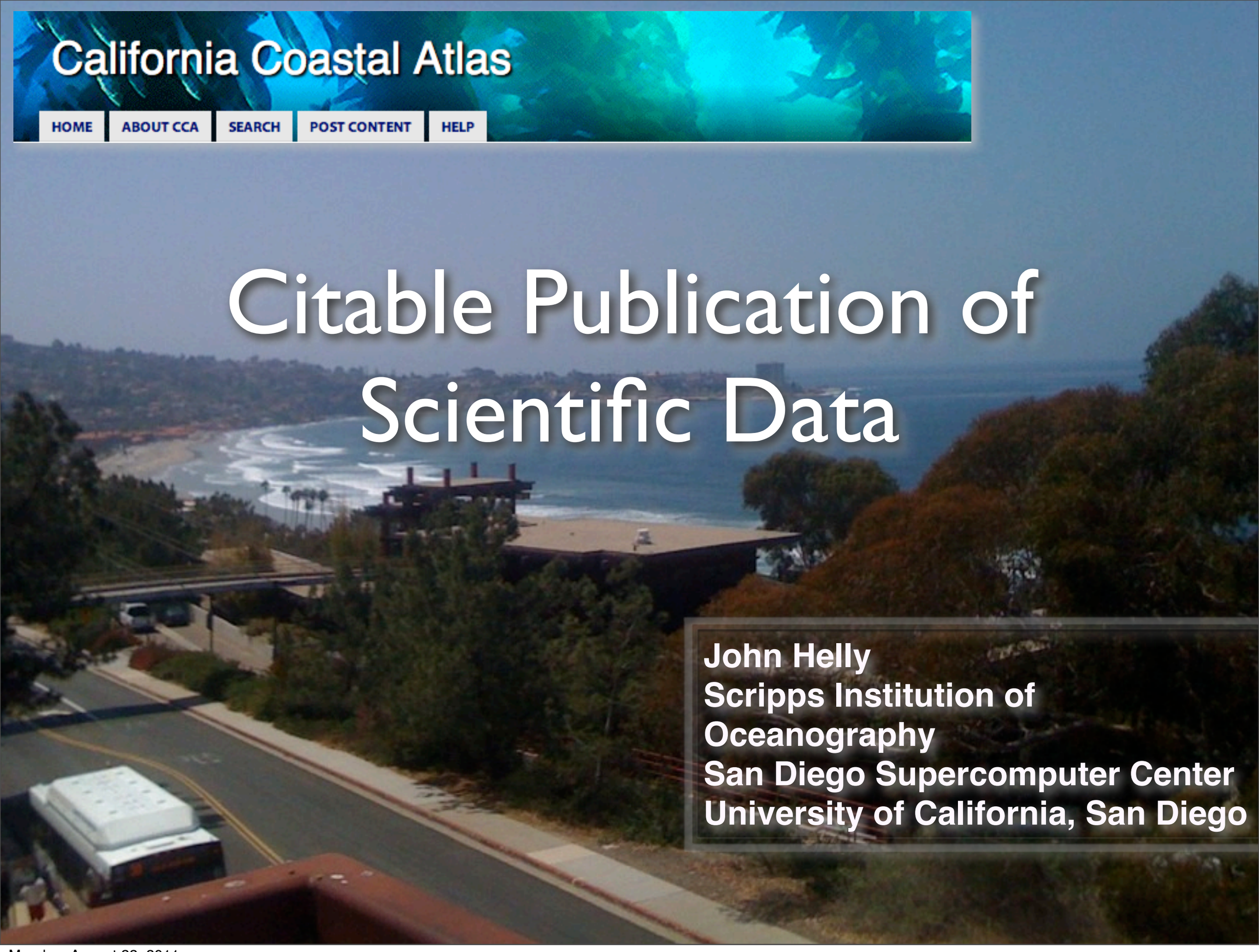
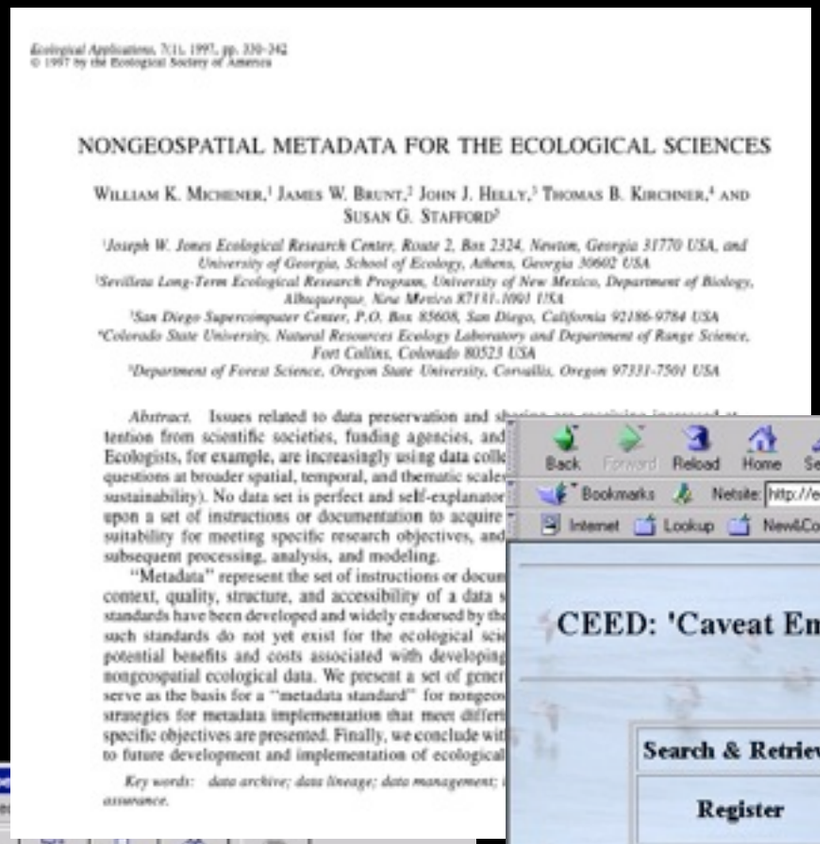


Citable Publication of Scientific Data

John Helly
Scripps Institution of Oceanography
San Diego Supercomputer Center
University of California, San Diego

Outline

- Evolution of Scientific Data Publication (Helly@SDSC)
- Changing Workflows
- Scope & Structure
- Data & Metadata
- Bibliographic Approach
- Protection of Intellectual Property Rights
- Editorial Policy
- Discussion



Ecological Applications, 7(1), 1997, pp. 330–342
© 1997 by the Ecological Society of America

NONGEOSPATIAL METADATA FOR THE ECOLOGICAL SCIENCES

WILLIAM K. MICHENER,[1] JAMES W. BRUNT,[2] JOHN J. HELLY,[3] THOMAS B. KIRCHNER,[4] AND SUSAN G. STAFFORD[5]

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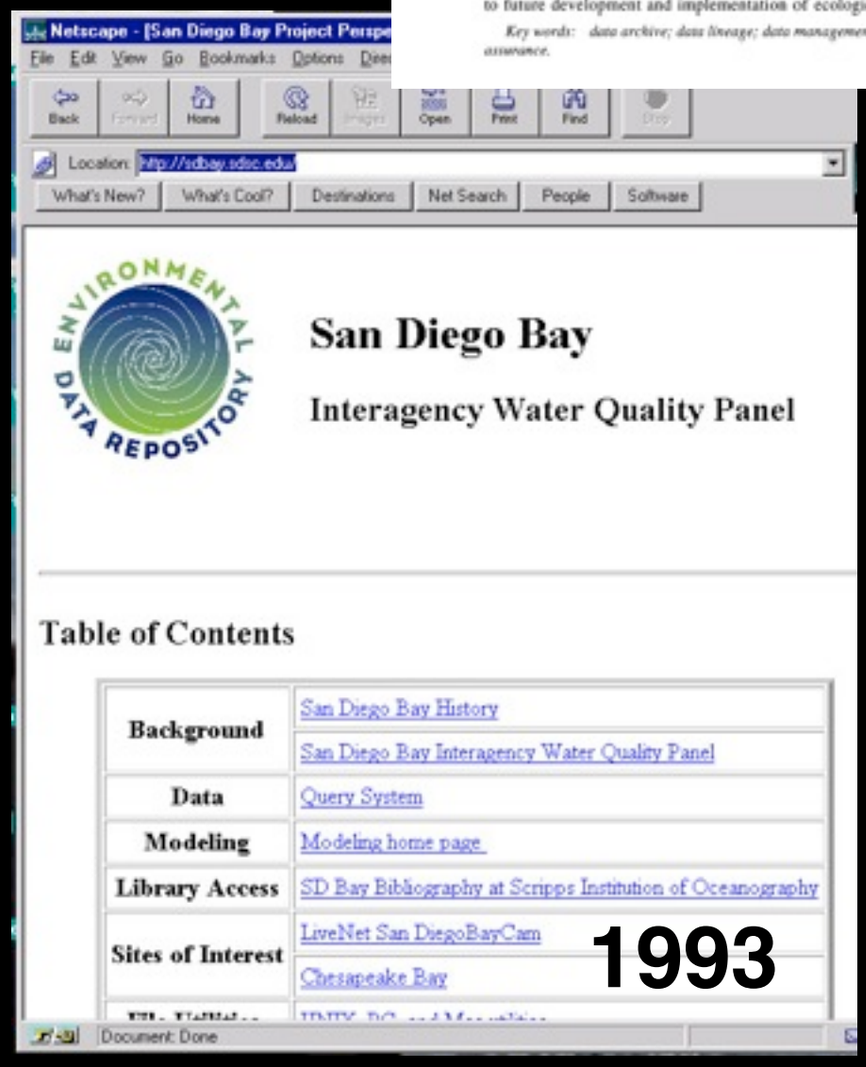
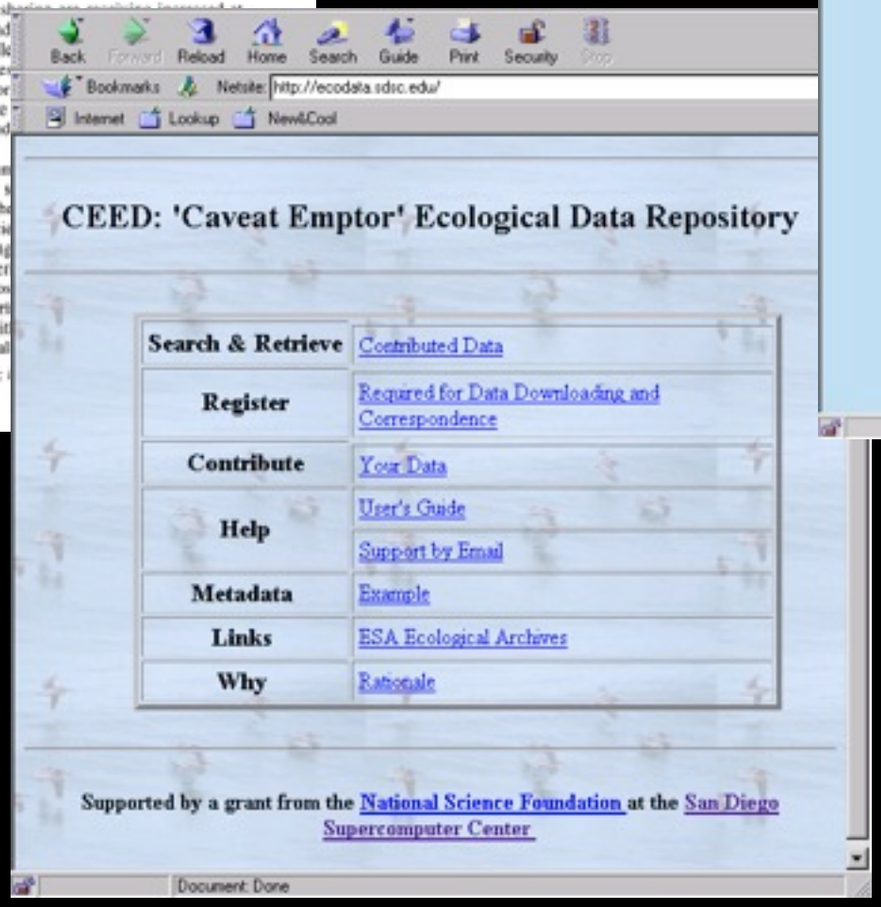
[5]*Department of Forest Science, Oregon State University, Corvallis, Oregon 97331-7501 USA*

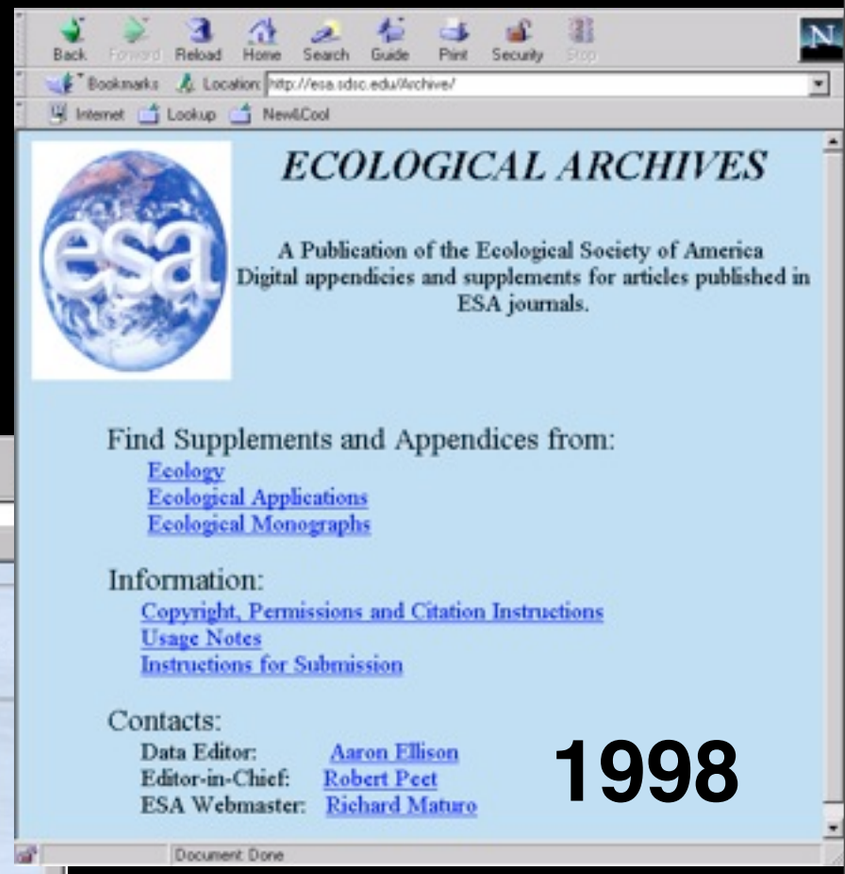
Abstract. Issues related to data preservation and sh… are receiving increased at… tention from scientific societies, funding agencies, and… Ecologists, for example, are increasingly using data colle… questions at broader spatial, temporal, and thematic scales… sustainability). No data set is perfect and self-explanator… upon a set of instructions or documentation to acquire … suitability for meeting specific research objectives, and… subsequent processing, analysis, and modeling.

"Metadata" represent the set of instructions or docum… context, quality, structure, and accessibility of a data s… standards have been developed and widely endorsed by th… such standards do not yet exist for the ecological sci… potential benefits and costs associated with developing… nongeospatial ecological data. We present a set of gener… serve as the basis for a "metadata standard" for nongeos… strategies for metadata implementation that meet differ… specific objectives are presented. Finally, we conclude wit… to future development and implementation of ecological…

Key words: data archive; data lineage; data management; … assurance.







FLED: Future of Long-term Ecological Data

Funding needed for creative science

Sir — For science to contribute
breakthroughs to help people t
and healthier lives, it has to be c
Pioneers are being squeezed ou

Too many scientists spend t
repeating what their colleagues
competitors do in their field of
with no new ideas, no new con
creation. The race for grants an
publication, if possible in leadi
journals with a high impact factor, probably account for this behaviour.

Awards like the Realizing Our Potential Awards (ROPA), recently extended in the United Kingdom (*Nature* **392**, 10; 1998), should be developed by governments elsewhere. By allowing the funding of 'risky' projects, they provide scientists with the opportunity to do creative research. Please, let us have more creativity, and more ROPA-like awards, for science in the future.

Bertrand Le Douarin
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Faculté de médecine CNRS UPR41,
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35043 Rennes Cedex, France
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New concepts of publication

Sir — I read with interest your leading article[1] about the withholding of data from "full and open access"[2], which is increasingly at issue across the sciences.

During the past four years or so, my colleagues and I have been developing methods and procedures for the publication of research data in general and because of the unique and influential role professional societies and journals play in the debate about intellectual property rights in data.

There are recurring and fundamental issues limiting 'full and open access' to data that are intrinsic to institutionalized scientific research. Examples include the fear of being 'scooped' by someone using one's data or inadequate attribution for one's intellectual investment in a research programme resulting in the data, and the relationship this has to academic career advancement. The efforts of *Nature* and *Science* to address the issue of restricted access to data is a crucial and significant crack in the cultural mind-set that fosters, permits and even necessitates the withholding of research data.

The next steps along this path require fuller discussion and involvement of the scientific community along with the funding agencies and academic policy-makers. New ideas are needed. As digital library and data repository technology improves and the potential for broader and more rapid dissemination of data increases, consideration needs to be given to new concepts of publication. One approach would be to raise data collections to the status of citable entities in journals.

La Jolla, California 92093, USA
e-mail: hellyj@sdsc.edu

1. *Nature* **391**, 617 (1998).
2. National Research Council. *Bits of Power: Issues in Global Access to Scientific Data* (National Academy Press, Washington DC, 1997).
3. Gross, K. *et al. Report of the Committee on the Future of Longterm Ecological Data* (1995) http://esa.sdsc.edu/FLED/FLED.html
4. Helly, J., Elvins, T., Sutton, D., Martinez, D. *Controlled Publication of Digital Scientific Data: An Example in Ecology*. In preparation.

Out of order

Sir — Blaxter *et al.* in "A molecular evolutionary framework for the phylum Nematoda" (*Nature* **392**, 71; 1998) incorrectly attribute to me "the view that vertebrate parasites evolved from arthropod parasitic ancestors". The oxyurids of vertebrates have long been considered to have been derived from oxyurids in insects, but to extend this idea to the other orders of the nematode of vertebrates is weird indeed and cannot be attributed to me or to any expert on helminthology I can think of.

Roy C. Anderson
Department of Zoology,
University of Guelph,
Guelph, Ontario,
Canada N1G 2W1

'... One approach would be to raise data collections to the status of citable entities in journals. ...'

Nature, v393, May 1998

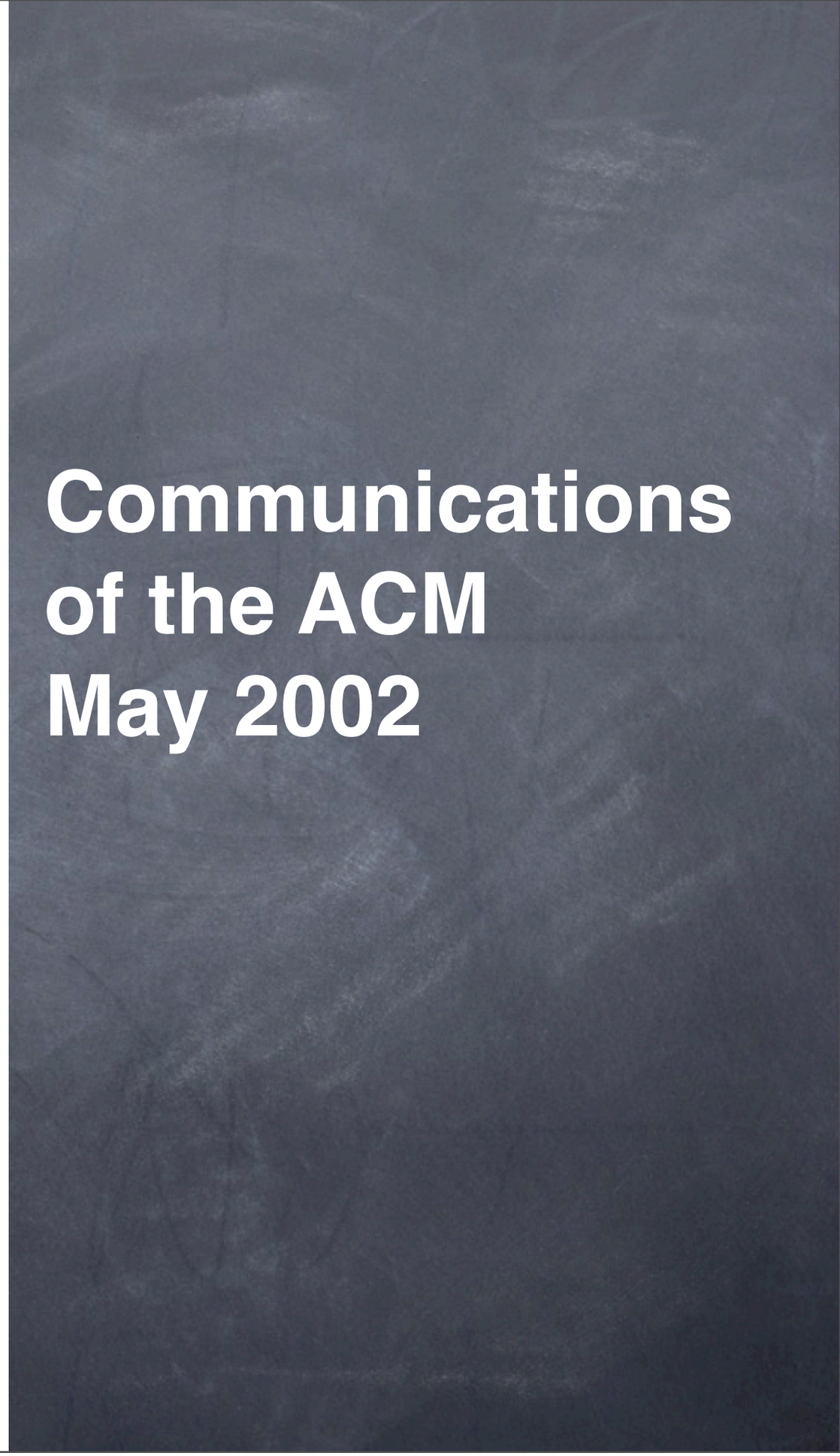
Controlled Publication of Digital Scientific Data

How to balance free and open access to scientific data with privileged access to new results by authors while protecting them from being scooped by competing interpretations of their own data.

John J. Helly, T. Todd Elvins, Don Sutton, David Martinez, Scott E. Miller, Steward Pickett, and Aaron M. Ellison

Although the principle of equal access to data is a key aspect of U.S. government-funded science policy [10], there are strong, institutionalized, though sometimes contradictory, incentives for investigators to maintain proprietary control over that data; there is also increasing commercial and in some cases federal pressure to treat data as a commodity [4]. Efforts by the scientific community to prevent potentially deleterious international commercialization of scientific data through the World Intellectual Property Organization (WIPO) have had some success, thanks to support from the U.S. State Department. A recent example is the Anti-Piracy Bill (H.R. 2652) passed by the U.S. House of Representatives in 1998 but never approved by the Senate; it was similar in some ways to the WIPO proposal. Related pressures continue to build, including from within the U.S. private sector. It seems the commercialization of scientific data and treating it as a commodity represent an increasingly important aspect of how scientific data is published today; further complicating this scenario is the growth of the Internet-based business sector and the increasing commercial value of the data itself, especially biomedically significant data. These changes have influenced many aspects of scientific research, including the published content of professional journals, both online and on paper. The special role of research data in the advancement of science and its distinctly non-commodity character were identified as threatened by efforts to put a price on data [5].

Efforts by some scientists and policymakers to prevent the commercialization of scientific data reflect a certain irony and tension attending the purpose and politics of such data. On one hand is vigorous support for free and open access to the data consistent with the scientific



Geochemistry Geophysics Geosystems G3
AN ELECTRONIC JOURNAL OF THE EARTH SCIENCES
Published by AGU and the Geochemical Society

Technical Brief
Volume 4, Number 3
29 March 2003
8004, doi:10.1029/2002GC000314
ISSN: 1525-2027

Electronic data publication in geochemistry

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Geochemistry Geophysics Geosystems G3
AN ELECTRONIC JOURNAL OF THE EARTH SCIENCES
Published by AGU and the Geochemical Society

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1010, doi:10.1029/2002GC000318
ISSN: 1525-2027

Scalable models of data sharing in Earth sciences

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Hubert Staudigel and Anthony Koppers
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Properties Required for Controlled Publication

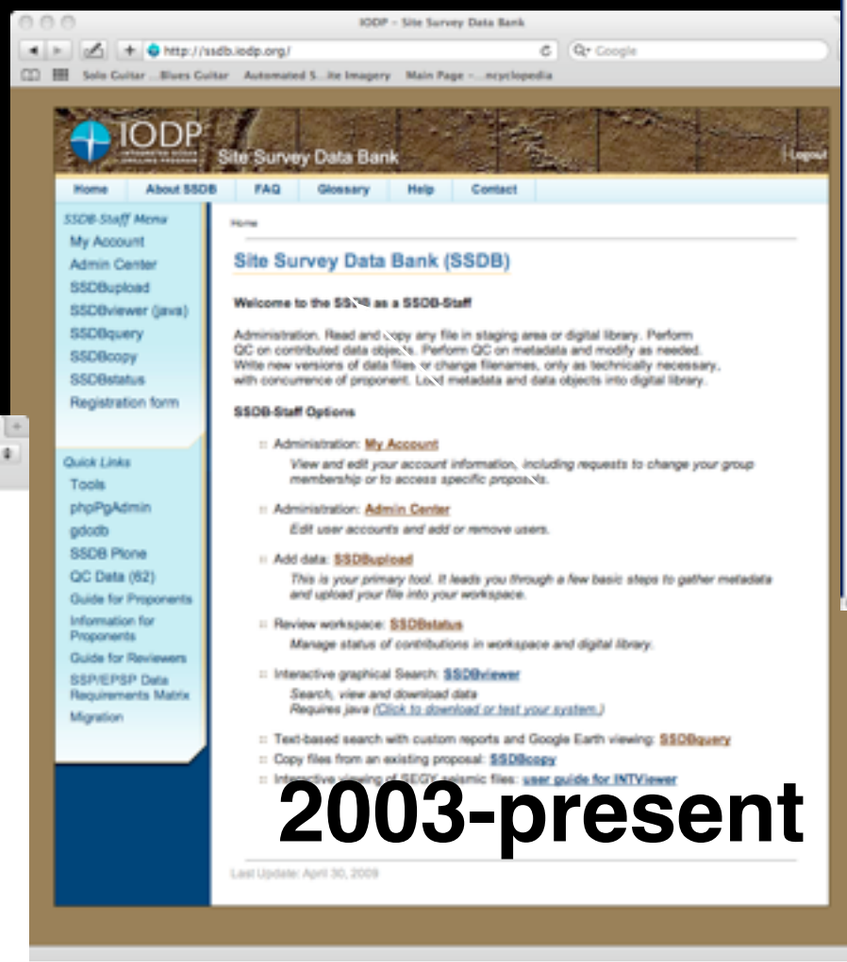
Function	Purpose
User Registration	A user ID and password are assigned to a given user while acquiring the user's email address and related contact information. The ID is used to audit data access and communication with users.
Data Acquisition	Data is acquired through contribution and submissions, along with at least a minimal set of metadata. This initiates the automatic creation of a unique name for the ADO and a transportable metadata file bundled within the ADO.
Search and Retrieval	A search system provides for spatial, temporal, and thematic (such as keyword) queries based on metadata content.
Deletion Control	The ability to delete an ADO is tightly controlled to prevent the arbitrary deletion of data copied by users. In a manner analogous to journal articles, no one should be able to unpublish data. Errata can be accommodated by publishing a revision of the data. An important special case to consider is the editorial peer-review process requiring confidentiality and the ability to remove an ADO if not accepted for peer-reviewed publication. A looser deletion policy might allow deletion of data if it had never been copied.
Assignment of Persistent Names	The persistent name, or accession number of an ADO, as in Figure 1, is used in the data repository to access the ADO, monitor updates of previously published ADOs, identify the retrieval of ADOs by users, notify users of anomalies or issues related to an ADO, establish precedence by publication date, and enable citation in other publications.
Quality Control and Quality Assurance Policy and Methods	This function can exist (or not exist) to varying degrees, exemplified by peer review and non-peer review, as well as by anomaly detection and reporting, though it must be stated explicitly. Some investigation is beginning on how to semiautomate QA/QC for specific types of data.
Access Control	Access control enables data contributors to specify a password only they know and that may be provided to other users to access the contributed ADO. This approach enables data submitters to independently control access to their own published data. Any user attempting to retrieve a password-protected ADO from the system needs to obtain that password from the data's contributor.
Traceability of Data Heritage	A mechanism for establishing the heritage of data contained within an ADO informs users of the data's measured, derived, or computed nature. This approach is also essential to preserving intellectual property rights analogous to claims of copyright or trademark.

Discipline-specific Data Sharing Platforms

Atmospheric Science

2005-present

Deep-sea Drilling



2003-present

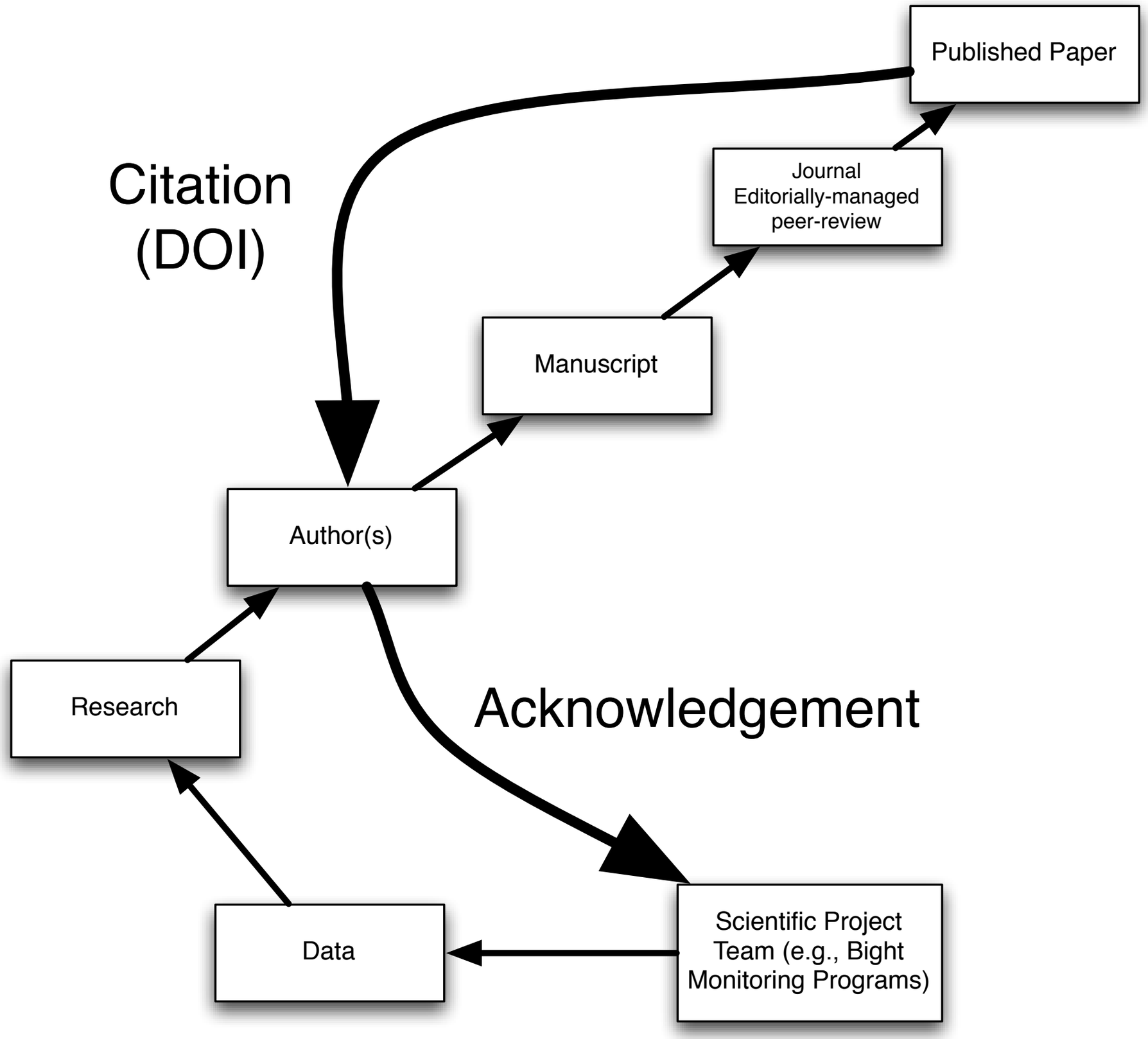
Oceanography

2001-present

Outline

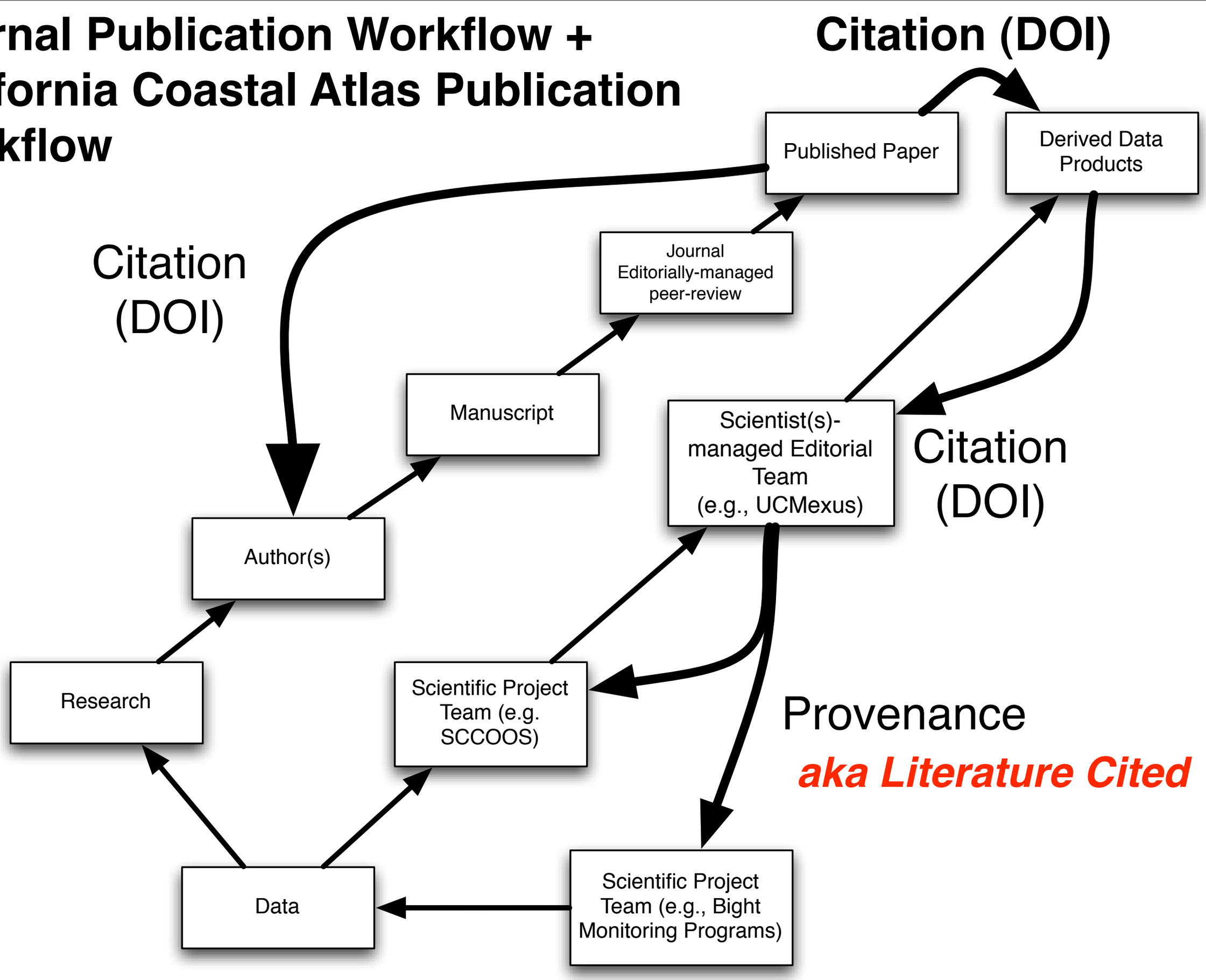
- Evolution of Scientific Data Publication
- Changing Workflows
- Scope & Structure
- Data & Metadata
- Bibliographic Approach
- Protection of Intellectual Property Rights
- Editorial Policy
- Discussion

Journal Publication Workflow



DOIs for Data

Journal Publication Workflow + California Coastal Atlas Publication Workflow



Obstacles to Progress

- Only scientific experts can ensure data quality and provide sufficient metadata
- Sticks are out there now in terms of agency archival requirements, no carrots
- How are long-term archives to be paid for?
- Recent information suggests that main DOI providers for data are not interoperating (i.e., stove-piped)

For reasons not yet clear
It seems these organizations are stove-piped

The scientific community may need another solution that fully realizes the value of DOIs and warrants the effort to use them.

Outline

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California Coastal Atlas

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- The Cultural Environment
- The Physical Environment
- The Social Environment
- Projects
- Reference Maps
- Acknowledgments
- Appendices
- Bibliography
- Search

Search for Data

- Data Collections Browser
- Search for Data

My Projects

- 303d Listing Framework
- Sea-level Rise
- UCMexus

Tags in CCA Taxonomy

Biotic Causes and Forcing Ecological Consequences Manipulative Laboratory Experiments MBARI Measurement Ocean Acidification oxygen pH Reviews UCMexus Water

more tags

Welcome to the California Coastal Atlas

This atlas is devoted to the publication of original and derived data from scientific research projects relating to coastal California; broadly interpreted. Projects are hosted by the California Coastal Atlas (CCA) during their period-of-performance through research collaboration between the Editor of the CCA and the project Principal Investigator and colleagues. The goal is to provide cyberinfrastructure support to the project and the project participants agree to develop their data products in a manner consistent with the CCA approach to citable scientific data publication. A presentation on this approach, ***Citable Scientific Data Publication***, is provided **here**. Investigators are encouraged to contact the Editor (editor_at_californiacoastalatlas.net) regarding their projects and the type of support available through collaboration with the CCA. Investigators retain all rights in their intellectual property while gaining from the application of the CCA approach to scholarly publication of scientific data in a manner similar to that of journal manuscripts.

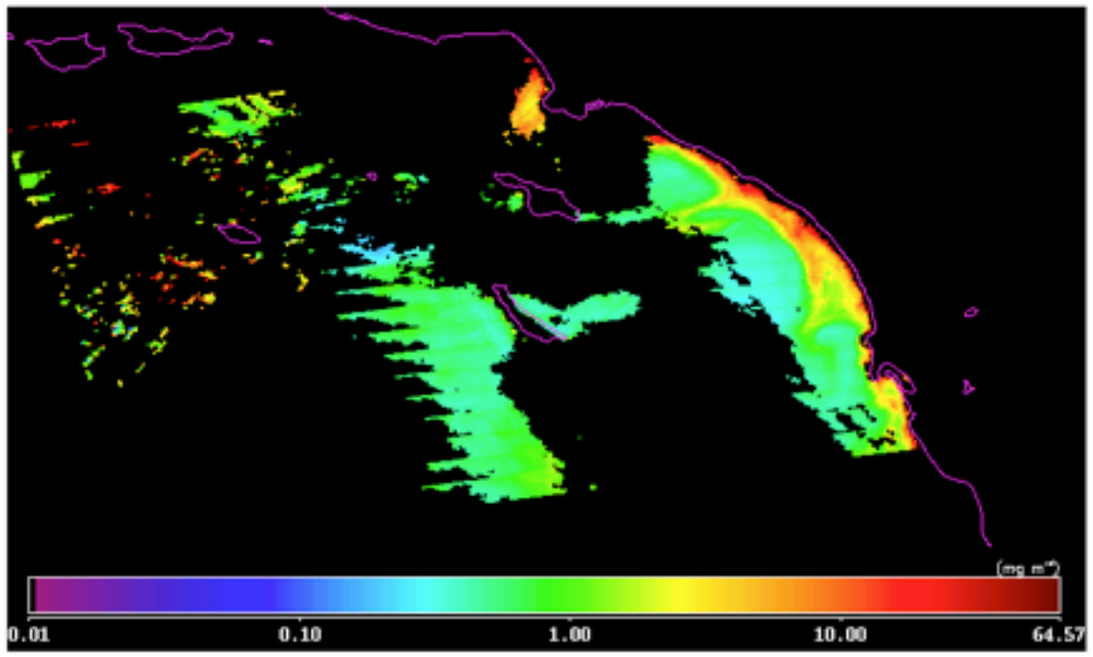
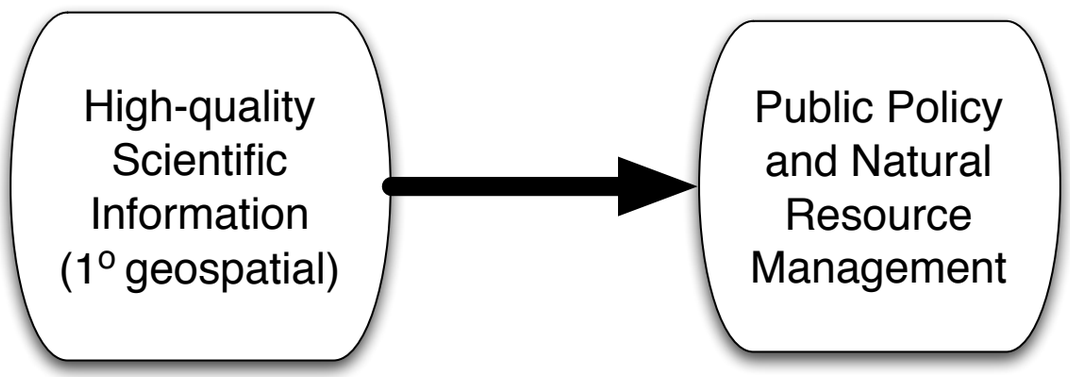


Figure CCA_AAA_001. Green algal (Tetraselmis sp.) bloom along the San Diego coastline August 2010. Color bar is chlorophyll-a concentration as measured by NASA MODIS-A sensor. Image produced by J. Helly using the NASA SeaDAS system. Source data: Feldman, G. C., C. R. McClain, Ocean Color Web, MODIS-A Reprocessing, NASA Goddard Space Flight Center. Eds. Kuring, N., Bailey, S. W. 2010-08-18. http://oceancolor.gsfc.nasa.gov/

description **home**



Contact: hellyj@CaliforniaCoastalAtlas.net / editor@CaliforniaCoastalAtlas.net

hellyj

- My account
- Administer
- Documentation
- Log out
- Mapping
- Feed aggregator

California Coastal Atlas

designed for data publication

Scalable

Project Editors
(Principal Investigators)

Chief Editor

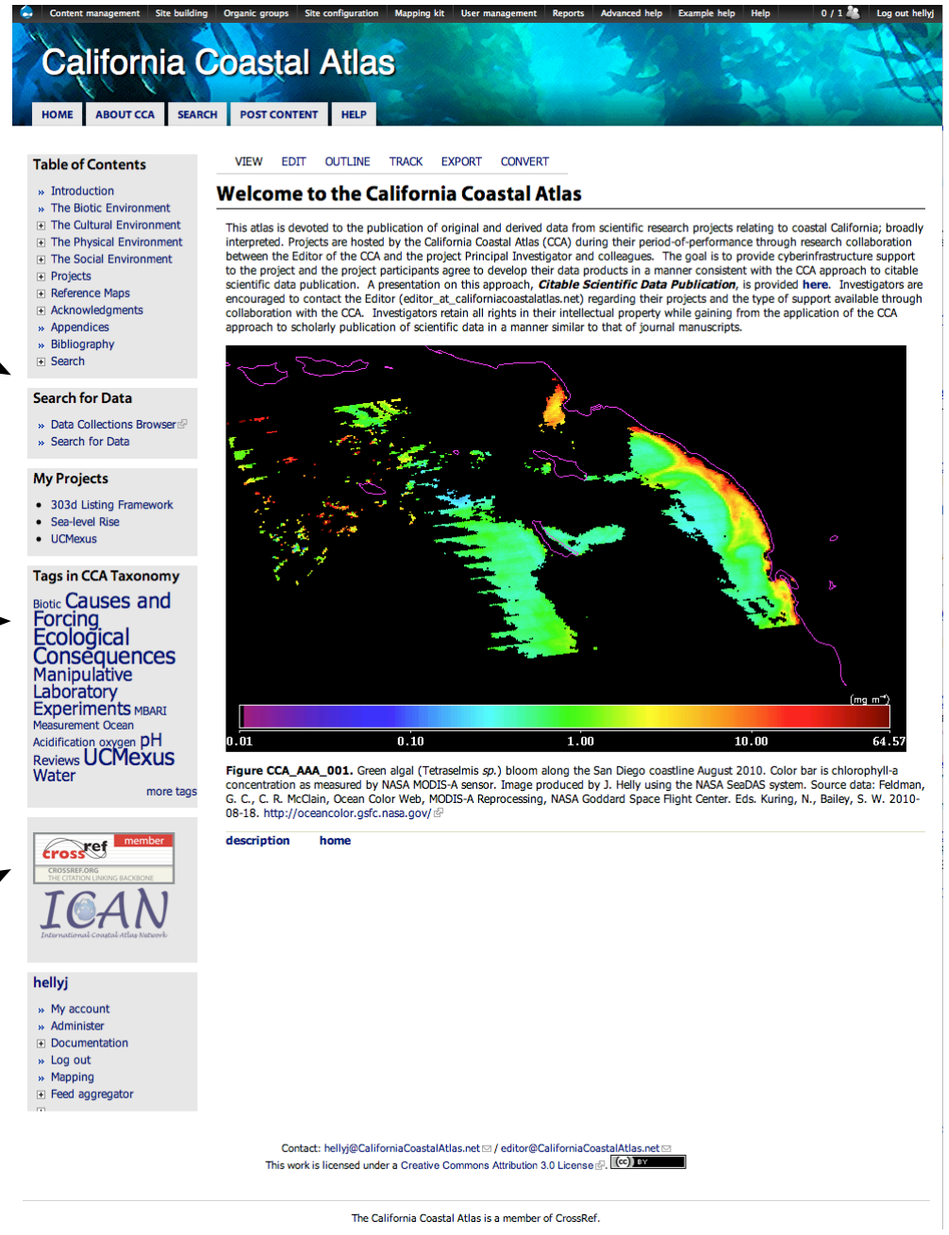
Project A

Project B

Project C

Data
and
Metadata

DOI



Current Projects

- UCMexus: Declining Oxygenation and pH of the Eastern Pacific Margin
- US Navy: A Methodology For Assessing the Impact of Sea Level Rise on Military Installations in the Southwestern United States
- California Environmental Data Exchange Network: 303D-listing Dataset
- California Spatial Data Infrastructure

http://californiacoastalatlas.net/?q=projects/ucmexus

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Content management | Site building | Organic groups | Site configuration | Mapping kit | User management | Reports | Help | 0 / 1 | Log out hellyj

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California Coastal Atlas

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Project Administration

- Create Project Page
- Invite friend
- 4 members
- Manager: garen
- My membership

Search for Data

- Data Collections Browser
- Search for Data

CCA Published Data

- Garen's Test Dataset Title
  2011-2-4

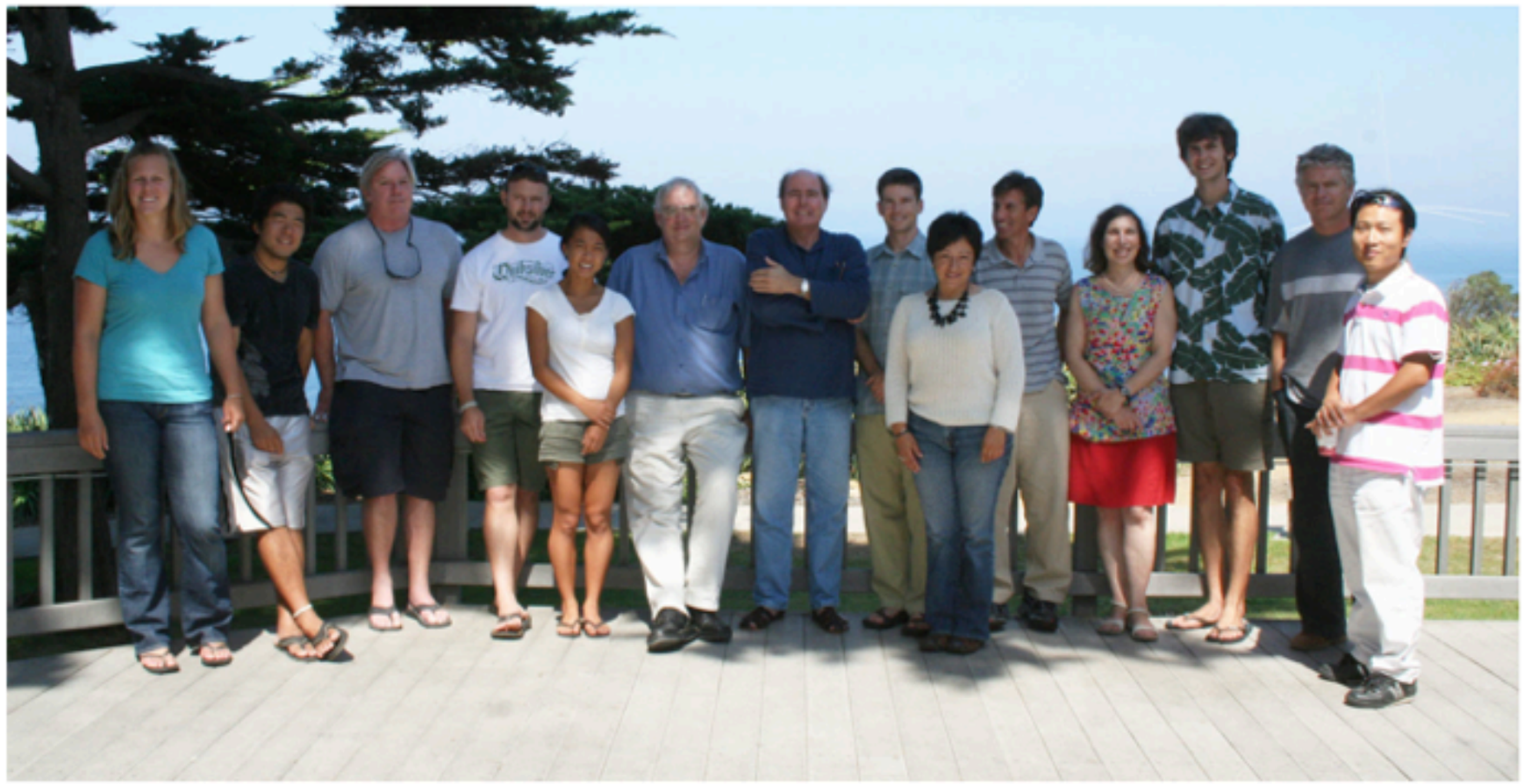
My Projects

- 303d Listing Framework

Home » Projects

VIEW EDIT OUTLINE TRACK ACCESS CONTROL EXPORT CONVERT

UCMexus



Introduction

The UCMexus program is supporting this project to describe and evaluate declining oxygenation and pH of the Eastern Pacific Margin by looking at trends and ecosystem-level consequences for California and Mexico. This is the beginning of a long-term effort to establish a baseline for this phenomenon and California Coastal Atlas is the home for the publication of the work product of this effort.

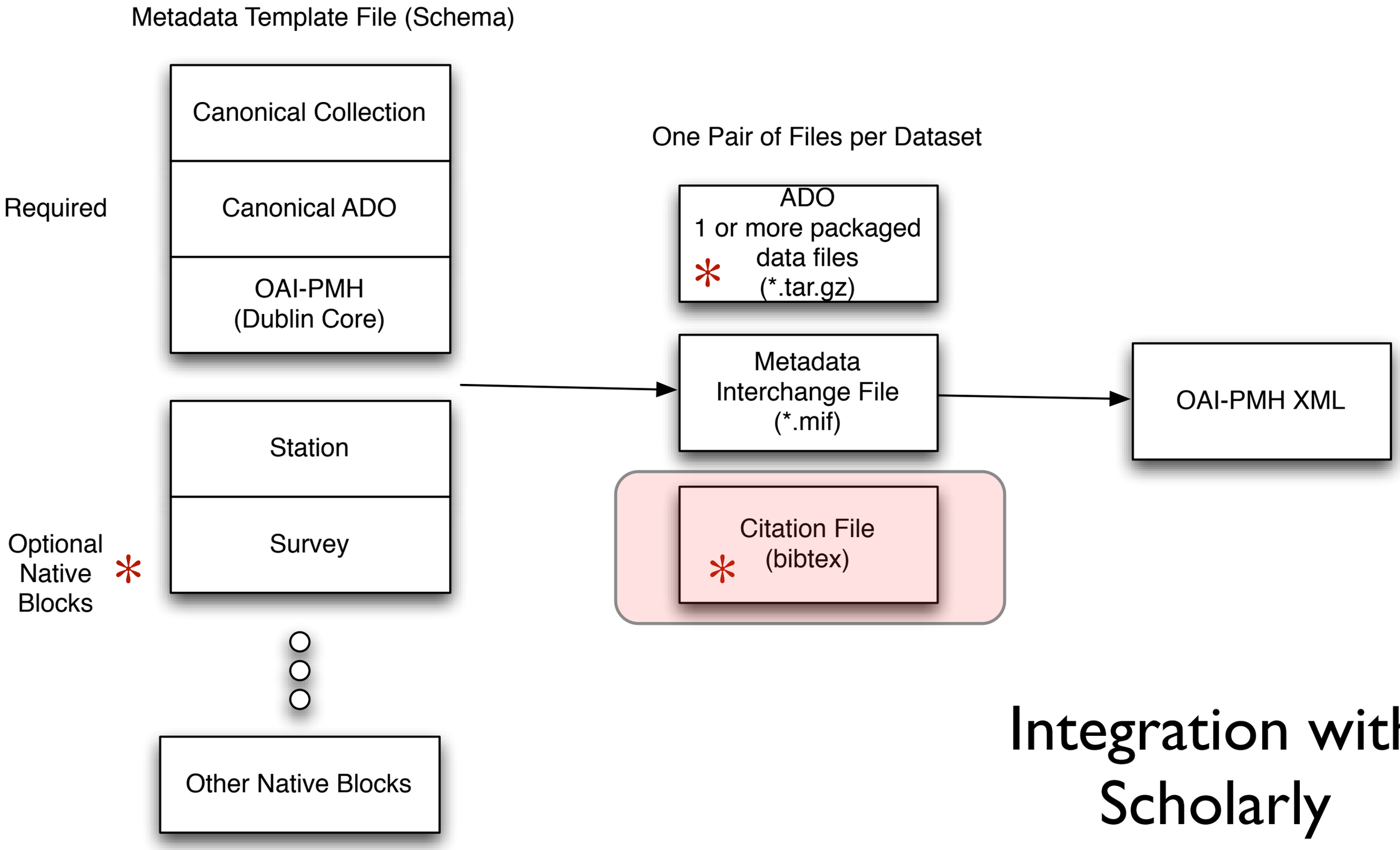
Why Does This Work?

- Changing scientific workflows in familiar but powerful way to attribute high-quality data to the authors of it
- Incentivize researchers to modify their existing workflows only slightly (and provide tools to do it)
- Integrating into a well-established and trusted system of scholarly publication
- Providing the basis for protecting intellectual property rights

Outline

- Evolution of Scientific Data Publication
- Changing Workflows
- Scope & Structure
- Data & Metadata
- Bibliographic Approach
- Protection of Intellectual Property Rights
- Editorial Policy
- Discussion

Metadata Production



Information content does not have to be mutually exclusive across native blocks

Integration with Scholarly Publication

BibTeX

http://www.bibtex.org/

bibtex

SAIC VPN Solo Guitar ...Blues Gu

BibTeX

BibTeX.org

Your BibTeX resou

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references, mostly in conjuncti

Here you can learn about the
to ease your BibTeX usage.

NEW: Be sure to try the *Bib2x*
into a few target formats. It
conversion of BibTeX bibliograp

PKZ2 Print

Belkin modems

LaTeX project: LaTeX - A document preparation system

http://www.latex-project.org/

latex

SAIC VPN Solo Guitar ...Blues Guitar Post to CiteULike IODP Site S...Bank — SSDB Adobe Photoshop CS Help SAS OnlineDoc, Version 8 .Mac

LaTeX project: LaTeX - A docume...

LaTeX – A document preparation system

LaTeX – A document preparation system

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Books

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Project articles
Development code
LaTeX3 news

How to get it
Get help!
Browse bugs database
How to report a bug

Site news
Site news feed
The LPPL
Contact

Search

News

New LaTeX3 conference presentations and publications
(Sept 10, 2009)

LaTeX3 news, issue two, released
(June 10, 2009)

LaTeX3 news, issue one, released
(February 10, 2009)

LaTeX is a high-quality typesetting system; it includes features designed for the production of technical and scientific documentation. LaTeX is the *de facto* standard for the communication and publication of scientific documents. LaTeX is available as free software.

LaTeX the product

What is LaTeX?
If you do not yet know what LaTeX is all about, have a look at our short introduction to LaTeX.

The latest version of LaTeX
We provide a newsletter (as a PDF file) about each release of LaTeX created since 1994.

Documentation
Each release of LaTeX provides a number of guides for users.

Getting LaTeX
If you need to know how and where to get LaTeX, please have a look at our instructions.

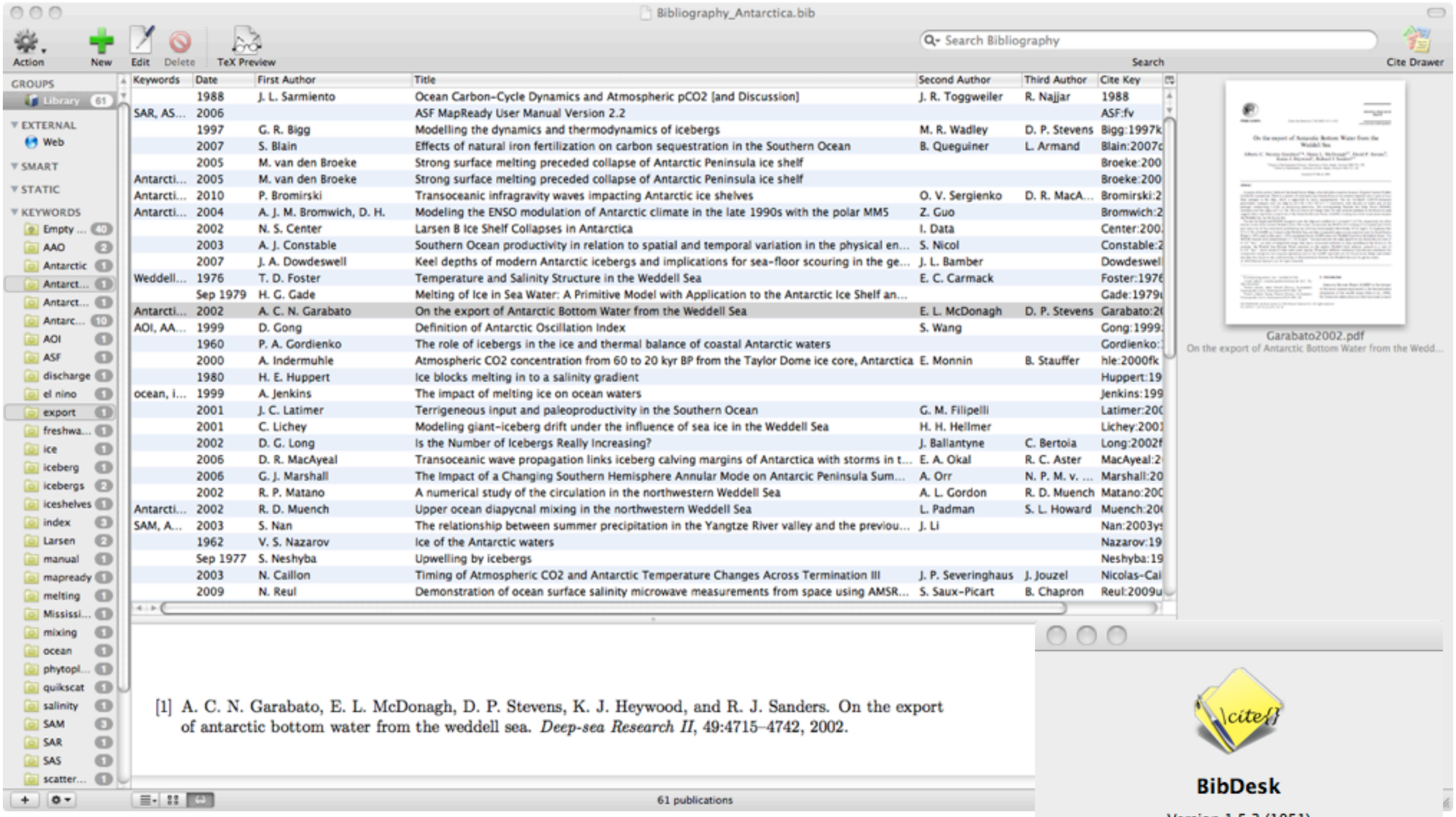
Getting help
If you are in trouble and need to get some help, please read our hints on where you might find help.

The LaTeX3 project

The LaTeX3 project
Do you want to know more about the LaTeX3 project? If so, then please have a look at a (short) description of the LaTeX3 Project.

Ongoing work of the LaTeX3 project
Over the years a number of articles, conference papers, etc., have been produced and published by the LaTeX3 project. A selection of these are available in Portable Document Format (PDF files).

Experimental, new products
We would also like to make development code available to you via this site. We are continuing to add new material at this location so as to stimulate further discussion of the underlying concepts.



Citation Manager for References (another form of metadata)

BasemapProduction_20101001.tex

Typeset | LaTeX | Macros | Tags | Templates

```
\subsection{SIO Coastal LIDAR}
This summary is the result of discussions between Helly and Guza after discussions between Helly
SIO survey are taken directly from an email from Guza to Helly.

The goal is to reference all surveys to the same vertical datum, NAVD88, and horizontal datum, NA
basemap has source data with variable accuracy and precision in addition do different datums, the
those errors are in each source and produce a self-consistent dataset that can be progressively im
available.  At this point, we are not trying to get complete consistency of geoids and epochs betwe
difficulties of reconciling differences in geoids retrospectively.  For example, the current GEOID09
models that have been differentially applied to the source data we are using.  Were we to attempt
now, it would introduce horizontal location shifts in data that has been used for prior analyses and
confusion.  This will be addressed prospectively once we have a sound basemap for vertical refere

The standard we are using is the March, 2006 SIO LIDAR survey.  From these data we select four
Beach, Coronado, SIO, Oceanside) since these provide the needed coastal locality as well as inter
The accuracy of this survey has been documented against multiple ground control regions betwee
Beach. Each quality control (QC) region, pier or frontage road, is divided into a few hundred  2x2 m
contain USGS benchmarks for verification that we are in NAVD88.  On piers, the surveyors run a 2
avoid side rails and other sources of noise.  On a 200m long pier there would be 100 cells.  Each
comparison, so it is not a problem that piers slope up to seaward.  In the Coronado and Pendleton
accuracy bias was +-10 cm with estimated precision (rms scatter) = +-15cm.

\subsection{USGS High-resolution Southern California}
As described in the accompanying metadata file, this is a:

\emph{...seamless, three-meter digital elevation model (DEM) was constructed for the entire South
extending 473 km from Point Conception to the Mexican border. The goal was to integrate the mos
available (for example, Light Detection and Ranging (Lidar) topography, multibeam and single bea
Interferometric Synthetic Aperture Radar (IfSAR) topography) into a continuous surface from at lea
elevation contour.}

The complete description of the dataset can be found as a USGS publication \cite{Barnard:yn}.

\subsection{Army Corps of Engineers LIDAR}
The US Army Corps of Engineers (ACOE) LIDAR data were provided by an Army contractor, NOBL
were analyzed against the other sources of data and found to be biased relative to the SIO Coasta
difference between the GEOID and the ELLIPSOID as expected since these were referenced to W
vertical datum.  The use of WGS84 for both datums is a common source of confusion between De
and National Geodetic Survey conventions.

\textbf{Definition:  Horizontal/Geometric Datum} -- All such datums are comprised of 8 primary elen
3 - Definition the origin of the coordinate system
3 - Definition of the orientation of the coordinate system
2 - Definition of the reference ellipsoid used to express the latitude
and longitude values

This is where WGS 84 and GRS 80 can get to be a little confusing.  The name World Geodetic Sys
the Defense Department, National Geospatial-Intelligence Agency (NGA) to mean both the ellipsoi
3ug}.  The Geodetic Reference System 1980 (GRS 80) (\url{http://www.gfy.ku.dk/~iag/HB2000/part
contemporary reference ellipsoid recommended by the International Association of Geodesy.  GRS
datum definition.  For all practical purposes the size and shape of the WGS 84 and GRS 80 ellipso
is the datums that they help to define (the first 6 parameters) that can be quite different.  This is wh
datum, not the ellipsoid) can be different - around 1 m each in latitude/longitude and ellipsoid heigh
Doyle, NGS}).

However, since this only addresses the horizontal datum explicitly but implicitly imposes the vertica
(i.e., GRS80), the elevations in these data have to be corrected to be compatible with NAVD88 use
this basemap.  This was done using the \textit{grdmath\_calibrate.bash} procedure (cf. source cod
calculated relative to the SIO Coastal LIDAR at the pier locations listed in Table \ref{tbl:SIOxACOE}
```

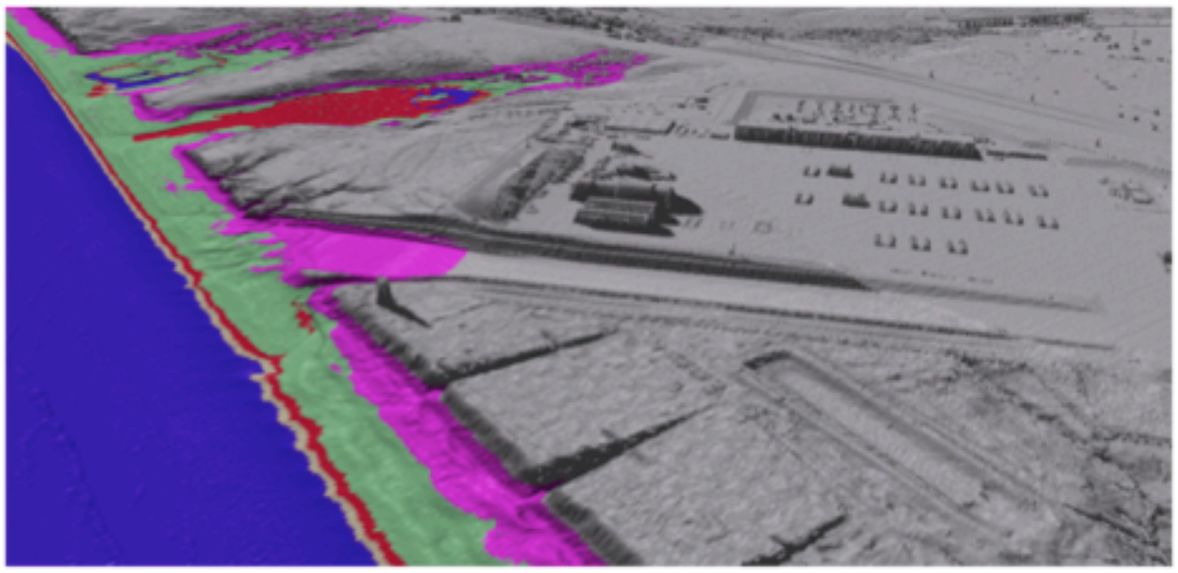



Figure 4: Fused ACOE LIDAR (calibrated) with SIO coastal LIDAR. View is looking northeast towards the LCAC facility at Camp Pendleton from offshore.

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- Sea-level Rise
- UCMexus

High-resolution Shoreline Methodology

Updated 2011-08-13 by hellyj

Sea-level Rise Risk Framework Project
Basemap Production Conventions and Procedures

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6 Tile index for fused ACOE LIDAR (calibrated) with SIO coastal LIDAR for the San Diego Bay area including North Island. Some of the tiles have been faded (increased transparency) to enable the coastal LIDAR to be seen. The ACOE LIDAR and the USGS data still have slight biases in elevation that obscures the SIO coastal LIDAR in this area.
7 View of North Island looking southeast from offshore and above Coronado Island. ACOE LIDAR are faded in favor of the SIO coastal LIDAR. The wall-like features at the tile edges (perimteters) is due to the addition of the bias elevation correction to an artificial perimeter of zeroes in the source files of the ACOE LIDAR. The procedure for removing them is described in section 2.7.

Outline

- Evolution of Scientific Data Publication
- Changing Workflows
- Scope & Structure
- Data & Metadata
- Bibliographic Approach
- Protection of Intellectual Property Rights
- Editorial Policy
- Discussion

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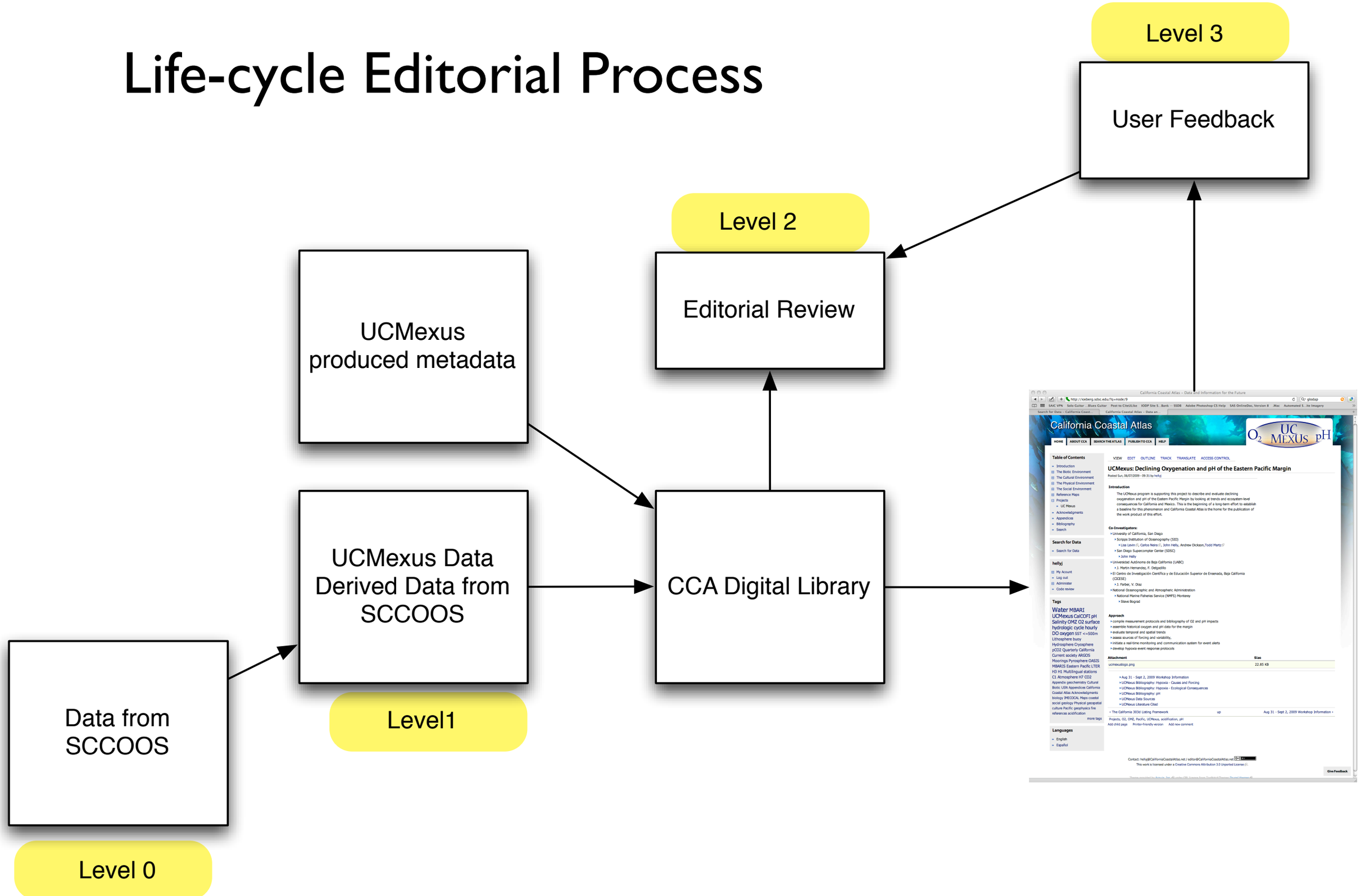
Life-cycle Editorial Process



Editorial
‘Publish’ Requirements

- Derived data product in CCA-conforming data format & packaging
- CCA-conforming metadata (fully-provenanced)
- Procedural software for reading Level 1
- Confirmatory listing for verification
- DOI
- Manifest with summary description (e.g., README)
- Licensing statement

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Monday, August 22, 2011

Backup

Approach

- Provide a locus for scientific research projects to share data within project
- Teach ‘best practice’ data management methods to students
- Incentivize researchers to publish data according to CCA standards and conventions
- Use the published data to populate the CCA chapters in narrative context