

GeoViQua Components and Achievements

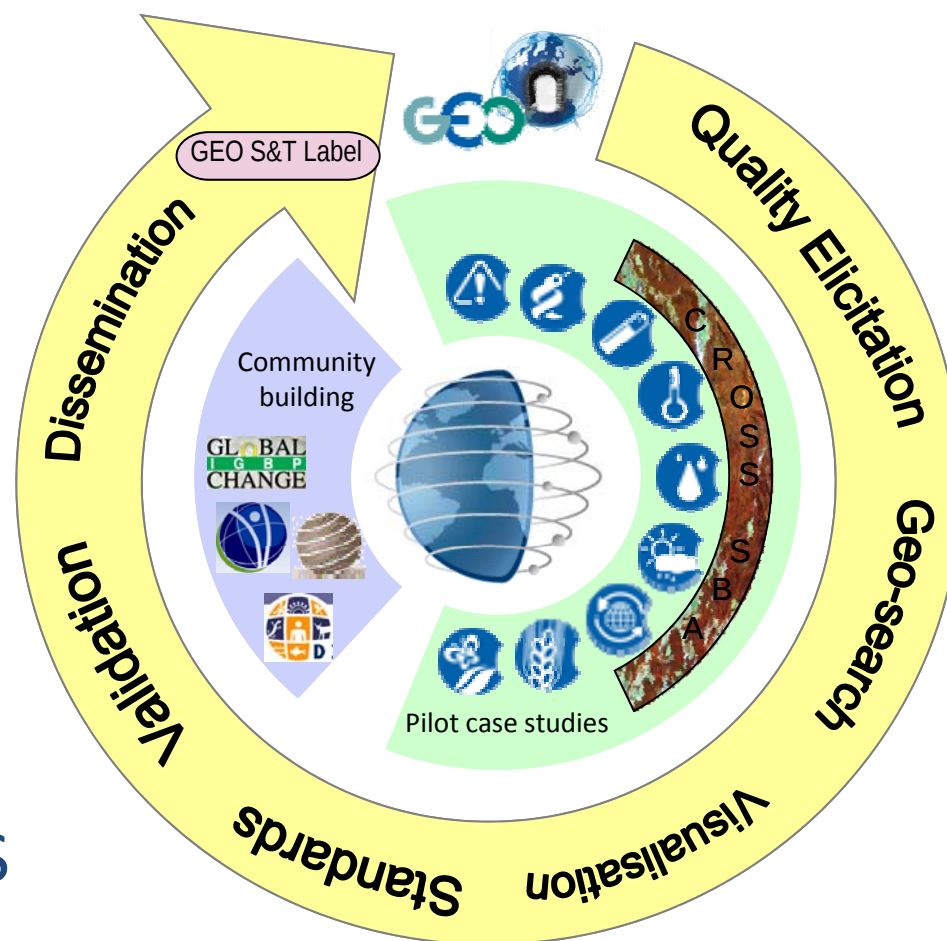
Tuesday, January 14th
2014

GEOVIQUA



This is a GeoViQua initiative

GeoViQua provides a set of scientifically developed software components and services that facilitate the **creation, search and visualization** of **quality information** on EO data integrated and validated in the GEOSS Common Infrastructure.



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Universities



Research centers



The team

Small or Medium Enterprises



International org.



GeoViQua (265178)

QUALity
aware
Visualisation
for the
Global Earth
Observation
system of
systems

FP7 Collaborative Project
Environment

10 partners with CREAM coordinating

Duration: 36 months

1 February 2011 – 31 January 2014

Budget: 4.024.256,42 €

EC Contribution: 3.266.803,98 €

2 reporting periods:

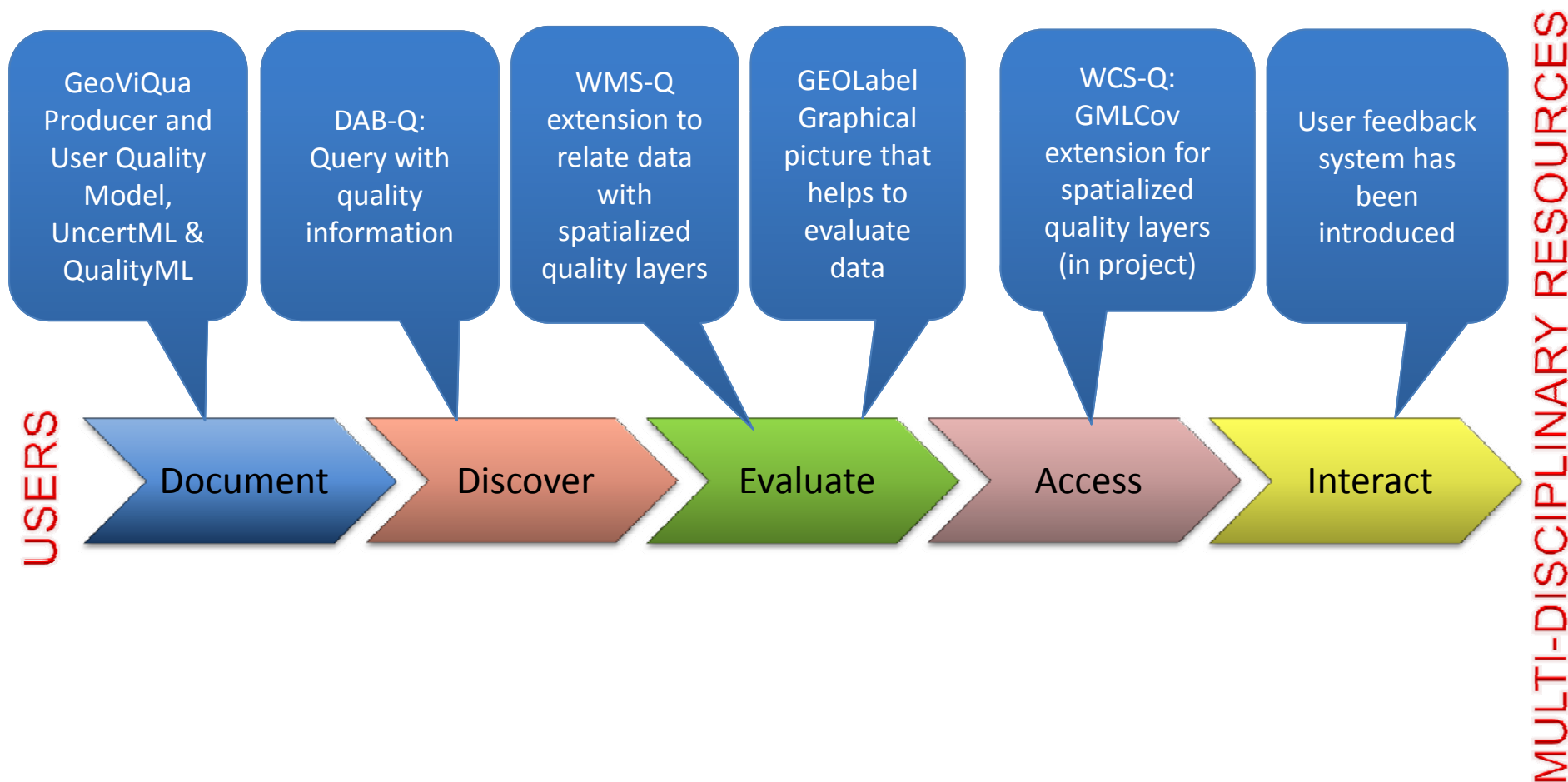
1. Months 1-18
2. Months 19-36

Elements that are not in the normal portal



- Documentation phase
 - No **quality** focused metadata **model**. No pixel level quality.
- Discovery phase:
 - Query
 - It is not possible to use a quality indicator as a way to **refine** the search
 - No **user feedback** consideration
 - Response
 - Quality is not a criteria for **ranking** results
 - Quality is not emphasize in the results
 - Metadata can not be easily **compared**
 - No visual representation of the metadata **completeness**
- Evaluation phase
 - No pixel level quality **visualization** strategies
- Access phase
 - No data access with **pixel level quality**
- Interaction phase
 - No immediate **user feedback**

Embedding quality in all phases of the geospatial data exploitation



Assessing fitness-for purpose

- **peer and expert review**
- better **traceability** and **provenance** information
- information on **citations** and **usage** of a dataset
- warnings about **problems** identified with a dataset and potential **workarounds**,
- ‘**soft knowledge**’ from data producers (e.g. recommendations for use which are not easily encoded using the existing standards)

Chrisman, 1988: asked for ‘user experience’ to be included in data quality specs

Epstein et al 1998: disclaimers only cover ‘reasonably foreseeable use’

Comber et al., 2006: identify mismatches between producer/user ontologies

Devillers et al., 2007: tools needed to help users understand quality information.

Boin & Hunter, 2007: users want a simple summary that they can interrogate for more detail as appropriate.

Lush et al., 2011: Interviews identified that these needs are still not being met.

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Document

Producer
quality
model

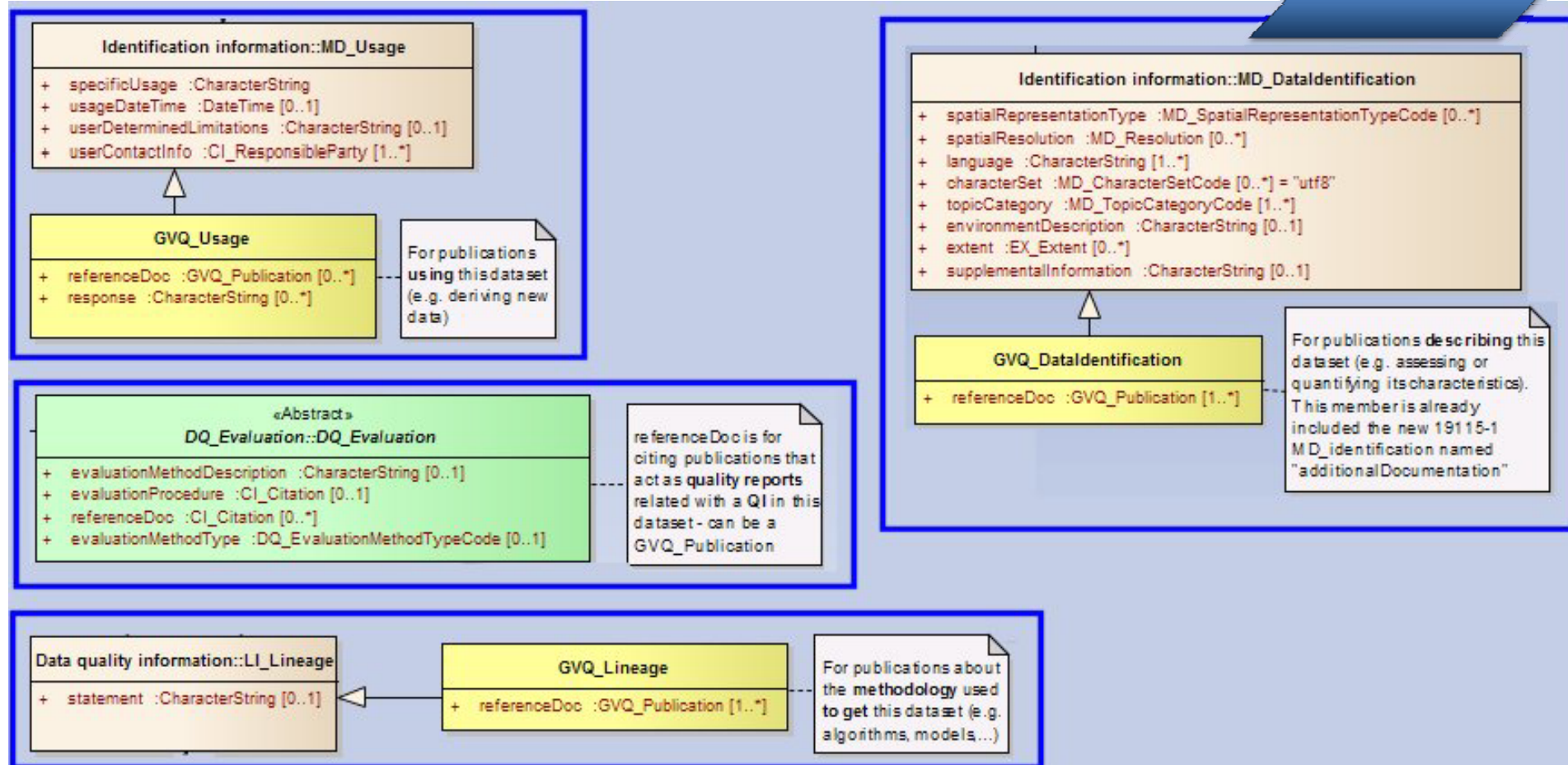
- ISO 19115 / 19157
- Extensions to the GCI:
- Citations
- Reference datasets
- Traceability
- Discovered Issues
- Pixel and dataset level –UncertML
- INSPIRE-recommended identifiers and codelists

User
Quality
model

- User feedback
- More flexible
- New model - not present in the GCI
- Ratings
- Examples of use in named application domains
- 'Soft knowledge' from producers

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Document



Documents describing this dataset

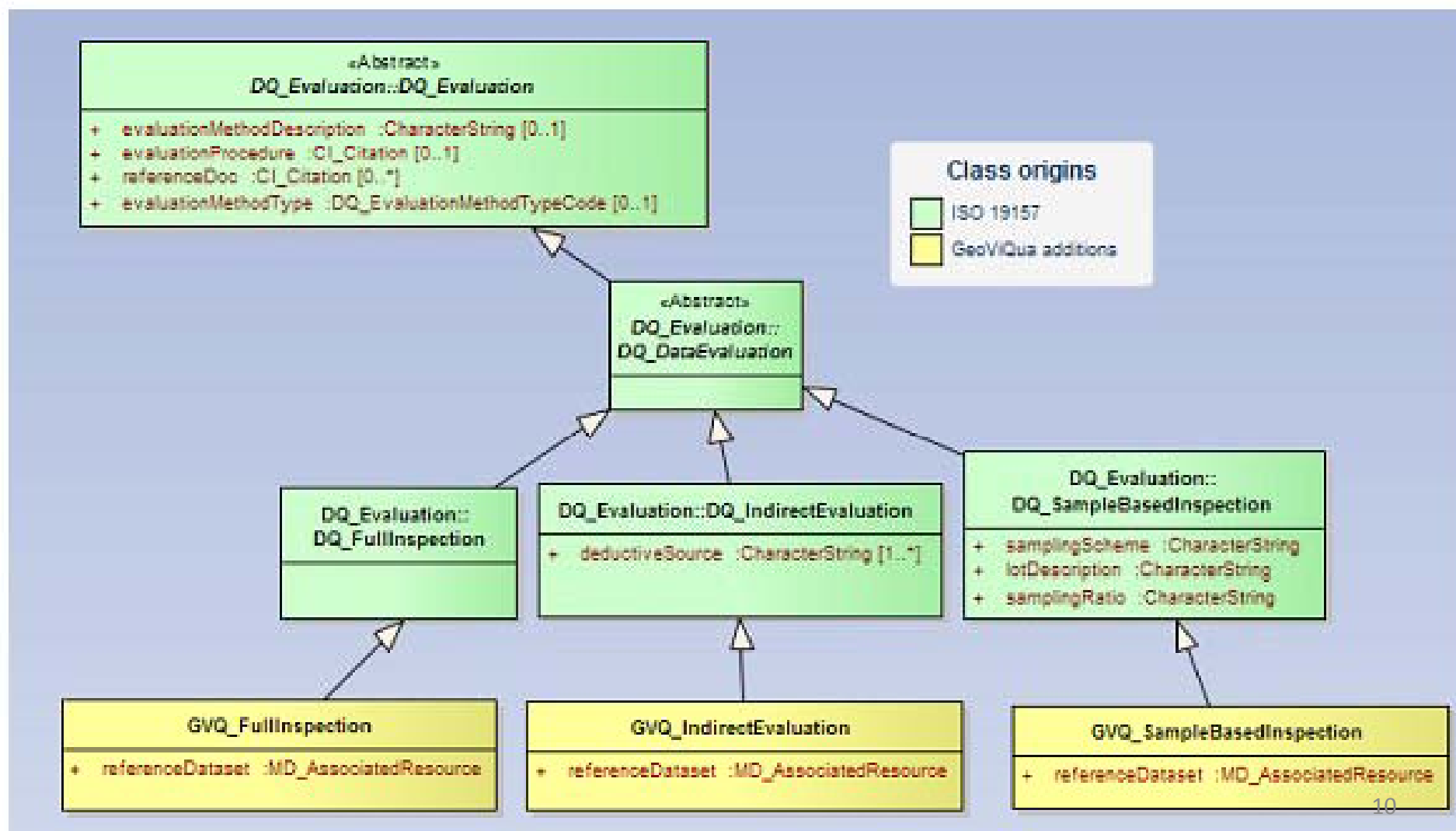
Title: A new land-cover map of Africa for the year 2000 , DOI: 10.1111/j.1365-2699.2004.01073.x

<http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2699.2004.01073.x>

Category: JournalArticle

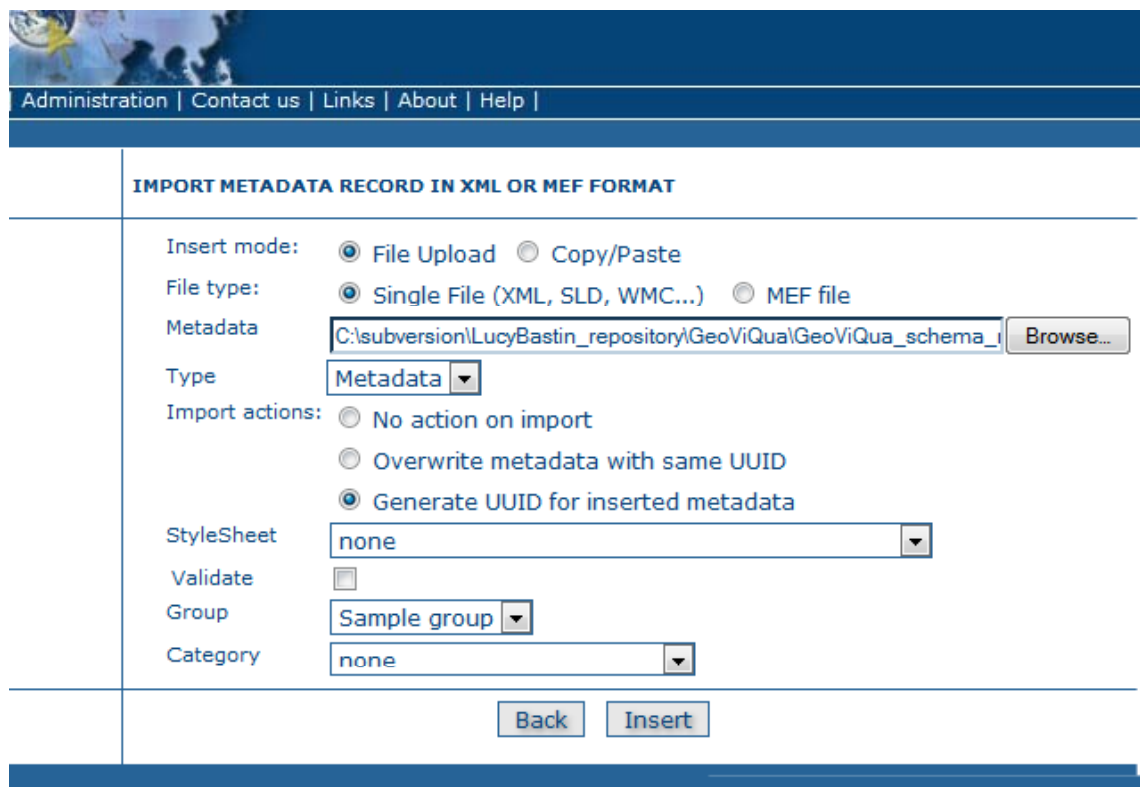
Citations

Reference datasets



Populating the producer model

- Geonetwork plugin to create, edit and publish GeoViQua-compliant metadata



Administration | Contact us | Links | About | Help |

IMPORT METADATA RECORD IN XML OR MEF FORMAT

Insert mode: ☒ File Upload ☐ Copy/Paste

File type: ☒ Single File (XML, SLD, WMC...) ☐ MEF file

Metadata:

Type:

Import actions: ☐ No action on import
☐ Overwrite metadata with same UUID
☒ Generate UUID for inserted metadata

StyleSheet:

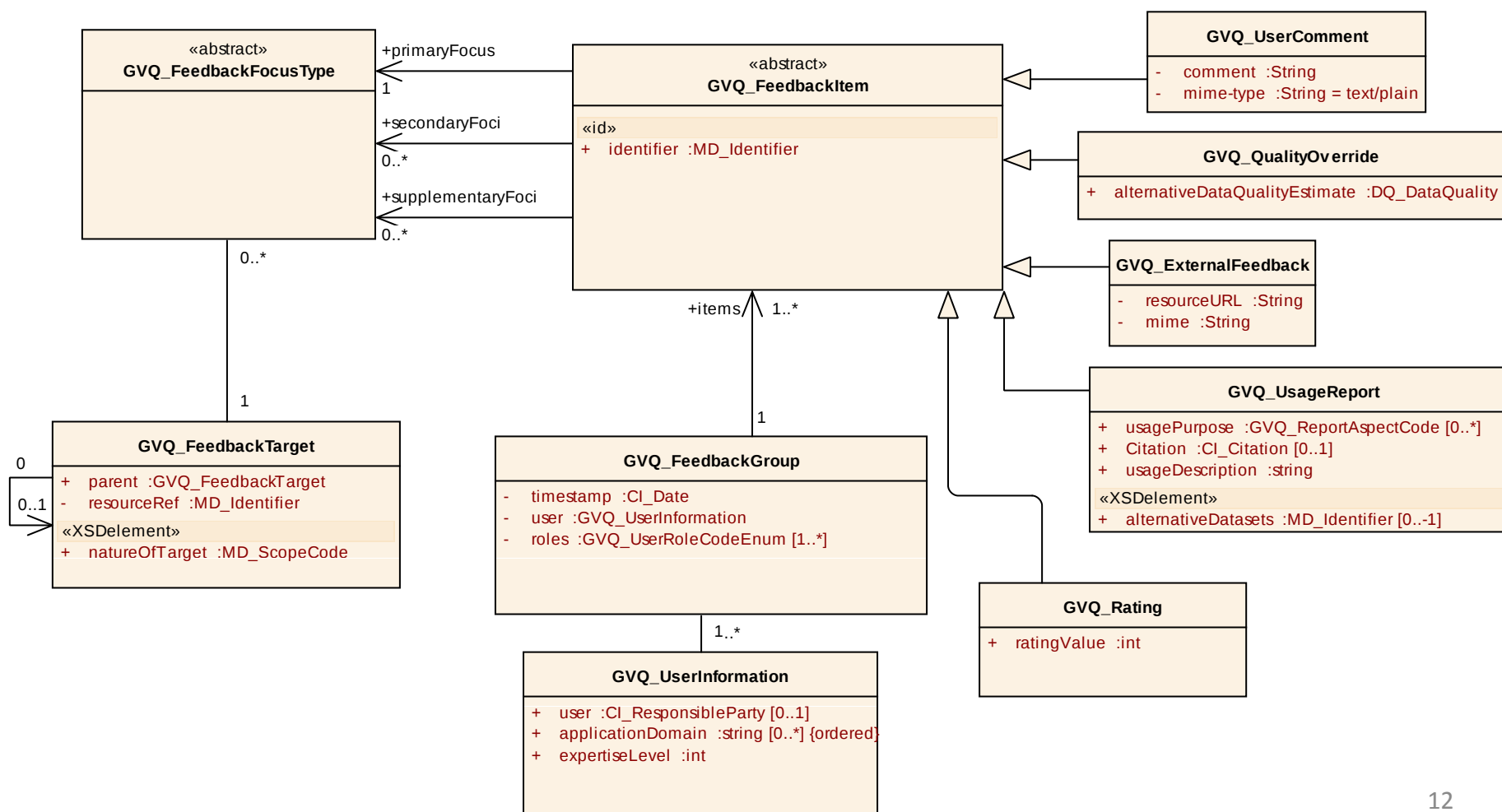
Validate: ☐

Group:

Category:

User feedback model

class User Feedback model (simplified)



User feedback

- Mandatory information on **user role (application domain, expertise level** etc).
- Subject, application domain** and **keyword** tags
- Other optional information such as **rating, comments, a quality override** (superseding producer quality information), a **report of usage** or a **citation**.
- Focus -spatial, temporal** or **other** subsets to which feedback pertains

Populating the user model

User Feedback

Subject:
UKLA DEM has artefacts from c Put here the title for your feedback item

Rating score:
★★★★★

Rating justification:
Dataset quality is spatially very heterogeneous.

User Role:
Researcher

Comment:
I found this data to have significant spike artefacts over Norfolk, UK

DomainURN:
t.europa.eu/gemet/concept/4118 +

Add the relevant scientific domains and themes

Tags:
contour +

Previous Next Submit

Target reference
xx

Nature of the target
unknown

- unknown
- attribute
- activity
- document
- metadataDocument
- attributeType
- collectionHardware
- collectionSession
- dataset
- series
- nonGeographicDataset
- dimensionGroup
- feature
- featureType
- propertyType
- fieldSession
- software
- service
- model
- title

DAB-Q capabilities

- Feedback Catalog integration
 - Discover of user feedback items to the Feedback Catalog
 - Upload of user feedback items to the Feedback Catalog
 - Merging of discovered metadata records with related user feedback items
- Support to quality-related constraints
 - Producer Quality Model constraints (e.g.: misclassification rate, count of data quality info elements, etc...)
 - User Quality Model constraints (e.g.: rating score, user domain, etc...)
- WMS-Q integration
- Insertion of GEO label link to all discovered records

CSW-Q extension

Producer Quality model queryables

- Count of data quality info elements
- Count of report elements
- Misclassification rate
- Number of missing items
- Domain conformance rate
- Positional accuracy value
- Count of publication elements
- Uncertainty level value
- Number of items noncompliant to the rules of the conceptual schema
- Measurement method
- Number of process steps cited
- Number of sources cited
- Records that uses a process with the following description or identifier
- Records that uses a source with the following title or identifier

Quality parameters

- Completeness
- Logical consistency
- Thematic accuracy
- Positional accuracy

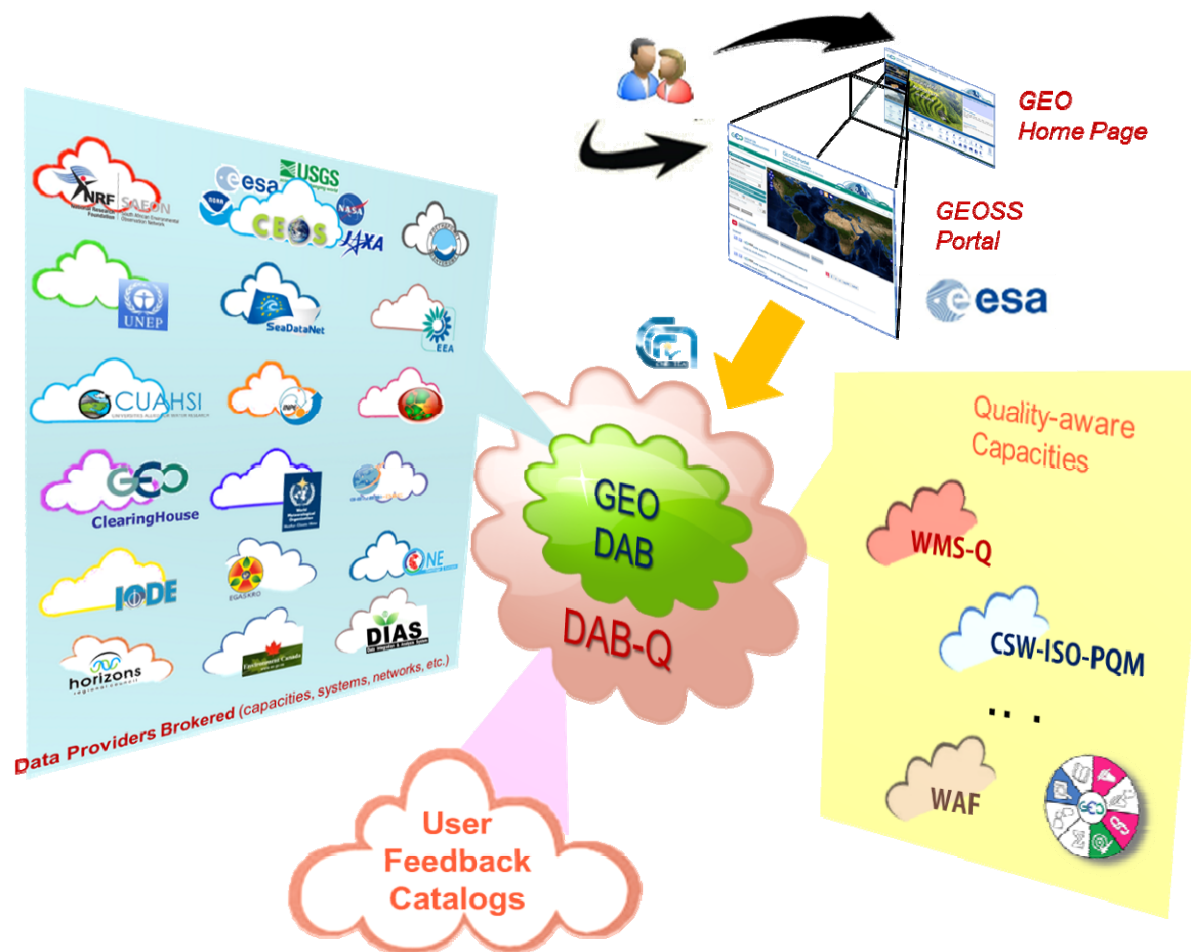
User Quality model queryables

- Rating score
- Presence/absence of feedback fields (e.g. user comment, usage, rating, citation,...)
- Any text
- Average of all rating score
- Category of the report
- Count of feedback items
- Domain in which the feedback is deemed relevant
- User domain
- Role of the user when submitting the item

Quality parameters

- Completeness
- User quality

Components diagram



GEOSS Portal Integration

The screenshot shows the GEOSS Portal search results for the query "wind". The page features a header with logos for the Group on Earth Observations, GEO Portal, GEOVIQUA, and ESA. A navigation bar includes links for HOME, ABOUT, HELP, SEARCH GEOSS, and MAP VIEWER. On the left, there is a sidebar with a "Provide Feedback to GEO" button, a "SELECT A COUNTRY/CONTINENT" dropdown, and a "BROWSE RESOURCES BY SOCIETAL BENEFIT AREAS" section with icons for DISASTERS, HEALTH, ENERGY, CLIMATE, WATER, WEATHER, ECOSYSTEMS, AGRICULTURE, and BIODIVERSITY. The main content area displays "SEARCH RESULTS" for "wind" with a total of 128,274 results. A "Legend" and "Actions" section is visible, with a dropdown menu showing options like "Compare Metadata", "Data InterComparison Wizard (GECA)", "View All Datasets (Greenland)", and "Access Data (GEODAB)". The results list includes a "Set of 1 k where ea..." and "Gewässerflächen im Münsterland nach INSPIRE DataSpecification Hydrography". Each result has a "Click to read more..." link and a "GEOLabel" button. A "CAPACITY BUILDING" button is at the bottom left.

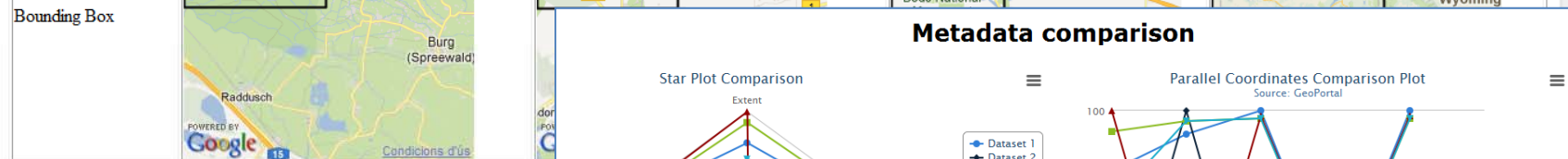
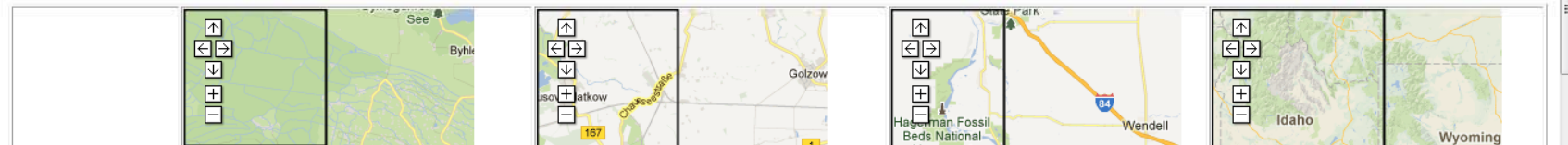
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Discover

http://www.ogc.uab.cat/cgi-bin/geosback/GEOSX
Hilton HHo... els-cdn.com EUROGI - W... uab.cat COBWEB Servei de C... SOS-Q

Archivo Edición Ver Favoritos Herramientas Ayuda

Metadata comparison. GeoViQua Project



Identification	Dataset 1				
Title:	Digitale Topographische Karte 1 : 10 000 - Vorläufige Ausgabe 4150-NW Leipe	Digitale Topographische Karte 1 : 10 000 - Vorläufige Ausgabe 4150-NW Leipe			
Abstract:	Die vorläufige Ausgabe besteht aus georeferenzierten Rasterdaten der gescannten Topographischen Karte 1 : 10 000 (TK10). Zukünftig soll die DTK aus dem Basis-DLM abgeleitet werden. Die Daten sind in Ebenen (Einzellayer, im wesentlichen den Druckfarben entsprechend) oder kombiniert aus diesen als Summenlayer verfügbar. Sie liegen in 5 Inhaltsebenen vor: Situation schwarz, Waldflächen, Gewässerlinien mit Gewässerschrift, Gewässerflächen, Relief (Sandstein, Granit, Schiefer, etc.). Die	Die vorläufige Ausgabe besteht aus georeferenzierten Rasterdaten der gescannten Topographischen Karte 1 : 10 000 (TK10). Zukünftig soll die DTK aus dem Basis-DLM abgeleitet werden. Die Daten sind in Ebenen (Einzellayer, im wesentlichen den Druckfarben entsprechend) oder kombiniert aus diesen als Summenlayer verfügbar. Sie liegen in 5 Inhaltsebenen vor: Situation schwarz, Waldflächen, Gewässerlinien mit Gewässerschrift, Gewässerflächen, Relief (Sandstein, Granit, Schiefer, etc.). Die			

Highcharts.com

Highcharts.com

DQ_Element	Dataset 1	Dataset 2	Dataset 3	Dataset 4
Scope:				
Measure Name:	horizontal	horizontal	Horizontal Positional Accuracy	Horizontal Positional Accuracy
Measure Description:			Resolution as reported	Resolution as reported
Measure Identification:				
Evaluation Method Type:				
			Approximate horizontal accuracy is 40 feet.	Conforms to National Map Accuracy

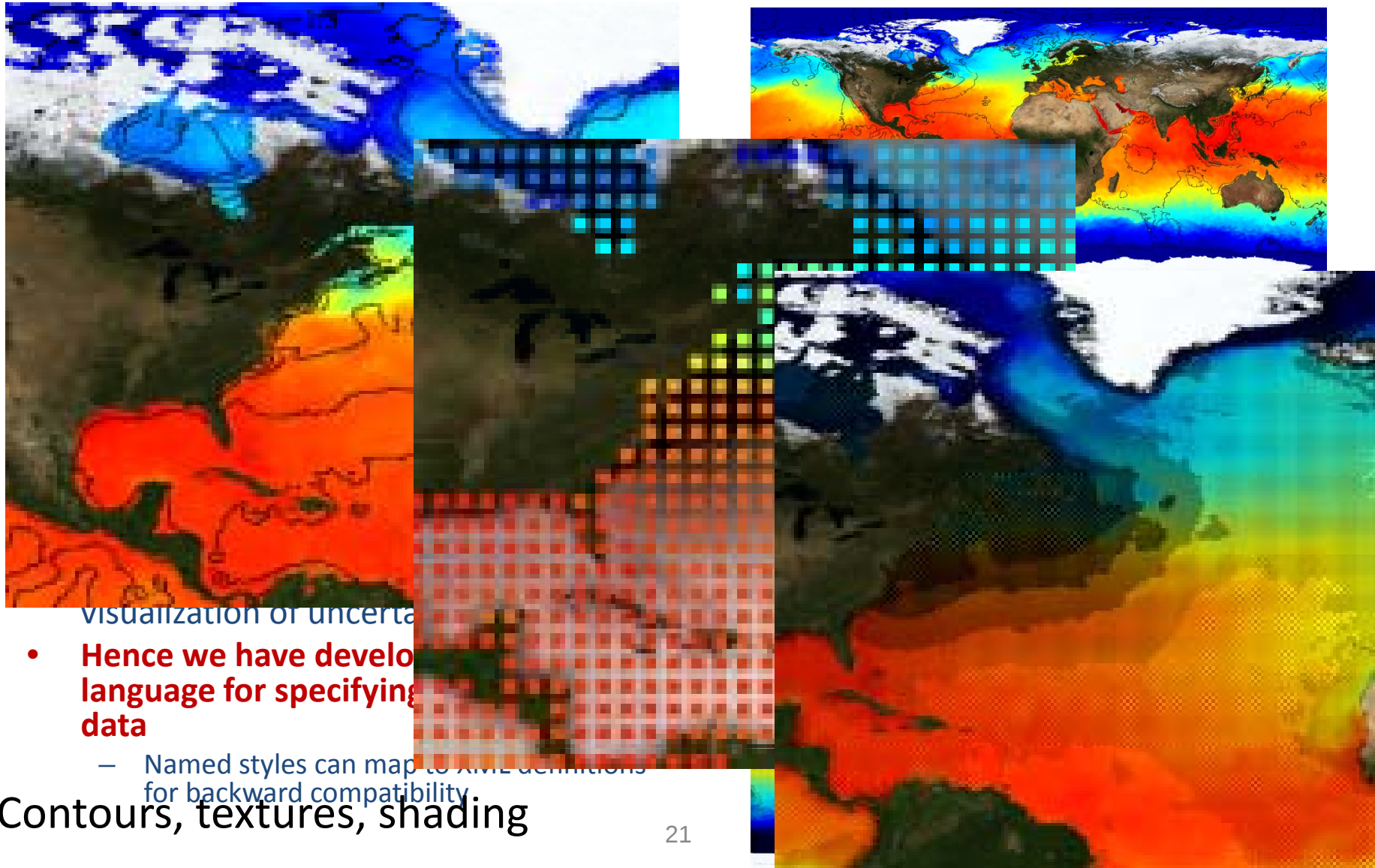
Positional Accuracy	Dataset 1	Dataset 2	Dataset 3	Dataset 4
Absolute External Positional Accuracy	1.0	0.5	11.3	0.5
Absolute External Positional Accuracy:	10.0	10.0	40 feet	50.8 meters

Semantic groupings of WMS Layers

- We need a method to convey that individual Layers are related semantically
 - E.g. one Layer represents the variance of another Layer
- We use Layer **nesting** + coupled with **keywords** from the UncertML vocabulary
- See fragment of Capabilities document (right, simplified)
 - In this examples uncertainties are normally distributed
- Also could be applied to other kinds of semantic groupings
 - E.g. components of a velocity field

```
<Layer>
  <!-- Non-displayable
  container -->
  <Title>Sea Surface
  Temperature</Title>
  <KeywordList>
    <Keyword
      vocabulary="http://uncertml.org
      /distributions">
      normal</Keyword>
    </KeywordList>
  <Layer>
    <Name>sst</Name>
    <Title>Sea Surface
    Temperature Mean</Title>
    <KeywordList>
```

Styling of Layers



Published by OGC as Public Eng. Report

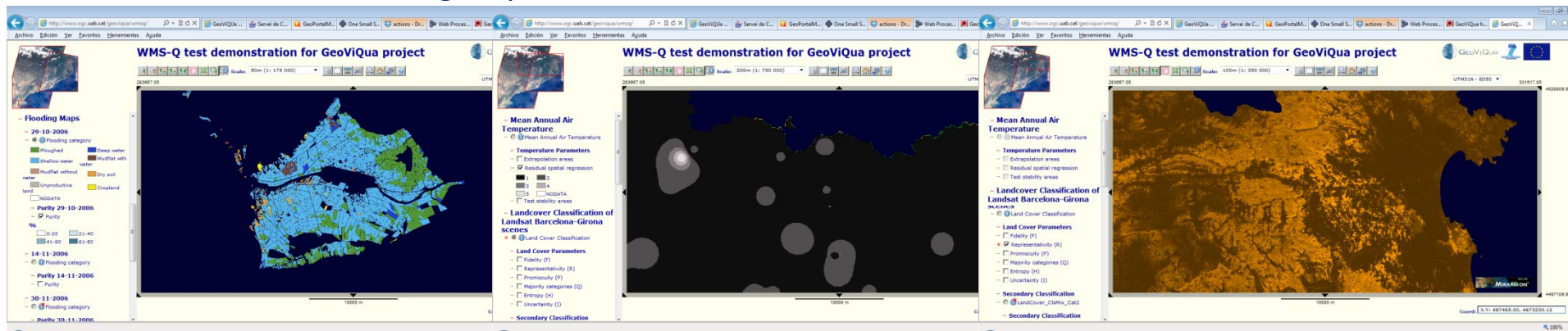
- [OGC® OWS 9 Data Quality and Web Mapping Engineering Report 12-160r1](#) Jon Blower, Xiaoyu Yang, Joan Masó and Simon Thum, 2013-06-18
- This Engineering Report specifies conventions for conveying information about data quality through the OGC Web Map Service Standard (known hereafter as the “WMS-Q conventions”), OGC Web Map Tile Service Standard (known hereafter as the “WMTS-Q conventions”), OGC KML (known hereafter as the “KML-Q conventions”) and OGC Augmented Reality Markup Language.
- https://portal.opengeospatial.org/files/?artifact_id=52884

MiraMon WMS-Q client and server

- <http://www.ogc.uab.cat/geoviqua/wmsq>
- Three different layers with several quality indicators

Ebro delta rice fields flooding maps

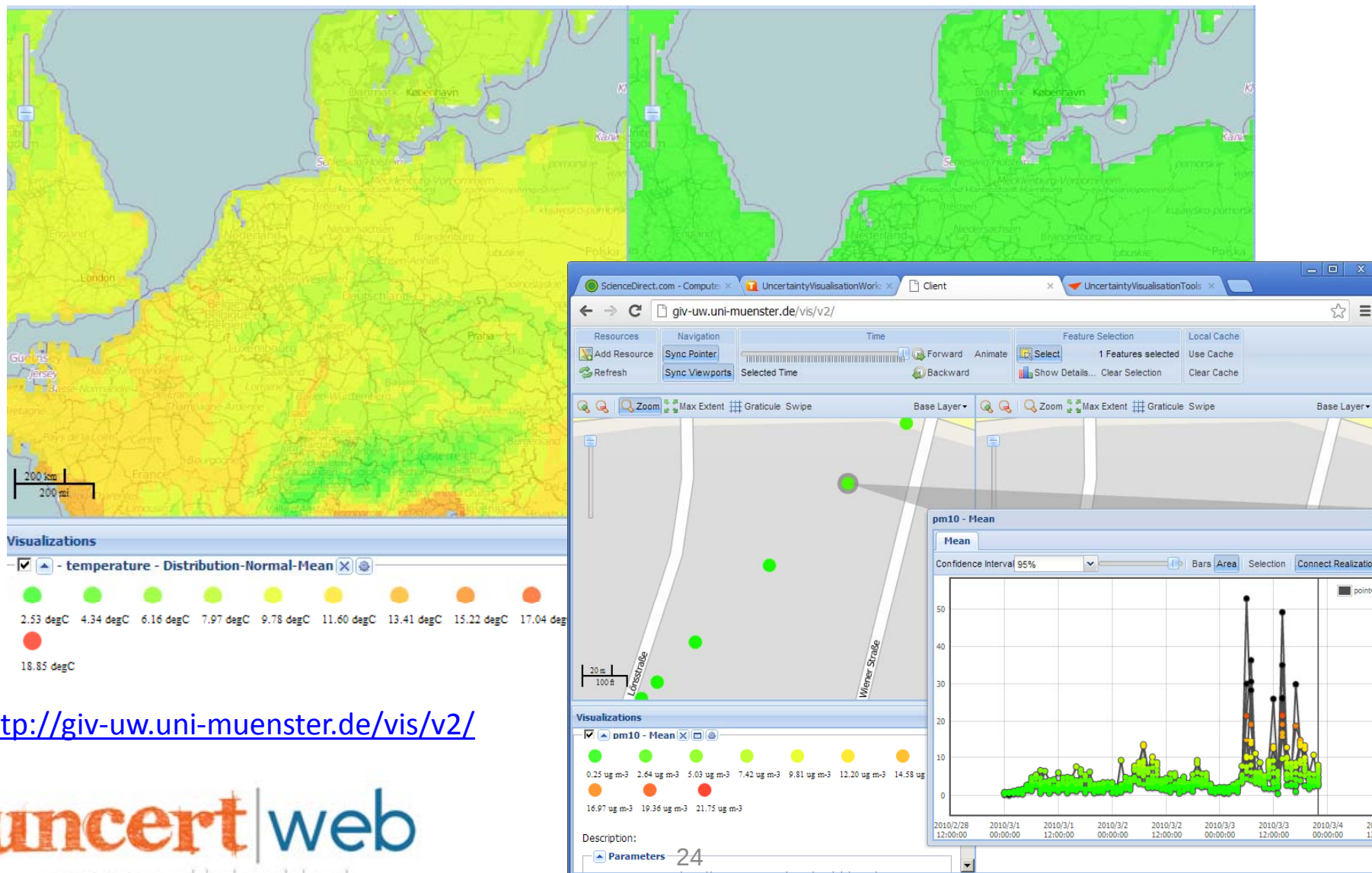
Catalan Landsat land use classification



Iberian annual air temperature

- Service GetCapabilities
 - <http://www.ogc.uab.cat/cgi-bin/GeoViQUA/WMSQ/MiraMon.cgi?REQUEST=GetCapabilities&VERSION=1.3.0&SERVICE=WMS>

Greenland: Visualisation of DATA quality / uncertainty



GEO label

- a quality **indicator** for GEOSS geospatial data and datasets
- assist in **searching** - provide users with visual clues of dataset quality / relevance.
- provide **accreditation, provenance, monitoring**
- increase **visibility** of EO data
- emphasize **open access** and **easy availability**



GEO label meaning



Producer of the dataset, e.g., organisation or individual who produced the dataset, their contact information, etc.



Quality measures of the dataset, e.g., uncertainty measures recorded in UncertML, errors, accuracy information, etc.



Lineage/provenance information, e.g., processing applied to data and number of process steps.



Feedback, comments and ratings provided by the users of the dataset, e.g., general comments on dataset quality, identified problems, suggested use for the dataset, etc.



Informal comments about the dataset quality as provided by the dataset **producer**, e.g., any identified problems, suggested use, etc.



Domain **experts' comments** on dataset quality, e.g., results of formal quality checks, expert suggestions on the dataset applications, etc.



Dataset's **compliance** with international standards, e.g., compliance with ISO 19115, Dublin Core, etc.



Citations where the dataset **was used** and cited, e.g., formal reports on dataset quality checks, journal articles, etc.

GEO Label : Metadata+feedback summary with drill-down

Citations for this dataset

Title: Objective air temperature mapping for the Iberian Peninsula using spatial interpolation and GIS

DOI: 110.1002/joc.1462

<http://onlinelibrary.wiley.com/doi/10.1002/joc.1462/abstract>

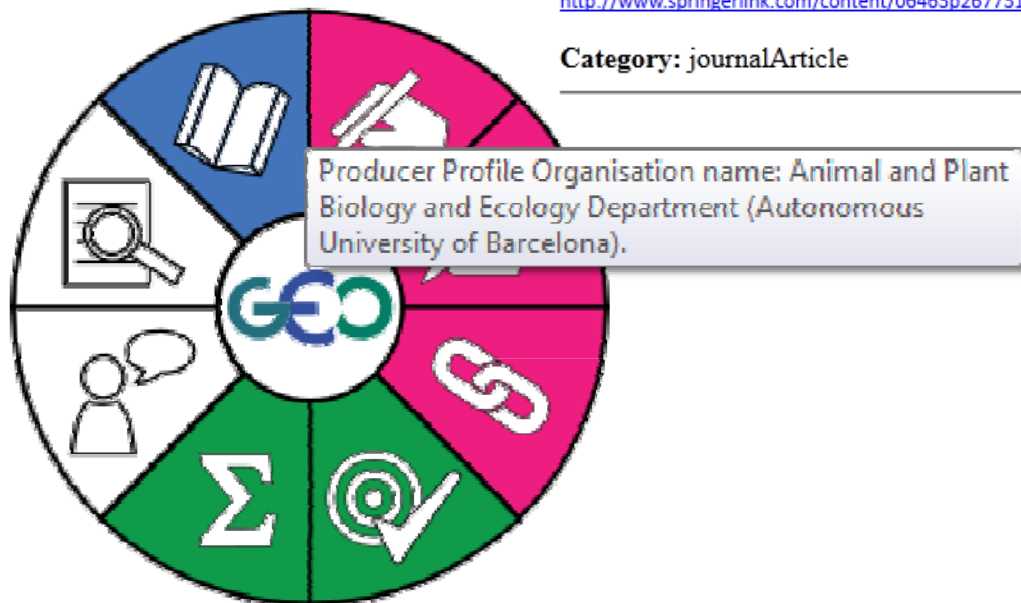
Category: journalArticle

Title: Monthly precipitation mapping of the Iberian Peninsula using spatial interpolation tools implemented in a Geographic Infor

DOI: 10.1007/s00704-006-0264-2

<http://www.springerlink.com/content/06463p2677318556/>

Category: journalArticle



GEO Label-based Dataset Intercomparison Tool

The screenshot displays the GEO Label-based Dataset Intercomparison Tool. The interface is split into two main sections. The left section features a map on the far left and a list of dataset details (Title, Keyword, Date, Contact, Abstract) on the right. The right section shows a grid of dataset icons, each representing a different dataset. The icons are arranged in a grid, with some icons being larger than others, indicating different levels of detail or availability. The interface includes search filters and a 'GEO Label Filtering' section.

GeoViQua Scenarios booklet

Agriculture flooding practices control

The EU agri-environmental measures (Regulation CEE 1257/1999) consist of a subsidy that farmers receive to support agricultural practices that favour the conservation of affected ecosystems. In Catalonia, the local government monitors the farmers' practices by means of a fair decision support system based on remote sensing imagery and flooding practices detection, replacing time-consuming and expensive field surveys.

Global Carbon Atlas

Through the Carbon Atlas website, carbon balances information is provided to derive both technical reports and dissemination material for the media, general public and, most importantly, inputs for national policy makers who ultimately agree on the emission market rules. The Global Carbon Atlas is able to return datasets in several visualization styles (e.g., legends, layers styling, etc) through GetMap WMS requests. Flux models can be visually compared and analyzed, detecting trends, anomalies and calculating statistics related to the quality and performance of the models.

URLs for the public components code and API's

- Schemas
 - schemas.geoviqua.org
- Catalogues DAB-Q CSW, GI-CAT (CNR)
 - <http://geoviqua.essi-lab.eu/dabq-demo/>
- GEO label services, API, github (ASTON+52N)
 - <http://www.geolabel.net/api.html>
 - http://twiki.geoviqua.org/twiki/bin/view/GEO_SIF/SifGeoLabel
 - <https://github.com/lushv/geolabel-service>
- WMS-Q, WMS, ncWMS, contact MiraMon (UREAD + CEA)
 - <http://ncwms.geoviqua.org/godiva2.html>
- KML-Q, KML, github Contact Fraunhofer(FRAUN)
 - <https://github.com/igd-geo/pcolor>
- GECAaaS WPS, Contact S&T
- Q emitter tool (github) API, (ASTON+S&T)
 - <https://github.com/GeoViQua/computeqi-web>
 - <https://github.com/GeoViQua/emulatorization-api>
- GeoNetwork
 - <https://github.com/GeoViQua/geoviqua-geonetwork-plugin>
 - For Geonetwork 2.8 use the 2.8.x-dev branch

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www.geoviqua.org
Come to our booth!!



GeoViQua scenarios



GEOVIQUA

- Agriculture policy control (UAB)
- Global Carbon (CEA)

Agriculture flooding practices control Scenario

- The EU agri-environmental measures (Regulation CEE 1257/1999) consist of a subsidy that farmers receive to support agricultural practices that favour the conservation of affected ecosystems. In Catalonia, the local government monitors the farmers' practices by means of a fair decision support system based on remote sensing imagery and flooding practices detection, replacing time-consuming and expensive field surveys.

1

*...Farmers' flooding practices are extracted by combining Landsat image classification procedures with rigorous statistical quality assessments. Both the Landsat imagery and sample of the classified maps are available through the **GEOSS Portal**.*

GEOSS PORTAL

<http://geoportal.geoviqua.org>



This enhanced **GEOSS Portal** includes:

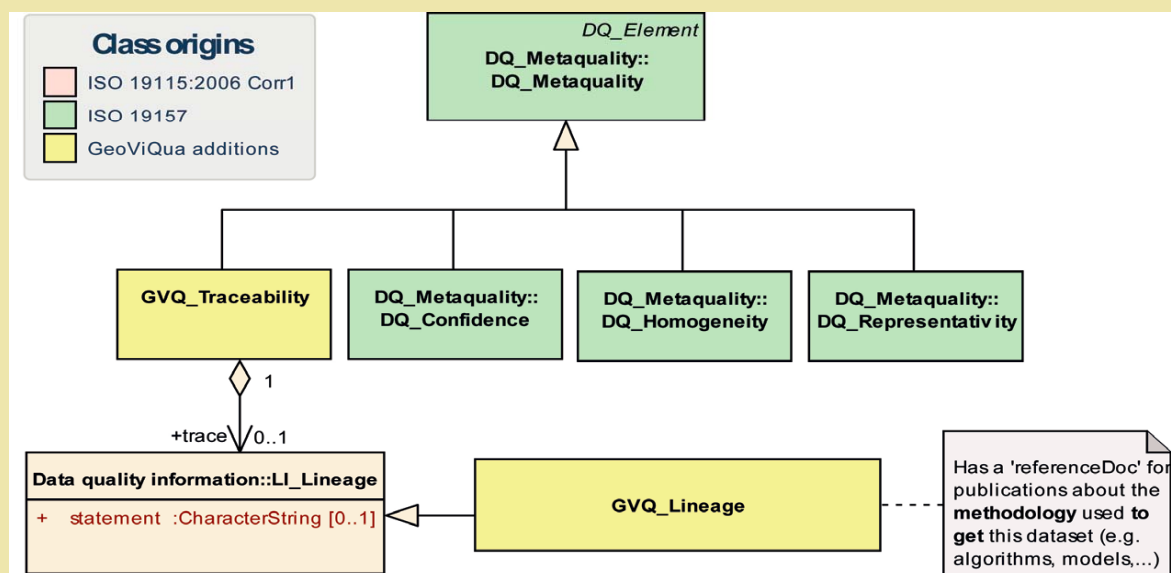
- discovery and access of quality indicators and traceability embedded in metadata
- a GEO Label and referencing scientific reports
- smart quality visualization
 - at pixel level (quality enriched Web Map services [WMS-Q] visualized in Greenland)
 - at feature level (Quality enriched [KML-Q] visualized in Google Earth).

2

...A sudden failure of the Landsat TM/ ETM+ sensor occurs during a monitoring critical period. Time is critical to find a suitable alternative dataset. A **discovered issue** is found.

ADDITIONS IN THE METADATA QUALITY MODEL

The Producer Quality Model extends ISO 19115-1, 19115-2 and 19157 standards to include information such as **discovered issues**, new and better formalized quality indicators (reference datasets for quality evaluation, traceability, and statistical summaries of uncertainty), citations to publications, pixel level quality and more.



3

...The government technicians can search for these alternative datasets through the GEOSS Portal thanks to the quality-aware component (DAB-Q)

QUERY BY QUALITY INDICATOR

The Quality-enabled Discovery and Access Broker (**DAB-Q**) is an extension of the GEO-DAB that implements the Producer Quality Model (and also the User Quality Model) as a quality extensions of the OGC Catalogue Service for the Web (CSW-ISO-Q) interface.

The screenshot displays the DAB-Q DEMO PORTAL interface. On the left, there is a search sidebar with various filters and a 'Show sources selection' button. The main area shows a world map with a search results table below it. The table lists search results with columns for document ID, quality indicators, and document title. The search results are as follows:

Document ID	Quality Indicators	Document Title
Urban Atlas - Spain - Pamplona	Quality info count (int), Thematic class correctness result value (double), Positional accuracy result value (double), Domain consistency result value (double), Lineage process description (string), Lineage source (string), Rating, Report aspect, Search term, User domain	Urban Atlas - Spain - Pamplona
Urban Atlas - Spain - Zaragoza (Zaragoza)	Quality info count (int), Thematic class correctness result value (double), Positional accuracy result value (double), Domain consistency result value (double), Lineage process description (string), Lineage source (string), Rating, Report aspect, Search term, User domain	Urban Atlas - Spain - Zaragoza (Zaragoza)
SPOT 4 SOURCE 2011-04-07T10:52:07	Quality info count (int), Thematic class correctness result value (double), Positional accuracy result value (double), Domain consistency result value (double), Lineage process description (string), Lineage source (string), Rating, Report aspect, Search term, User domain	SPOT 4 SOURCE 2011-04-07T10:52:07
Urban Atlas - France - Toulouse	Quality info count (int), Thematic class correctness result value (double), Positional accuracy result value (double), Domain consistency result value (double), Lineage process description (string), Lineage source (string), Rating, Report aspect, Search term, User domain	Urban Atlas - France - Toulouse
Urban Atlas - Spain - Valencia	Quality info count (int), Thematic class correctness result value (double), Positional accuracy result value (double), Domain consistency result value (double), Lineage process description (string), Lineage source (string), Rating, Report aspect, Search term, User domain	Urban Atlas - Spain - Valencia
SPOT 2 RAW 2002-07-10T11:10:46	Quality info count (int), Thematic class correctness result value (double), Positional accuracy result value (double), Domain consistency result value (double), Lineage process description (string), Lineage source (string), Rating, Report aspect, Search term, User domain	SPOT 2 RAW 2002-07-10T11:10:46
Urban Atlas - Spain - Alicante	Quality info count (int), Thematic class correctness result value (double), Positional accuracy result value (double), Domain consistency result value (double), Lineage process description (string), Lineage source (string), Rating, Report aspect, Search term, User domain	Urban Atlas - Spain - Alicante
SPOT 2 RAW 1996-12-26T10:53:56	Quality info count (int), Thematic class correctness result value (double), Positional accuracy result value (double), Domain consistency result value (double), Lineage process description (string), Lineage source (string), Rating, Report aspect, Search term, User domain	SPOT 2 RAW 1996-12-26T10:53:56
SPOT 3 RAW 1994-11-19T11:21:27	Quality info count (int), Thematic class correctness result value (double), Positional accuracy result value (double), Domain consistency result value (double), Lineage process description (string), Lineage source (string), Rating, Report aspect, Search term, User domain	SPOT 3 RAW 1994-11-19T11:21:27

4

*...The metadata of the possible alternative datasets can be compared to facilitate the choice of the right product. The most fit-for-purpose dataset is identified through **metadata comparison***

METADATA COMPARISON

The **metadata comparison** tool. presents datasets in columns, with attributes and metadata parameters aligned in rows.

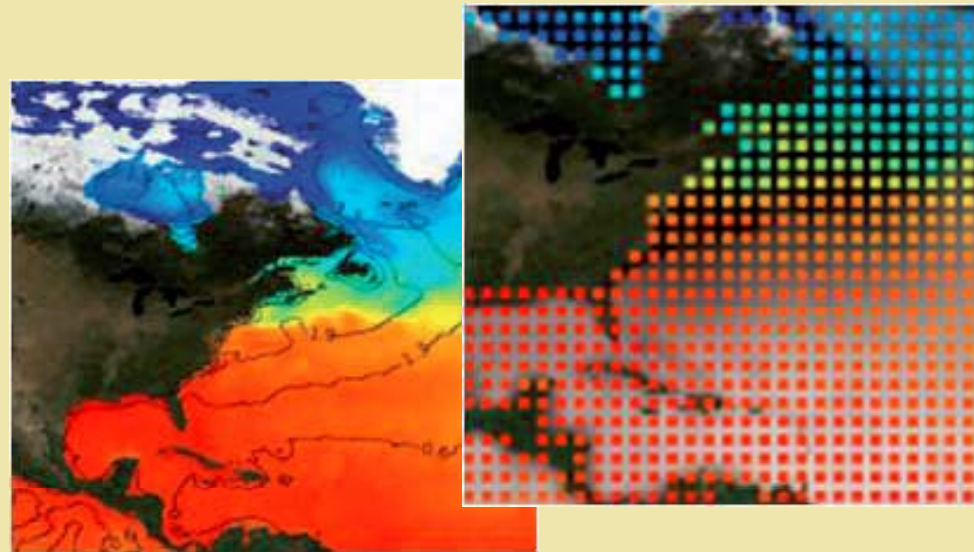
Metadata comparison			
Mapa Mapa Mapa			
Bounding Box			
Identifiers	Dataset 1	Dataset 2	Dataset 3
Id (fileIdentifier):	RiceFlooding2006-10-29to2007-03-22	mtri2en1ib	LCL12_BenGm_2005_07
uuid MD_Metadata/GVQ_Metadata			
id MD_Metadata/GVQ_Metadata			
uuid MD_DataIdentification/GVQ_DataIdentification			
Element Results			
Positional Accuracy			
Absolute External Positional Accuracy	0.5	11.3	1.00003
Relative Internal Positional Accuracy			
Gridded Data Positional Accuracy			

5 ...At the end of the campaign,
the local government
releases **KML-Q** with a
summary of the season

KML-Q AND WMS-Q

<http://www.ogc.uab.es/geoviqua/wmsq>

Quality can be described at dataset level (overall indicator in the metadata) or at pixel level and feature level (a quality value for each pixel or feature). GeoViQua has incorporated into the ncWMS and in the **KML-Q** innovative symbolization.



Global Carbon Atlas Scenario

- Through the Carbon Atlas website, carbon balances information is provided to derive both technical reports and dissemination material for the media, general public and, most importantly, inputs for national policy makers who ultimately agree on the emission market rules. The Global Carbon Atlas is able to return datasets in several visualization styles (e.g., legends, layers styling, etc) through GetMap WMS requests. Flux models can be visually compared and analyzed, detecting trends, anomalies and calculating statistics related to the quality and performance of the models. **<http://www.globalcarbonatlas.org>**

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1

*...When a scientist detects an anomaly he can send his **feedback** with a detailed report and contribute to improve the accuracy of the models on the basis of local studies.*

USER FEEDBACK

https://geoviqua.stcorp.nl/submit_feedback.html

Offers a framework for storing and querying user comments, ratings, expert reviews, metadata overrides and other feedback elements. The user **feedback** component allows introduction of new feedback items, while

the DAB-Q is able to search in the user feedback database and integrate the response in its search results.

The screenshot shows a web form titled "User feedback" with a sidebar menu containing "Target", "User information", and "Advanced". The main form area is titled "User Feedback" and contains the following fields:

- Subject:** A text input field with a placeholder "Put here the title for your feedback item".
- Rating score:** A field with five stars (☆☆☆☆☆).
- Rating justification:** A large text area for providing details.
- User Role:** A dropdown menu currently set to "Basic User".
- Comment:** A large text area for additional comments.
- DomainURN:** A text input field with a "+" button.
- Tags:** A text input field with a "+" button and a note: "Adding tags helps other users to find relevant feedback".

At the bottom of the form are three buttons: "Previous", "Next", and "Submit".

2

...User feedback and expert reviews can be accessed by means of a GEO label. In the carbon atlas, each dataset is associated a **GEO label**.

GEO LABEL

<http://www.geolabel.info>

The **GEO label** is a dynamic graphic representation which visually summarizes the availability of quality information for the dataset it represents, comprising 8 informational facets: producer profile, producer comments, lineage information, standards compliance, quality information, user feedback, expert review and citations Information.



European Commission Speakers Corner

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*...In the Carbon Atlas, a scientist wants to compare two type of carbon flux models. They have different geographic projections and a different averaging period. **GECA Toolset** harmonizes them.*

DATA COMPARISON TOOL: GECAaaS

The **GECA Toolset** is a toolkit for ingesting, processing and inter-comparing satellite data against collocated measurements. which can be either in-situ data or other satellite data.

The screenshot displays the GEO Portal interface. At the top, there are logos for the Group on Earth Observations, GEO Portal, GEOVIQUA, and ESA. Below the logos is a navigation bar with links: HOME, ABOUT, HELP, SEARCH GEOS, and MAP VIEWER. The main content area is titled 'GEOSS SEARCH' and shows a search for 'Mean Annual Temperature'. The search results section indicates 'Total Results: 2' and lists a single result: 'Digital Climate Model (DCM)'. A circular menu is overlaid on the search results, showing various actions: 'Compare Metadata', 'Provenance', 'RubricQ', 'Data InterComparison Wizard (GECA)', 'View All Datasets (Greenland)', and 'Access Data (GEODAB)'. The left sidebar contains a 'Provide Feedback to GEO' button and a 'SELECT A COUNTRY/CONTINENT' dropdown menu. Below this is a 'BROWSE RESOURCES BY SOCIETAL BENEFIT AREAS' section with icons for DISASTERS, HEALTH, ENERGY, CLIMATE, WATER, WEATHER, ECOSYSTEMS, AGRICULTURE, and BIODIVERSITY.

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*...The scientist gets a new quality indicator that convinces him about the fit for purpose of the data. From now on, other users will also get the **quality emitter** result*

QUALITY EMITTER

The WPS utilized by the GECA Toolset can also be queried directly to generate a ZIP file that contains the intercomparison report and collocated values. The **quality emitter** extracts a QI and adds it to the Producer Quality Model metadata. The quality emitter also provides a validation for quality indicators.

