Data Access Working Group (DAWG) Meeting
New Media Studio, Santa Barbara, California
March 24-25, 2005

Meeting Participants: http://swiki.dlese.org/dawg/uploads/2/DAWG_Members_0305.doc
Meeting Notes as taken: http://swiki.dlese.org/dawg/26

The DAWG meeting was opened with a welcome from Bruce Caron, DAWG chair.

The members of the DAWG addressed or were involved in a number of activities during the meeting. These included:

1. Data/Content/Service Developer Space in DLESE
2. Discussion on the data/data services review criteria for inclusion in DLESE
3. Discussion on metadata standardization for data issues for DLESE
4. Direct Small Group Interactive Browsing of Earth Science Data Resources

The members of the DAWG were also informed of the status of the DLESE Quality Process, outcomes of the recent DLESE PI meeting and preparations for the DLESE Visiting Committee Meeting, and the upcoming DLESE Data Services Workshop (April 18-20, 2005).

1. Data/Content/Service Developer Space in DLESE - Ledley

The idea of a development space has been around for some time--a testbed for unfinished materials, access to data, a development "playground." All of the ideas however, are not yet funded.

The charge to the DAWG is: **Define a structure for this developers' area**

The emphasis should be on: How developers would interact with each other – creating collaborative networks of application developers--tools developers who share code that enables groups to access and analyze remotely collected data. Resources cannot be created by just one person/role within the data services realm, therefore, an online environment where teams can work together, essentially continuing the work of the Data Services workshop, would be useful. The community should think of a digital library as a place where members might go to work with others to create products. Nascent developers need access to people who already do development--like a matching service to complement people's skills (will need facilitation for making contacts). In addition, developers need to know the community needs and requirements and such a space can provide a place for them to gain that information. Usability needs to be an important feature of this development space.

DAWG could develop a prototype resource of data and tools that show capabilities of a development area. Current projects that might serve this purpose include: Using Data portal, Starting Point, Cutting Edge, Earth Exploration Toolbook. Opportunities for that might help facilitate this include the Federation Earth Information Exchange portal, and

the International Polar Year (IPY). Note: a newly funded ITEST project, Expanding the Data Cycle includes funding that might help in this effort. Could we replicate the model of bringing together people from the various develop groups (scientists, technology developers, etc) online – ie the Data Services model online?

Look for existing work that can be leveraged into this.
The DAWG work would need a focus rather than existing in several different projects.
The DAWG should keep considering the big list of data access issues. DLESE could facilitate practical tools for working with data.

DAWG could focus on development part, and invite a set of partners for the evaluation eg. ESSE 21 Evaluation Working Group-developing detailed analysis for evaluation criteria for Earth System Science education projects, including national and state curricula.

User education--show users what they have to gain by joining in. Then facilitate it with some collaborative tools. Critical mass of people who would participate is important. Exposure and persistence of Plone-based email archives is better than just email.

Motivation to participate must be obvious. All NSF-funded awards must make educational resources, etc. So a lot of separate efforts could be brought together. How would the environment be made attractive enough for people to participate?
How about using it to compile all projects' broader impact efforts... "Here's a plug-in that would help you get your educational stuff developed and get your tenure credit, and...."

Group has established consensus that DLESE should include ways to do more than find things, but a place to foster collaboration and develop.
.
Should have access to collaboration tools, how to find each other.

Datasets and tools need to have “pedagogical wrappers” to make them more meaningful for the educational community. Though the pedagogical wrappers may contain some key information that would feed into the metadata, the “wrapper” and the metadata are two different key issues.

Existing Efforts to Examine or Take Advantage Of

- Cyberinfrastructure--New audiences for data, including work force development current researchers as well as next generation of scientists

- Earth Ed Online--comprehensive package for finding and using data including writing about it, etc. Could be funded by a student activation fee, similar to buying college textbooks.

- NASA education partnering with Pearson for school-age materials--Could we follow this model? NASA Education Enterprise - Adena Loston

- O'Reilly (oreill.com, computer books that can be constructed through their site)--custom publishing for teachers in college. Chose from 10,000 different chapters, add your own, sequence however you like, your compilation gets its own ISBN and can be delivered to your bookstore. Each of the original authors receives royalties on a per page basis. Marketed heavily to open-source community. This model is really great for something as cross-disciplinary as ESS. We could talk about getting data sources into this mix.

- DialogPlus (www.dialogplus.org): Modules in support of undergraduate geography. Develops learning modules in geography at various institutions in UK and US. People pick and choose modules to be used. Not seamless-Shibboleth is being used to authenticate users. Could this work for developers as well? Create commons with additional tools. Project began by linking conventional teaching tools together. Geographers extended the reach to national and then international databases (i.e. UK and US census data). Develops and deploys reusable digital learning nuggets through the Alexandria Digital Library (ADEPT = Alexandria Digital Earth Prototype) DOUBLE CHECK THIS ONLINE

- Access grid meetings/video conferencing/

- "My DLESE" idea expanded to "Our Development Space"

- University of the Arctic--virtual consortium of circumpolar universities. Students can take a course from any of the real universities and get credit from the virtual university. Field camp gets the people together once per year and covers some of the components of the University of the Arctic. Universities each issue their own passwords

- Discussion of DLESE use of Plone for some core service areas - data services and evaluation to date. Plone is a web-site development system that works over the ZOPE content management system. Does this have potential for faciliation of development place?

- SAFARI model--if people get to pick and choose, they might want to contribute

- BREEZE from Macromedia/Flash. Real time screen sharing video, audio, white boarding, click stream recording. We could do workshops who would teach us how to do X in 30 minutes, save it as an invitation for other people to see what we can do. In broad role of DLESE, communication between data providers, scientists, curriculum developers and educators could be an outreach project.

- IMS (Internet Mapping Service) project-IMS Global Learning Consortium. IMS is a metadata structure for learning materials. Began as training materials for Sun, Microsoft. Container versus nugget (item-level) cataloging. Big in the professional training market--Here's a tool, here's what to do with it. Sequencing of linear set of

learning items. Allows an instructor for a specific course to define a sequence of learning materials. Example of reuse using larger granules than our interactive learning models.
This is still a practical nightmare in high schools.

- Marine Metadata initiative (marinemetadata.org).
  Plone CMS encapsulates work flow details. Availability to set access levels for materials (publish versus private).

Which of these models help people work together and might work for DLESE's developer's space?

Opportunities (not the only opportunity, just the one that was explicitly mentioned during meeting)
NSF CIT RFP is out-could be a funding vehicle.
Excellence in Earth Science Education--work with people who are doing doctorates in Education. This area would be ripe for educational researchers.

2. DAWG White Paper and Data/Data Services Review Criteria for Inclusion in DLESE - Caron

This discussion was held following the recommendations from the Quality Process being released (recommendations from the Quality Process concerning a tiered library at attached as an Addendum at the bottom of these notes) and Steering Committee's decision that all resources in DLESE be reviewed (ie the Broad Collection eventually disappears).

There are different points of view on how extensively the DLESE Collection should be reviewed - should it all be reviewed or should there be levels with some resources reviewed and some not-reviewed?

Currently there is a Broad Collection with very minimal accessioning criteria and a Reviewed Collection. The Quality Process recommended a three tiered system with a Standard Collection that is in some ways analogous to the Broad Collection; a Reviewed Collection in which all resources would have undergone a review process; and a Premium Collection for resources that had proved to have demonstrable impact on geo education.

It was suggested that the quality of the resource could be determined by the contributor who could work to move their resource up the tiers of the collection. One problem is that many times the resources are not contributed by the authors but by a third party who does not have the authority or capability to change a resource.

There were suggestions to institute a star system or provide the capability of assigning a number rather than just a comment so that resources could be sorted by their rating. Either of these kind of systems (star or number) could be built.

The discussions to this point were more broadly focused on the issue of all resources in DLESE. In addressing of how data should appear in DLESE there is a feeling that there should be the capability of having

1. reviewed datasets (with accessioning review criteria for data, data-rich resources, and data analysis tools being different than for educational materials) that are discoverable in DLESE

AND

2. a separate "Development Area" within which unreviewed datasets, unfinished educational modules using data, and data analysis tools could reside and be worked on by members of the community. (Note: Task Force 1 will be addressing this issue)

This issue for this discussion is to identify workable accessioning review criteria for datasets, data-rich resources, and data analysis tools. There have been some suggestions that reside on Katy Ginger's site: http://www.dlese.org/metadata/documents/katy
What is currently suggested might be the criteria for an ideal data site. This needs to be modified to identify minimum criteria for being part of the reviewed collection.

Sean, Tamara, Katy, Roland and Anupma will work on a document that suggests minimum review criteria for data sets to be accessioned into DLESE. They will most likely wordsmith the existing Data Site Criteria list from the DAWG white paper.

ADDENDUM: Recommendation of quality team/table for tiered system:

1. Tiered Collection. Wedding cakes! Our group recommends the adoption of a tiered collection...
The tiers include:
a. Standard (or "experimental" or "working" [whatever connotes a mixed bag]) Collection. These resources have undergone automatic metadata and technology checks to ensure there are no noticeable problems with metadata fields, links, etc. They would also be checked against the seven DLESE resource guidelines that might be by an adhoc task group or some other 3rd party. Again, the user prioritization model mentioned above is still the foundational principle to help make this effort manageable. The desire would be to move all these resources to higher tiers in the collections or be deaccessioned from the library. It is still not clear exactly how to treat data, images, etc. that does not lead itself to peer-review. Our group thought these resources should just be exempt from the peer-review process. This collection would also hold the developer materials and working earth data resources as recommended by the DAWG. These would be tagged somehow as "not-ready-for-end-users". Other data sites would be made available to end users when these meet the "criteria for data sites the support effective educational use" [See: DAWG white paper, appendix I].

b. Reviewed Collection. The resources would be evaluated by an Editorial Board or by a collection review board and assigned any relevant annotations. This review would couple science, pedagogy, functionality, and metadata issues. Feedback would be provided to the collection or resource builder. See our Group's Editorial Board recommendation below. A

set of community-vetted, publicly available standards for resource quality (along with helpful materials for resource builders who are planning to have their sites reviewed) will enable these contributors to demonstrate that their collection or resource meets the quality standards for review. The editorial process will also look at redundancy issues and gap-filling needs to determine which resources will be reviewed first.

c. Premium Collection. These resources would be those resources that had been judged as having a demonstrated impact on geo education in the classroom. (NOTE: it's much harder to judge reform than simply to judge learning. I think we should stick with learning.) Such designation could come from the Editorial Board, from community nominations (peer-acclaim), Community Review System input, evaluation and assessment studies, etc. This system could also feed some annual awards for outstanding contributions (perhaps nominated by the editorial service and then selected through some community service program—with proper recognition at the annual meeting and on the DLESE website).

d. Relationship with the existing CRS. The CRS would continue to operate in parallel with the Editorial Board process, except the CRS expert review function would be taken over by the Editorial Board. The CRS functions like Review-a-Resource, Teaching Tips, etc., is recognized as critical input, and would remain admissible and accessible. In fact, the CRS would continue to track the quality of a resource well after it had undergone the formal Editorial Board review process and could perhaps serve as an "Early Warning" system to detect a resource that has begun to deteriorate or has not been maintained.

e. General Issues. The results of a DLESE search would identify which collection a resource came from by a noticeable icon. As resources moved up these tiers, their builders would be provided with evidence that these resources had been accepted through the high quality DLESE review process. Annual and prestigious awards would be given for resources in the premium collection. Those involved in the editorial process would be given citations for their contributions. These would all be part of the professional development incentives for participating in DLESE in the various capacities.

3. Metadata Standardization Issues for DLESE (Domenico/Fox).

Metadata is the mechanism makes data harvestable to various audiences.

Framework/Tools – THREDDS provides catalogs into which metadata can be put. Put in categories of data.

Content of Metadata

There are a number of issues at affect the content of metadata:

1. Use or machine readable (semantic) metadata. The THREDDS community has focused on this aspect of metadata.
2. Discovery and human interaction – there are cases where human readable and spatial metadata are needed to best facilitate human interaction

Crosswalks that work between metadata standards

Ontologies allow the mapping of concepts into different domains. Interoperable ontologies enable working between communities with similar scientific lexicons

The big question is "What will go into DLESE?" What level of granularity should we have with respect to datasets and how should it be approached with respect to metadata?

Possibly what should be done is to go with a specific standard (currently DLESE uses ADN (ADEPT(Alexandria Digital Earth Prototype)/DLESE/NASA) and have crosswalks others. Some of these are FGDC (Federal Geographic Data Committee) and Dublin Core.

A major question is granularity. This can possibly be addressed through a hierarchy. We don't want every end granule in DLESE. Some felt that the preferred inventory item was a class of datasets. THREDDS is now providing tools to allow data providers to create an inventory list of data and urls to point toward those data sets. Then you could restrict entries into DLESE and point to a THREDDS catalog instead.

We could then make harvestable by digital libraries the top level classifications, eg. Forecast model output , radar data (160 radars are constantly scanning- 10-15 products a second are coming in)—you don't want to manually enter each data set, instead a pointer to the class that is inputted once.

However, the capability of cataloging individual datasets should be possible for those that developers are using or that fall into the category of "classic" datasets or that are subsetted datasets (small and static) for use in education.

It would be worthwhile to be able to catalog and make discoverable 3rd party catalogs that store a series of datasets on different servers related to a specific topic. We could then identify these datasets related to an event or theme and identify educational modules that can then be built around them.

Review criteria that apply to datasets don't apply to other kinds of learning objects This is also true for metadata. FGDC conformance has valuable search criterion and is a good filter for developers. Can we identify THREDDS or FGDC as a field in the metadata so we can take advantage of the services they provide.

Characterization of data access mechanism should be in DLESE metadata entries—URLs may be pointing to a generic access site or a URL to a specific file. These should be distinguished, and service provider characteristics should be identified. There should be other required metadata for example, we must have geospatial data and coordinates.

For the Educational Community:

Useful features for education to be considered to be included as metadata

- If a data set has been used in published conclusions: that is one measure of quality of a dataset
- The metadata needs to indicate the proximal use and resolution of the data, so that it can be applied in an appropriate context.
- Metadata needs to be useful to a developer, not necessarily for a student.
- Need to be able to indicate who and what the data set is useful for
- Need to crosswalk the purpose the educator has with the resolution of the data set. Indicate if it can be used for local regional or global scales.

There is the question of whether catalogers need to provide all these parameters or whether educators need to develop the skills to use data discriminately.

There should be pointers to materials to assist teachers in the use of a data set.

Look at ADN:
We should start by looking at the specific fields in an xml file to help teachers find and use the data that they need. There are "Metadata best practices" address the required metadata fields for all resources. However, do we want to have the same required fields for data—do we want others that we add, should we rule some of these metadata fields out because they specifically do not apply to datasets. Maybe for dataset metadata we need a more proscriptive vocabulary– need more information besides just "remotely-sensed, in-situ" to include buoy-sensors, satellite, etc

A small working group/task force should proceed to try to develop this metadata. Possibly starting from ADN and then adding or deleting items suggested in the discussion above and future discussion for making the data more discoverable and useful by educators

Task force on identifying required metadata on data:
Bruce Caron
Katy Ginger
Rob Raskin
Kate Beard

ADDENDUM: There some interesting pre-meeting discussions on the metadata for data issue and what follows is an attempt to capture those conversations:

From: Kathryn Ginger
To: Ed Geary , Ben Domenico , Cathy Manduca , Sean Fox
Cc: Karon Kelly , Michael Wright
Date: Fri, 11 Mar 2005 11:07:41 -0700 (MST)
Subject: agenda item on DAWG

Ben and Sean

I am attending the DAWG meeting and I see there is an agenda item for discussion of

metadata standardization issues in DLESE.

Since I am so closely involved with DLESE metadata, can you give me some more information on this item?

I have also heard through the grapevine that Data Services and Community Services are working on metadata for datasets (more than just what would be good to describe a dataset with). Can you also give me more information on that? I would like to be involved. Are you aware of what ADN does currently?

Katy

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From: Ben Domenico
To: Kathryn Ginger
Cc: Ed Geary , Ben Domenico , Cathy Manduca , Sean Fox , Karon Kelly , Michael Wright
Date: Sun, 13 Mar 2005 21:20:33 -0700

Katy,

I'm afraid my response will be at a very high level. As you know our main focus in THREDDS has been to provide a framework of middleware and a set of tools which experts in the field can use to create the content. Moreover, we have spent considerable time on the semantic metadata needed by automated tools that use the data. Within Unidata we don't have the wide range of disciplinary expertise needed to create the discovery metadata. However, we provide the hook to enable experts to build enhanced catalogs with more elaborate descriptions of the datasets. Those enhanced catalogs contain the information that discovery centers like DLESE can employ as the basis for user searches. The search results in turn can point to the inventory catalogs of specific datasets at data provider sites.

In terms of specific forms of metadata, we do have some basic tools that can transform THREDDS catalog information into NSDL Dublin Core, DLESE's ADN, and the Global Change Master Directory DIF. I also have heard that a tool has been developed to perform the crosswalk from FGDC/ISO TC19115 metadata and Dublin Core. But, as yet, we don't have many THREDDS catalogs populated with FGDC. But we expect more THREDDS catalogs with FGDC enhancements -- especially at government and international data provider sites.

I know this doesn't provide the detail you would like, but I hope this will help get the conversation started before the meeting.

Ben

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From: Sean Fox
To: Kathryn Ginger , Ed Geary , Ben Domenico , Cathy Manduca
Cc: Karon Kelly , Michael Wright
Date: Mon, 14 Mar 2005 09:43:14 -0600

Hi Katy,

Sounds like Ben has some ideas. I have to admit to not having thought much about this particular agenda item for the DAWG meeting (lots of other things on my plate) so I don't have any specific items in mind (presumably I'll give it more thought between now and then). If there are particular ideas you want to bring up we'd glad to have 'em and I'm sure this session will be largely general discussion within the whole group so that anyone who has insights can contribute.

Community services work on data has focused on the Using Data portal. The only metadata-specific activity there is the creation of a small set of controlled vocabularies intended to clarify how a particular data site (or data activity) fits into an educational context. This is the work we started awhile back and we talked about at the last DAWG meeting. You can see the current state of things in the Using Data portal--all the vocabularies we have are exposed in the two search pages. Since that last meeting we've been trying to get feedback from educators and data people about how particular vocabularies and terms work (or don't work) for them. We've worked to get feedback at professional meetings and the like.

In getting feedback to improve the vocabularies there's an obvious synergy with Data services since they do alot of work with data-oriented educators (at their workshops and such) and so can help us get some community feedback on how well the vocabularies work.

If you have insights about particular terms in these vocabularies and especially if you have any observations about how 'real users' might have worked with them we'd love to have your feedback too.

Beyond that I don't know of any metadata work in the two projects. Certainly nothing at the framework level or that would go beyond DLESE-IMS/ADN (since vocabs already fit nicely into these as keywords at the very least).

Hope that helps,
Sean

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From: Ben Domenico
To: Sean Fox
Cc: Kathryn Ginger , Ed Geary , Ben Domenico , Cathy Manduca , Karon Kelly , Michael Wright

Date: Mon, 14 Mar 2005 09:26:32 -0700

Thanks, Sean:

Your note reminded me of a few other substantial related initiatives that should be discussed at the meeting. One is Rob Raskin's SWEET ontology work -- in conjunction with the NASA GCMD people. I believe Rob will be at the DAWG meeting so he can cover that one. Another is the Marine Metadata initiative that John Graybeal of MBARI is spearheading. I'm not sure anyone will be at the DAWG to represent that effort. A third is NCAR's community data portal. Luca Cinquini and the crew there have leverages the NcML development with full text search facilities to make good use of the metadata associated with THREDDS catalogs in a discovery setting. But the main thing is that these groups are working on the "meat" to hang on the skeleton that THREDDS represents.

http://sweet.jpl.nasa.gov/ontology/

http://wiki.mbari.org/marinemetadata/moin.cgi/

https://cdp.ucar.edu/

Ben
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4. Direct small-group interactive browsing of major Earth science data resource sites

In addition to the discussions documented above the participants in the DAWG meeting explored various Earth science data resource sites (The url's, organization they are from and a brief description are shown in Table 1.) The purpose of this exercise was for the participants to determine how well the draft DLESE review criteria for data could be applied to these sites; the availability of viewer software; and metadata availability and content.

Participants worked in six groups of two or three and entered their findings for a particular url in response to specific questions on the swiki. Note that given the short time frame not all urls were examined and not all questions were answered completely. However, the exercise gave the participants the opportunity to examine the practical issues in establishing review criteria for datasets. This was not intended as a comprehensive study. The questions that each group addressed included:

1. Data site allows educators and students to find and access appropriate data of interest easily.
    a. Level of prerequisite knowledge for use is clear
    b. Interface is well-designed to support querying to answer applicable scientific questions

   c. Semantically transparent metadata enable data discovery
2. Data site allows educators and students to ascertain the quality of data and determine the impact of data quality on the certainty of their conclusions.
   a. The DVM is presented in such a way that an educator will likely draw correct conclusions about its accuracy/limitations.
   b. Information is provided about overall data collection, quality, reduction, and limitations. Data site includes sources of error and limitations of collection process as well as inaccuracies/uncertainties from models/ particular choice of representations.
   c. Information about accuracy of individual data sets/points/analyses is provided
3. Data site supports students ability to manipulate data to answer questions
   a. By using data contained within the site
   b. By combining data within the site with data from other sites
   c. By generating appropriate visualizations
   d. By compare student's own data to that in the site
4. Use of the dataset by non-experts is supported
   a. Information is provided on relevance of data to problems of significance
   b. Support for effective pedagogic use
5. Robustness of access
   a. Data and software needed for use are reliably available
   b. Tools needed for access and use are easily acquired and inexpensive
   c. Tools are reliable and easy to use
   d. Data are archived appropriately for persistent access

GROUP ASSIGNMENTS and DATA SITE URLS HERE
The responses recorded by the various group can be found at the following links.
Group 1 Notes Group 2 Notes Group 3 Notes Group 4 Notes Group 5 Notes
Group 6 Notes

Table 1. URL's Explored by DAWG Meeting Participants

URL	Organization	Description
http://www.cdc.noaa.gov/PublicData/data_descriptions.html	The NOAA Climate Diagnostics Center	The primary reason the data collection at CDC exists is to serve the scientists of CDC in carrying out their scientific research
http://www.pasda.psu.edu/access/index.shtml	PASDA Pennsylvania Spatial Data Access: The Pennsylvania Geospatial Data Clearinghouse	Pennsylvania Spatial Data Access, PASDA, is the State Geospatial Data clearinghouse for the Commonwealth of Pennsylvania. PASDA is also a National Spatial Data Infrastructure (NSDI) Clearinghouse node that provides free public access to geospatial data and metadata via the World Wide Web. PASDA supports search, display, and retrieval of GIS data, imagery, such as satellite images and aerial photographs, and metadata related to Pennsylvania. In addition to GIS data sets, PASDA also provides GIS tutorials, an extensive FAQ, information about metadata, and an online metadata entry form.
http://my.unidata.ucar.edu/content/projects/THREDDS/DataPublications/index.html	THREDDS/UCAR	data interactive publications
http://www.newmediastudio.org/DataDiscovery/DDTFWorkINprog.html	THREDDS/UCAR	data interactive publications: another example
http://earthref.org	Institute of Geophysics and Planetary Physics (IGPP), SIO	Earth Reference database.
http://cdip.ucsd.edu/	Integrative Oceanography Division, SIO	Coastal Environmental Data for planners, scientists and mariners

http://www.cdc.noaa.gov/cgi-bin/db_search/SearchMenus.pl	The NOAA Climate Diagnostics Center	A "search" interface that lists each data set and each variable in menus from which a search can be launched based on the data set(s) and variable(s)
http://www.cdc.noaa.gov/people/cathy.smith/Talk/examples.html	The NOAA Climate Diagnostics Center	There are links which describe using the web atlas as a teaching tool:
http://www.grdc.sr.unh.edu/index.html	University of New Hampshire Global Runoff Data Center	DWEL-000-000-000-027 A global hydrological database is considered essential for research and application-oriented hydrological and climatological projects at global, regional and basin scales. This includes water balance studies, investigation of trends in long-term hydrological time series, coupling of hydrological and meteorological models, flux of fresh water and pollutants into the oceans, and the coupling of runoff with water quality data. Monitoring of runoff is indispensable for water resources planning and management on all scale levels. The principal objective of the GRDC is to collect and disseminate hydrological data to support projects within the World Climate Programme (WCP) and the World Climate Research Programme (WCRP) of the World Meteorological Organisation (WMO) as well as for other programmes such as the World Hydrological Climate Observing System (WHYCOS) of WMO and the World Bank and the Global Environment Monitoring System – Water (GEMS-Water) of UNEP and WHO.
http://oceanography.geol.ucsb.edu/%7Egs4/w2005/a_Earth_Data.html	UCSB class	Oceanography
http://maewest.gso.uri.edu/avhrr-archive/archive.html	U of RI	
http://www.cdc.noaa.gov/cgi-bin/PublicData/getpage.pl	The NOAA Climate Diagnostics Center	A laundry list of "interactive web-based tools for exploring data at CDC"
http://ferret.pmel.noaa.gov/NVODS/servlets/dataset	The Pacific Marine Environmental Laboratory	National Virtual Oceanographic Data System (NVODS) is a Live Access Server installation from which a huge variety of oceanographic data can be explored
http://www.gommap.org/gommap/index.html	Gulf of Maine Ocean Observing System	Providing "Up-to-date information on weather and oceonographic conditions in the Gulf of Maine". Includes interactive mapping
http://reason.gsfc.nasa.gov/Giovanni/	Goddard	
http://gyre.umeoce.maine.edu/	U. of Maine	OCEAN Maine
http://beta.sedac.ciesin.columbia.edu/gpw/	SEDAC	gridded population
http://www.ngdc.noaa.gov/mgg/mggd.html	National Geophysical Data Center (NOAA)	Marine Geology and Geophysics national repository
http://www.iris.edu/seismon/	IRIS seismic database	Seismic Monitor, which is designed for the general user and is primarily for looking at earthquake locations, though it does link to the seismogram database
http://www.iris.edu/cgi-bin/wilberII_page1.pl	IRIS seismic database	Wilbur II, which is the main seismogram database and is designed for seismologists, but is also used to some extent by teachers:
http://great-sandy.arid.arizona.edu/scripts/esrimap.dll?name=aria&cmd=map	Arizona Regional Image Archive	This archive provides a wide variety of downloadable data for the state of Arizona, with an emphasis on GIS data, but containing a variety of remote sensing datasets as well. The data are primarily available for download, but there are a couple of visualization tools available within the archive as well: one that aids in the identification of available data
http://www.directionsmag.com/files/		
http://www.oc.nps.navy.mil/~icon/moorings/	Navy	OCEAN Maine
http://glcf.umiacs.umd.edu/data/	U Maryland	Global Land Cover data sets
http://www.ceonims.org/	Michigan State Univ. plus international partners	Terrestrial Circumarctic Environmental Observatories Network Internet Map Server
http://www.epic.noaa.gov/epic/index.html	The Pacific Marine Environmental Laboratory	
http://seth.arid.arizona.edu/Website/rangeview/RangeView_AZ/viewer.htm		and another that is a free-standing internet mapping application (RangeView,
http://www.gomoos.org/chameleo	Gulf of Maine Ocean Observing	Providing "Up-to-date information on weather and

n/gulfwatch/	System	oceonographic conditions in the Gulf of Maine". Includes interactive mapping
http://oceanography.geol.ucsb.edu/%7Egs4/w2005/a_Ingrid_Data.html	UCSB class	Oceanography
http://nsdl.sdsc.edu/beta http://SIOExplorer.ucsd.edu	SIOExplorer project, Scripps Institution of Oceanography (SIO) and San Diego Supercomputer Center (SDSC)	Digital Library for SIO expeditions, historic photos, seamount studies, and teacher resources, part of the NSDL. Also review beta site, providing basic webform interface, plus advanced Java CruiseViewer.
http://gdc.ucsd.edu:8080/gdc_home http://gdc.ucsd.edu	Geological Data Center, SIO	Two examples of hosting an ongoing data project: conventional and new beta Plone-driven content managed sites.
http://www.cdc.noaa.gov/ncep_reanalysis/	The NOAA Climate Diagnostics Center	A electronic "atlas" of certain fields from the NCEP Reanalysis
http://www.gomoos.org/buoy/satellite.html	Gulf of Maine Ocean Observing System	access to satellite data
http://waterdata.usgs.gov/nwis/rt	USGS Real-Time Water Data for the Nation	DWEL-000-000-000-014 This USGS site allows students to access a variety of streamflow information. There is an interactive map where the user can select streamflow data for selected stream gauging stations in the United States. Stations can be selected in list form, an interactive state map, or 10 nearest stations to position selected. Each retrieval form allows the user to refine their data search through predefined displays, such as tables, maps, or reports. Tables can be called up and further defined by basin, county, or hydrologic unit. For those unfamiliar with the process of data collection, an explanation of stream gaging is provided by a link.
http://earthref.org/ERESE		Plate tectonics teacher workshop site
http://marinemetadata.org	Monterey Bay Aquarium Research Institute (MBARI) plus international partners	Group site with metadata information, tools, standards, cookbooks, and working examples, with nearly 100 contributors, plone-managed.