Text, Data and People –
How to Represent
Earth System Science

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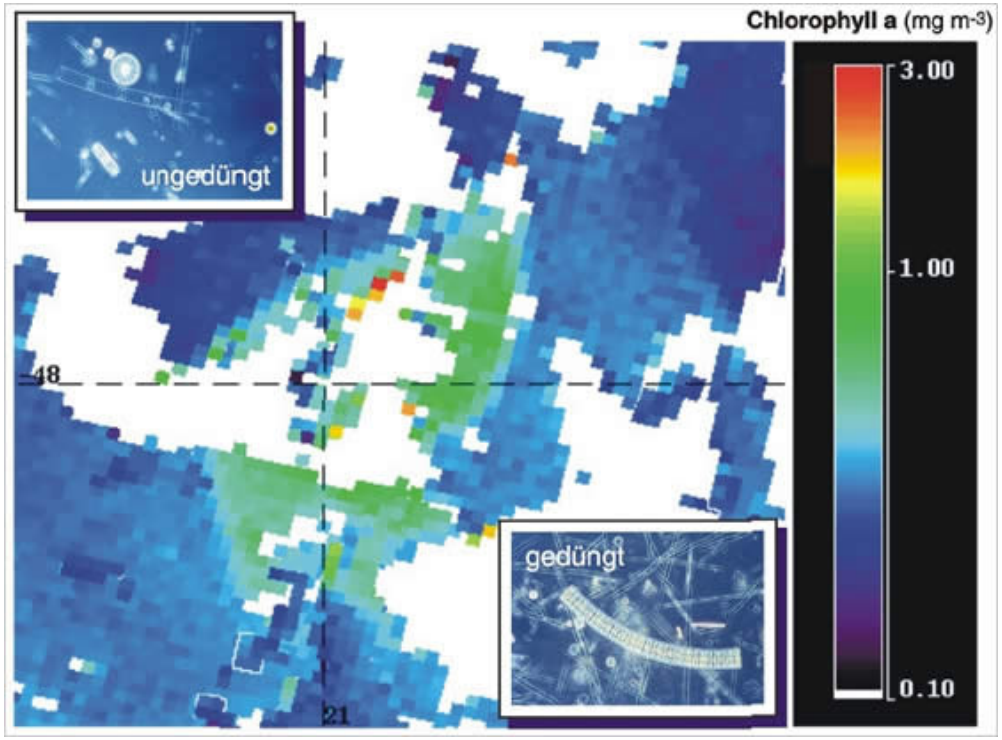
Introduction

- *Earth System Science (ESS) is an interdisciplinary and global collaboration*
- *ESS output is heavily data-centric*
  - **data come from observations**
  - **and simulation ("in silico" experiments)**
- *ESS work is organized around*
  - **expeditions or campaigns and**
  - **coupled models of earth's sub-systems**
- *Logistics and system cost are extremely high*
  - **one ship may cost up to 500 G€**
  - **"Earth Simulator", the fastest computer 2 years ago**
- *ESS data potentially are of extreme long term value*

An important, typical Experiment

- *EISENEX / EIFEX : Conducted during two expeditions of "Polarstern", with a 4 year pause*
- *EIFEX (2004):*
  - **54 scientists (and students) from**
  - **14 institutes and 3 companies from**
  - **7 European countries and South Africa**
  - **Oceanographers**
  - **Biologists**
  - **Chemists…..**
- *"Biogeochemistry"*



Collaboration's data needs

- *Need to work from a common understanding of what is known about the subject*
- *Need to plan expeditions and coordinate with ships' operators general plan (5 or more years in advance)*
- *Need to coordinate instrument design, operation and interfacing before ships departure*
- *Meet aboard , sail and work 8 weeks or so*
- *Do evaluation, when at the home institute, exchanging their particular results.*
- *Publish text; PhD students dump the data somewhere, if nobody watches, or keep it "private"*

Data Publishing

- *There is reason enough to thoroughly publish data:*
  - **Potential reuse in many more contexts than foreseen**
  - **Enable peer reviewers to have a critical look at data quality**
- *Problem: Metadata*
  - **ISO 19115 is a metadata standard (with ~1000 attributes) for georeferenced data**
  - **Almost no producer of data knows how to form ISO 19115 for his/her data (nor wishes to know)**
- *There is no reward system (like: number of peer reviewed papers) in place to stimulate individuals*
  - **There should be a solution for well curated datasets and databases**

Data Management

- *Metadata needed even on "work in progress"- or auxiliary datasets,*
  - **both need to be "archived", or managed**
  - **Even if they may never achieve a level of "published" data**
  - **They need to be available to a distributed project group during their project, long before publication**
- *There are too many datasets to produce correct and complete ISO 19115 metadata "manually"*
  - **Find ways to produce ISO by each instrument at the time of data creation, automatically**
  - **Use context or relationship instead of descriptive metadata**

Relating all relevant Objects

…but for AWI expeditions only, today

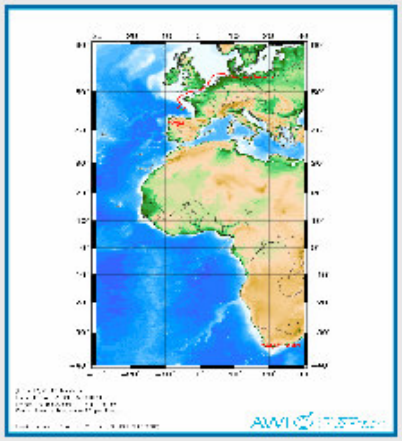
eXPEDITION
version 1.0

Login[Admin]

R.V. "Polarstern"- Expedition year: 2004 | Research vessels | Polarstern

Operation:	Alfred-Wegener-Institut [Germany]
Ice class:	GL/ARC 3, built 1982
Length/Beam:	117.91 m/25.07 m
Purpose:	Marine Science, logistic, re-supply
General info:	Current expedition | Current weather | Long-term schedule | On-line library
Cruise participation:	Call for Proposals | Proposal guidelines | Cruise-related forms
Instrumentation:	All | Physical oceanography
Data:	Meteorology | Oceanography | PANGAEA | PODAS
"Polarstern Abstracts":	All | Submit new abstract
Additional Publications:	Field reports | PhD Thesis
Presentations:	Invited talks | Talks | Posters

Where is "Polarstern"?



[See also] [Print schedule]

Expedition	Date || Port	Region || Research	Weekly reports	Data || AWI Publications	Details
ANT-XXI/3 Coordinator: Pörtner, H. Chief scientist: Smetacek, V.	21.01.2004 - 25.03.2004 Capetown - Capetown [Map]	Atlantic/Indian Ocean, Polar frontal zone Biology, EIFEX [Press release]	1. Report 2. Report 3. Report 4. Report 5. Report 6. Report 7. Report 8. Report 9. Report	Meteorology PANGAEA: Stations PANGAEA: Datasets *[Note: Datasets for recent cruises may not yet be available]* **"Polarstern Abstracts"** Bathmann [2004] Bathmann [2005]a Bathmann [2005]b Bathmann [2005]c Leach *et al* [2004] Sachs *et al* [2005]	▶

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Current PANGAEA relationship encoding

Resource

Dublin Core

Descriptive metadata

Dataset-to-Publication relationship metadata should be expressed in RDF/XML and placed in the "Relations datastream"

Identifiers needed (in addition to locators)

etadata

ource>
or content

elation>
or for
ation(s)

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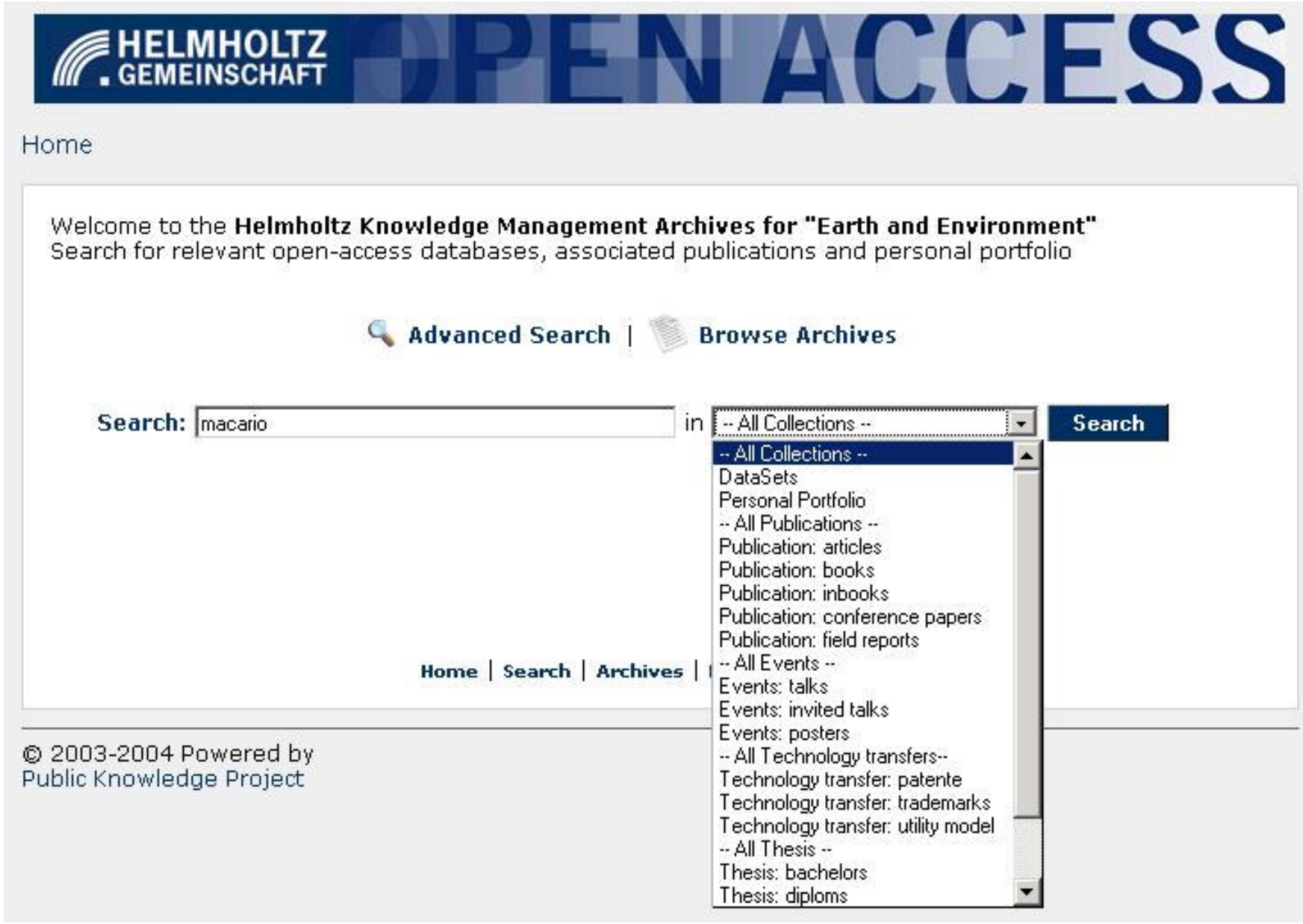
Goals

- *Transfer concepts and content from "homegrown", internal repositories to federations of standards-based IRs around the world*
- *Harvest (f.e.) Polarstern-expedition related text and data from all IRs of participants*
- *Display / sort / analyze / rank the maze of material through all meaningful criteria*
- *Find key networks of people, projects, text,…..*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Results 1-5 for 'macario':
Show Results 6-10 ->>
1 Personal Homepage of Dr. Ana Macario [text, people]
(2005) Ana Macario
2 A Discovery Service for Knowledge Related to Research Platforms [event, international talk]
(2004) Macario, A.; Pfeiffenberger, H.; Reinke, M.
3 Portal for Earth Sciences in Polar Regions [event, international talk]
(2003) König-Langlo, G.; Macario, A.; Olbers, D.; Pfeiffenberger, H.; Reinke, M.; Thiede, J.
4 Research platforms in polar regions - a portal approach [event, international talk]
(2003) König-Langlo, G.; Macario, A.; Olbers, D.; Pfeiffenberger, H.; Reinke, M.; Thiede, J.
5 An homogeneous Directory of People, Publications, and other Resources as a means for IT-based Knowledge Management in Science [event, invited national talk]
(2000) Macario, A.; Pfeiffenberger, H.
Fedora at AWI Response Time: 0.144s, 5 Results
Pangaea Response Time: 0.374s, 0 Results
Show Results 6-10 ->>
Script Time: 0.399s

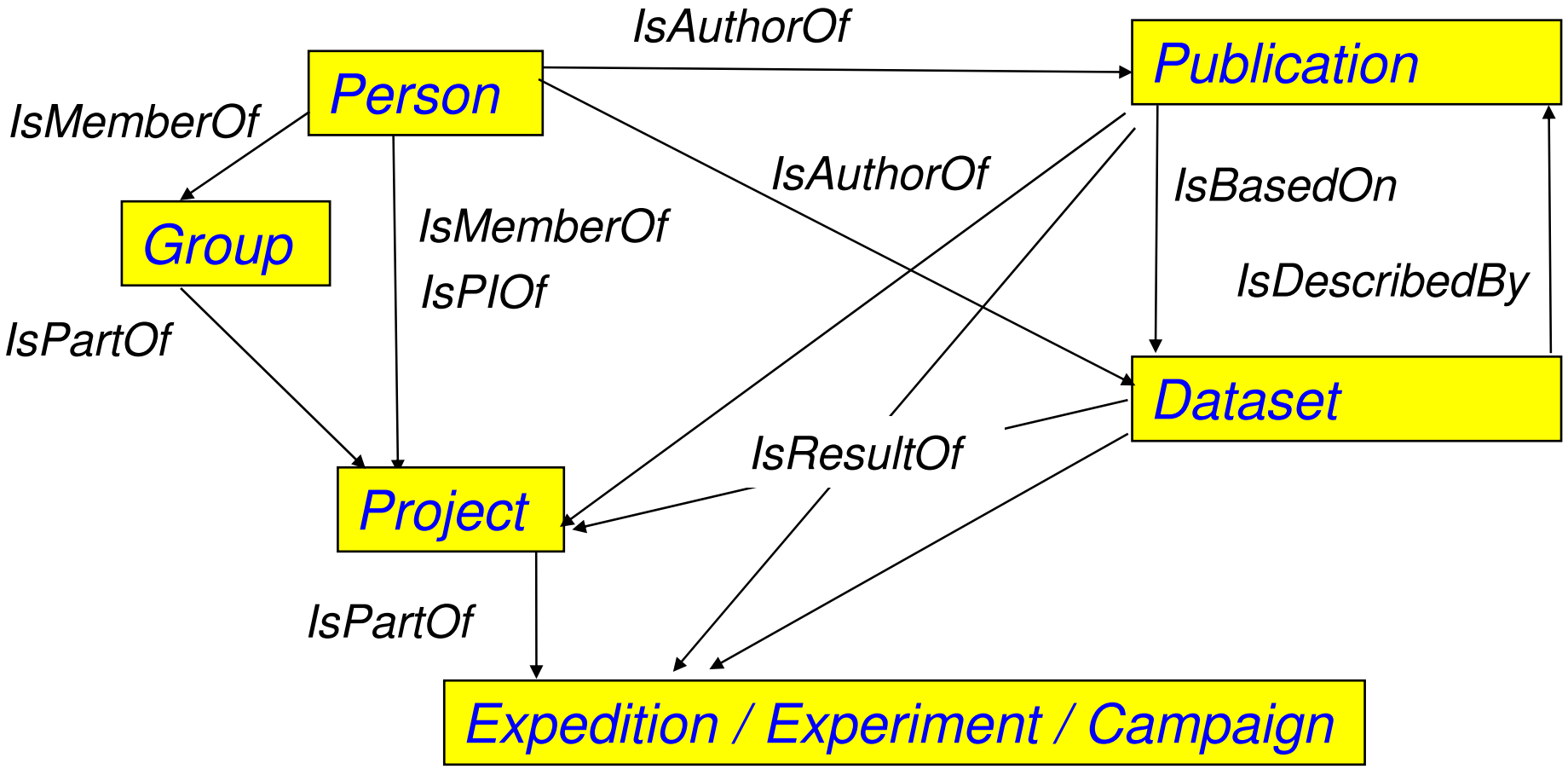
Types of Object *In the order of appearance (1)*

- *(Institutions)*
- *Person*
  - **represented by splash page (Personal home page)**
  - **uid: eduPersonPrimaryName**
  - **primary encoding: eduPerson schema**
- *(informal group)*
- *Project*
  - **represented by splash page (Project home page)**
  - **uid: maybe a specific encoding of the funders' project number**
  - **primary encoding: eduPerson/eduOrg schema**
- *Expedition, Campaign:*
  - **represented by splash page (Expedition home page)**
  - **treat it as a project, generate project number from expedition identifier**
  - **primary encoding: eduPerson/eduOrg schema**

Types of Object *In the order of appearance (2)*

- *Datasets*
  - **represented by splash page**
  - **uid: maybe the same kind as publications**
  - **primary encoding: Community specific (f.e.: ISO 19115)**
- *Publications*
  - **represented by splash page containing**
    - *abstract, etc.*
    - *pointer to article at publishers site*
    - *pointer to article at IR*
    - *publisher's word about what is the "original", etc.*
  - **uid: DOI, permanent URL, etc.**
  - **primary encoding: repository's (proprietary) format (f.e.: Fedora's , it must be possible to map this in an unambiguous way to METS, MPEG21-DIDL,…**

Object relationships (tentative)



Conclusion 1 – Text with Data

- *(Text-)Publications and related primary data have to be cross-referenced*
  - **We need ontology and schema designs to express the relationships (to solve reuse/aggregation problem)**
- *Extensive descriptive metadata (f.e. ISO19115) are useful only to big repositories of well curated datasets with similar content*
- *The full text of publications (and its relation to datasets) may be the best "metadata" for the datasets you will get*
  - **Primary hit in a (Google-like) search may be a publication, which refers to primary data**

Conclusions 2 - Full Relation Network

- *Service providers should make use of network of all relevant objects - people, projects, … datasets, text*
  - **harvest relationship metadata**
  - **harvest descriptive metadata (Dublin Core quality)**
  - **enable new search paradigms**
- *Data providers need to expose the relationship of objects*
  - **will require a "complex" metadata format**
  - **will require an ontology for relationships**
  - **will require unique identifiers for people etc. (from eduPerson schema , ~ email address)**
  - **introduce identifiers for projects and "experiments"**