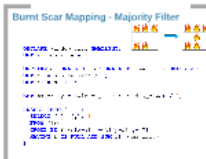


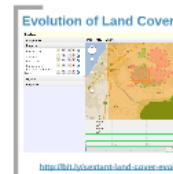
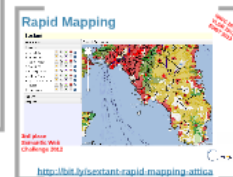
Ingestion, processing, cataloging and archiving

SciQL is an SQL-based query language for scientific applications with arrays as first class citizens.

Data vault is a mechanism that provides a true symbiosis between a DBMS and existing (remote) file-based repositories.

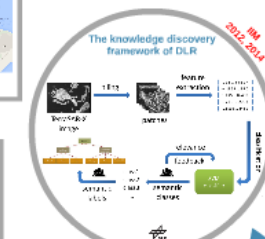
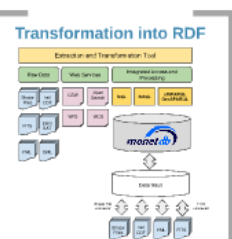
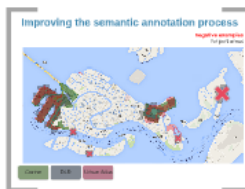
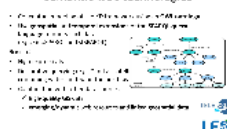


Monitoring of Fire Fronts



Kostis Kyzirakos
DA, CWI
kostis@cw.nl

High-level data modeling using semantic web technologies



The data model stRDF and the query language stSPARQL

Extensions of RDF and SPARQL for representing and querying geospatial information that changes over time.

RDF extensions:

- Allow the representation of geometric information using GSG standards
- Allow the representation of valid time of triples using time instants and time periods

SPARQL 1.1 extensions:

- Allow spatial or temporal terms to be used in the SELECT, FILTER, and HAVING clauses of a query
- Spatial functions: OpenGIS Simple Features Access GSG Standard, Eigenheimer relations, RCC-8 relations, spatial aggregates
- Temporal functions: Allen's interval algebra, temporal aggregates

Linked Earth Observation Data: The Projects TELEIOS and LEO



National and Kapodistrian
University of Athens
Greece



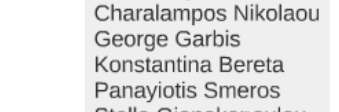
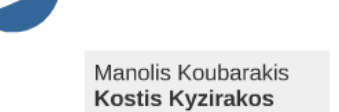
Database Architectures group
Centrum Wiskunde & Informatica
Amsterdam, NLD

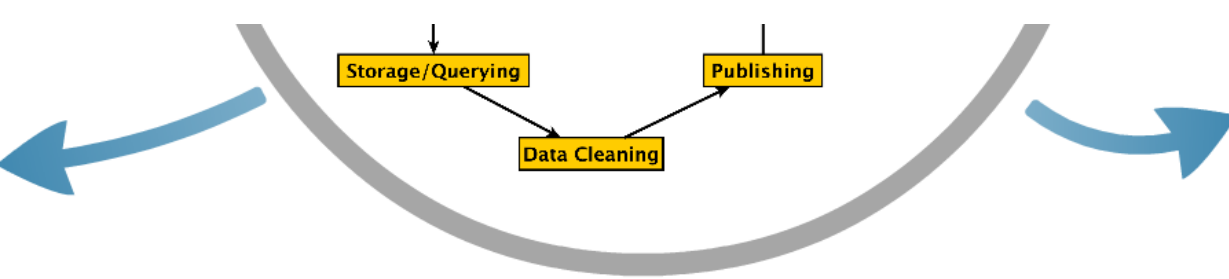
Manolis Koubarakis
Kostis Kyzirakos
Charalampos Nikolaou
George Garbis
Konstantina Bereta
Panayiotis Smeros
Stella Gianakopoulou
Kallirroi Dogani
Maria Karpathiotaki
Ioannis Vlachopoulos



Publishing

- Corine Land Use Land Cover of Europe
- Urban Atlas of Europe
- Greek Administrative Geography
- Coastline of Greece





- Greek Administrative Geography
- Coastline of Greece

European Environment Agency



available on [datahub](#) as linked data

Linked Earth Observation Data: The Projects **TELEIOS** and **LEO**



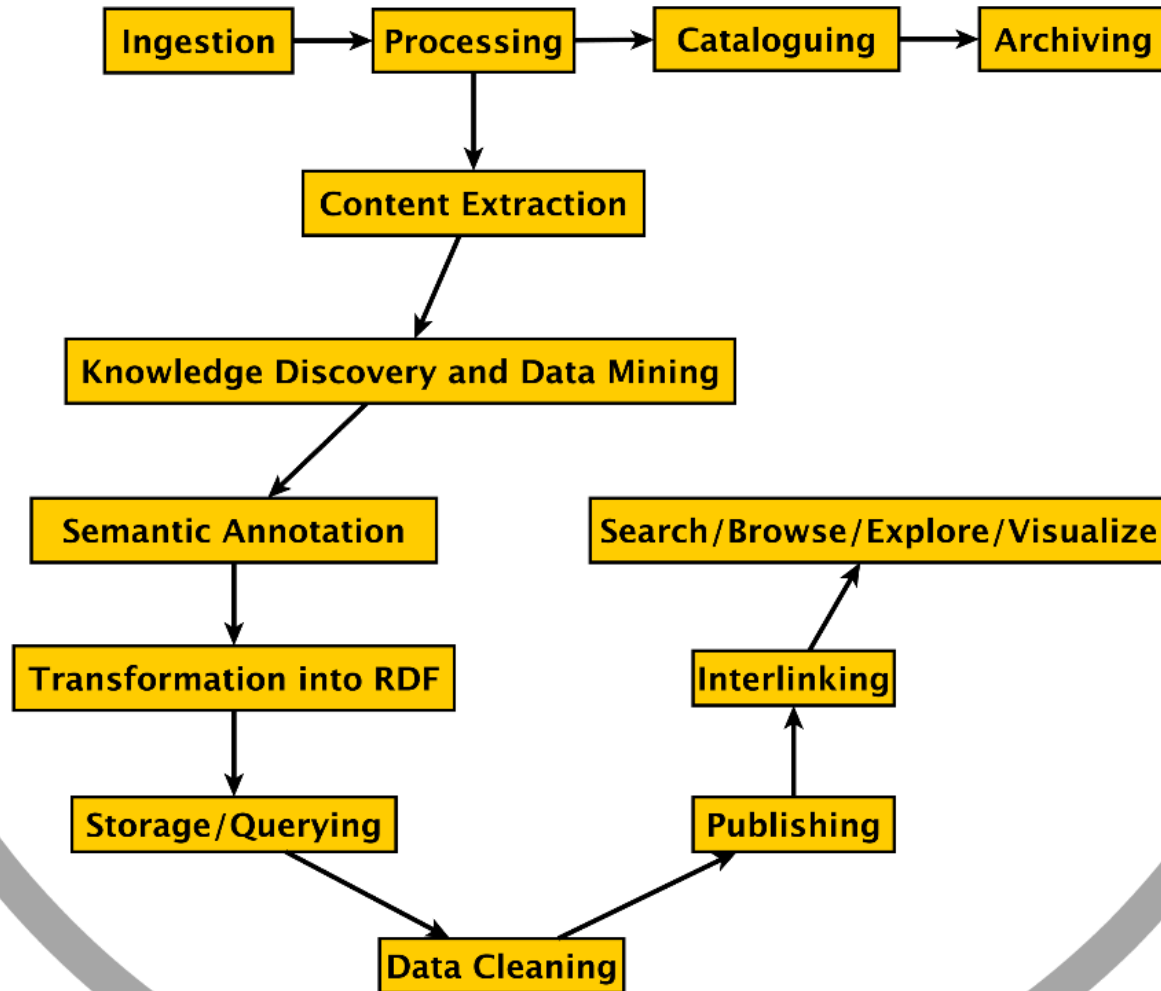
**National and Kapodistrian
University of Athens
Greece**

CWI

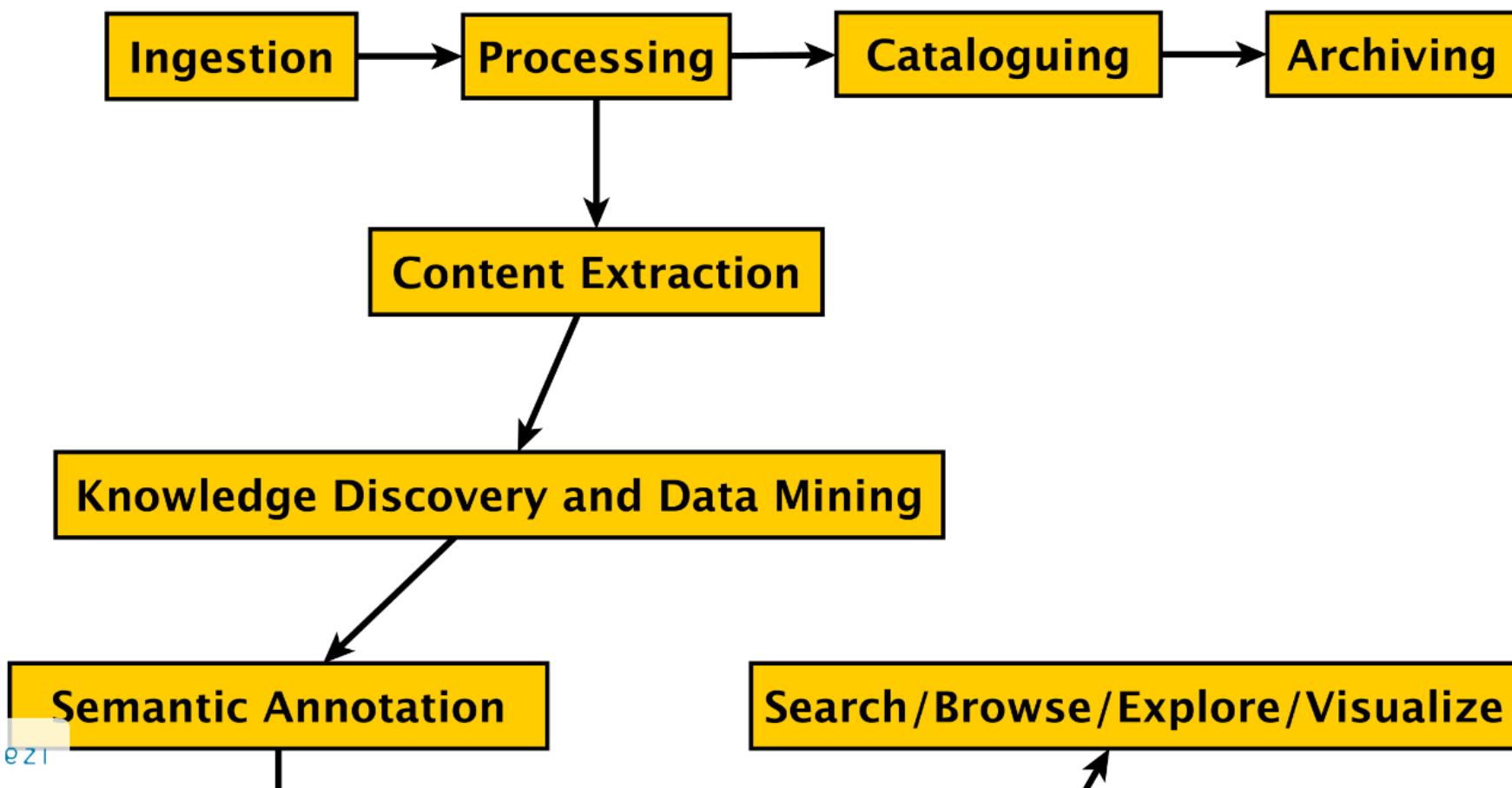
**Database Architectures group
Centrum Wiskunde & Informatica
Amsterdam, NLD**

Manolis Koubarakis
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The life cycle of Linked Open Earth Observation data



The life cycle of Linked Open Earth Observation data



SciQL: A Query Language for Science Applications

Burnt Scar Mapping - Classification

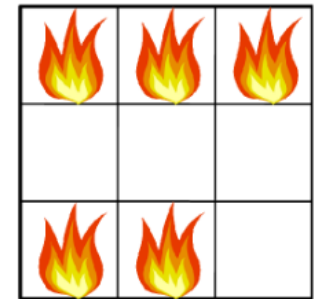
SIGMOD
2013

```
SET SCHEMA rs;

DECLARE size_x SMALLINT, size_y SMALLINT;
SET size_x = (SELECT MAX(x) + 1 FROM rs.image1);
SET size_y = (SELECT MAX(y) + 1 FROM rs.image1);

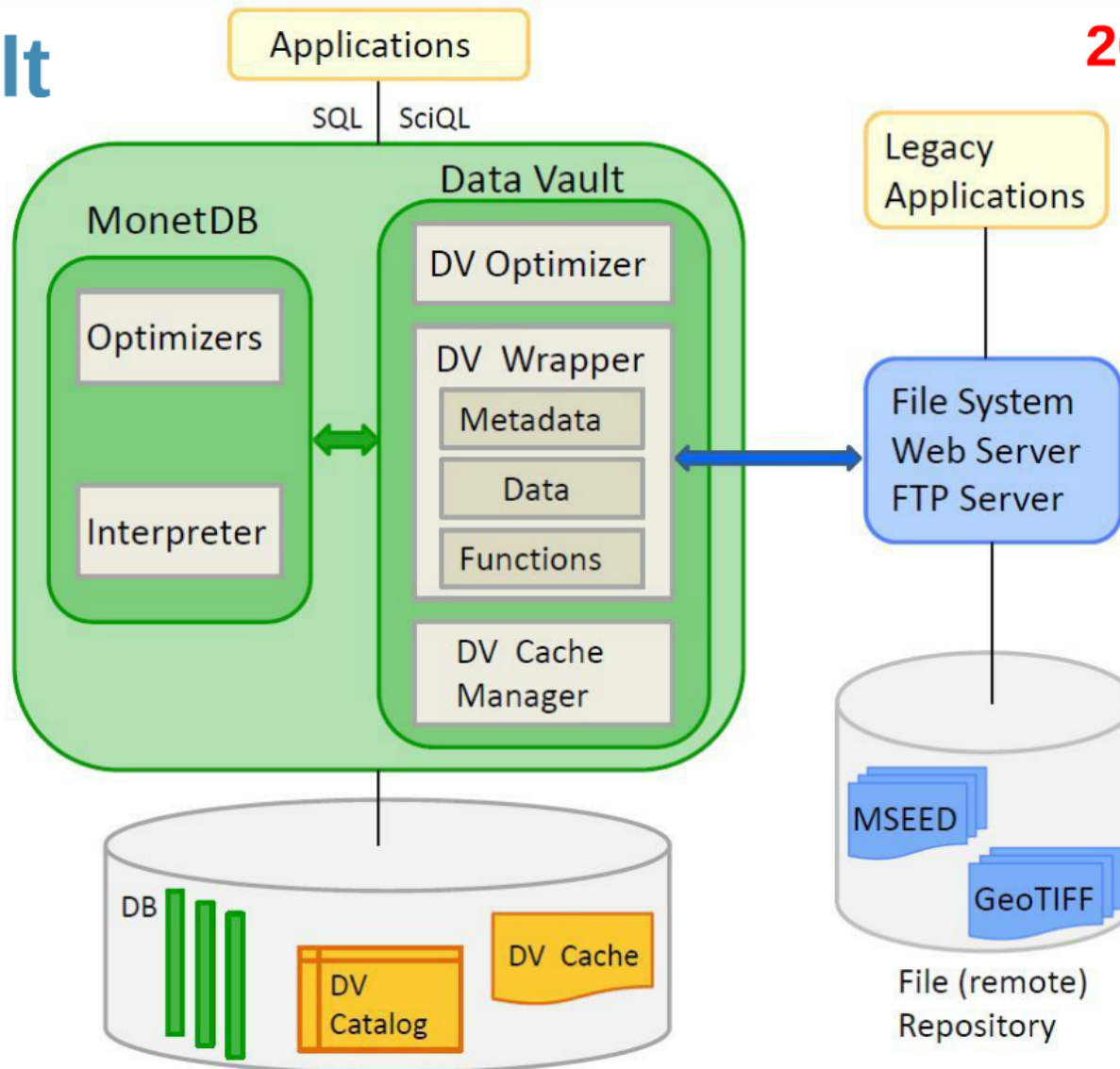
CREATE ARRAY fire (x SMALLINT DIMENSION[size_x], y SMALLINT DIMENSION[size_y], f INT);

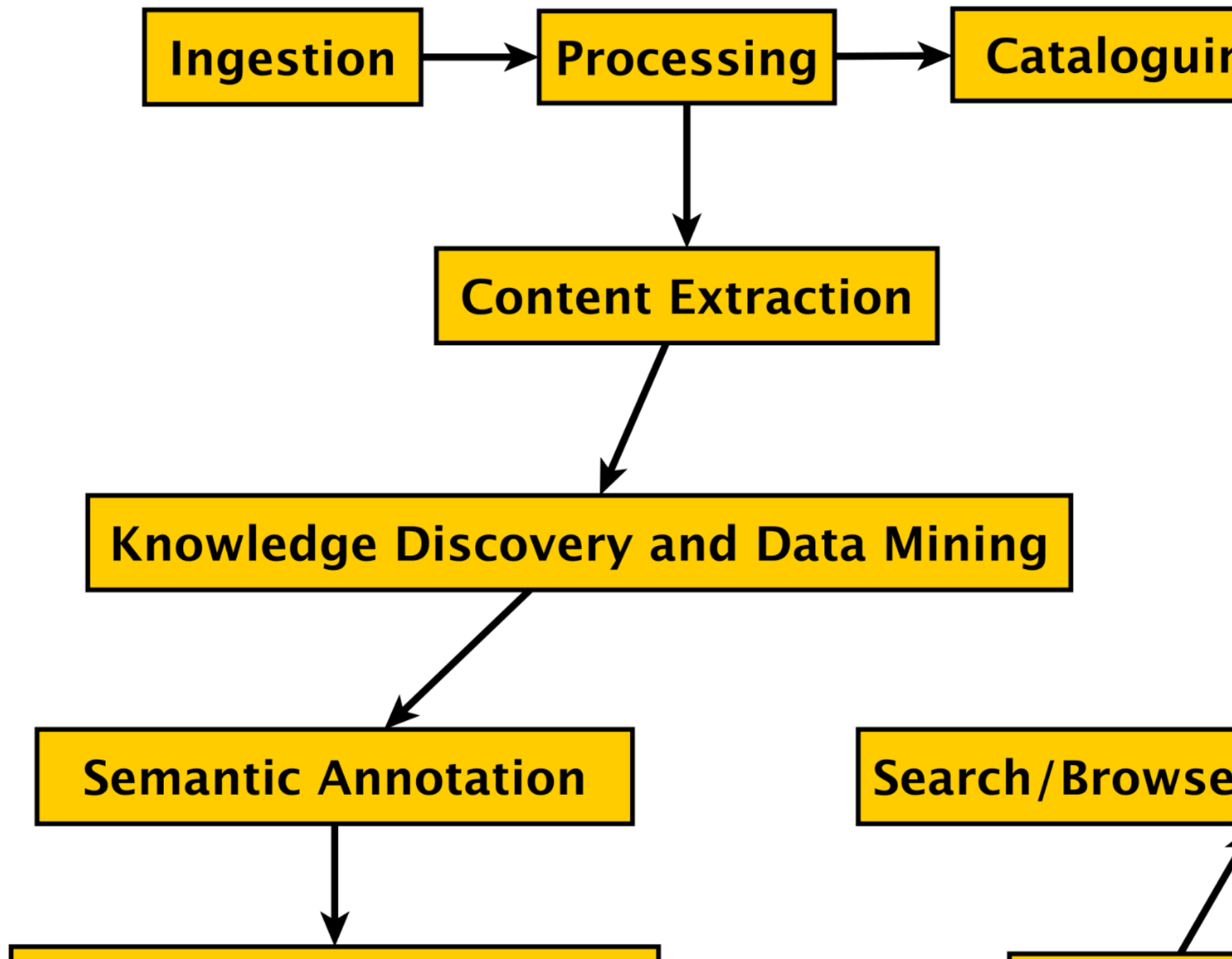
INSERT INTO fire (
  SELECT b3.x, b3.y, 1
  FROM rs.image1 AS b3, rs.image2 AS b4, rs.image3 AS b7, rs.image4 AS msk
  WHERE b3.x = b4.x AND b3.y = b4.y -- join the images
        AND b3.x = b7.x AND b3.y = b7.y -- join the images
        AND b3.x = msk.x AND b3.y = msk.y -- join the images
        AND msk.intensity = 1 -- cloud- & water-mask
        AND b3.intensity > 0 AND b4.intensity > 0 AND b7.intensity > 0
        AND b4.intensity <= 60 -- indexNIR
        AND (b3.intensity + b4.intensity) / 2 <= 50 -- indexALBEDO
        AND (CAST(b4.intensity - b7.intensity AS REAL) / (b4.intensity + b7.intensity) +
1.0) * 127.5 <= 126.0 -- indexNBR
);
```



Data Vault

**SSDBM
2012,2013**

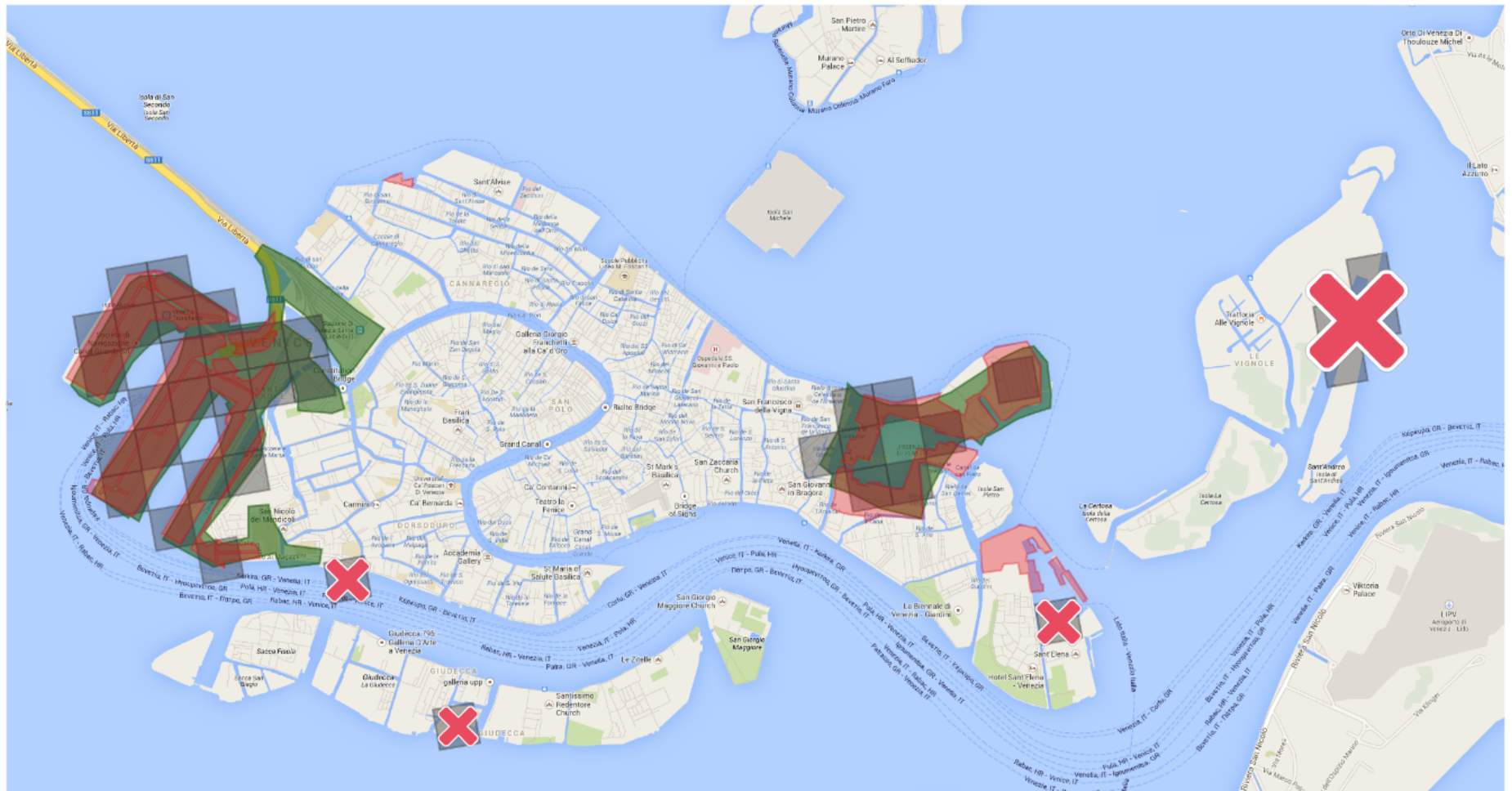






Improving the semantic annotation process

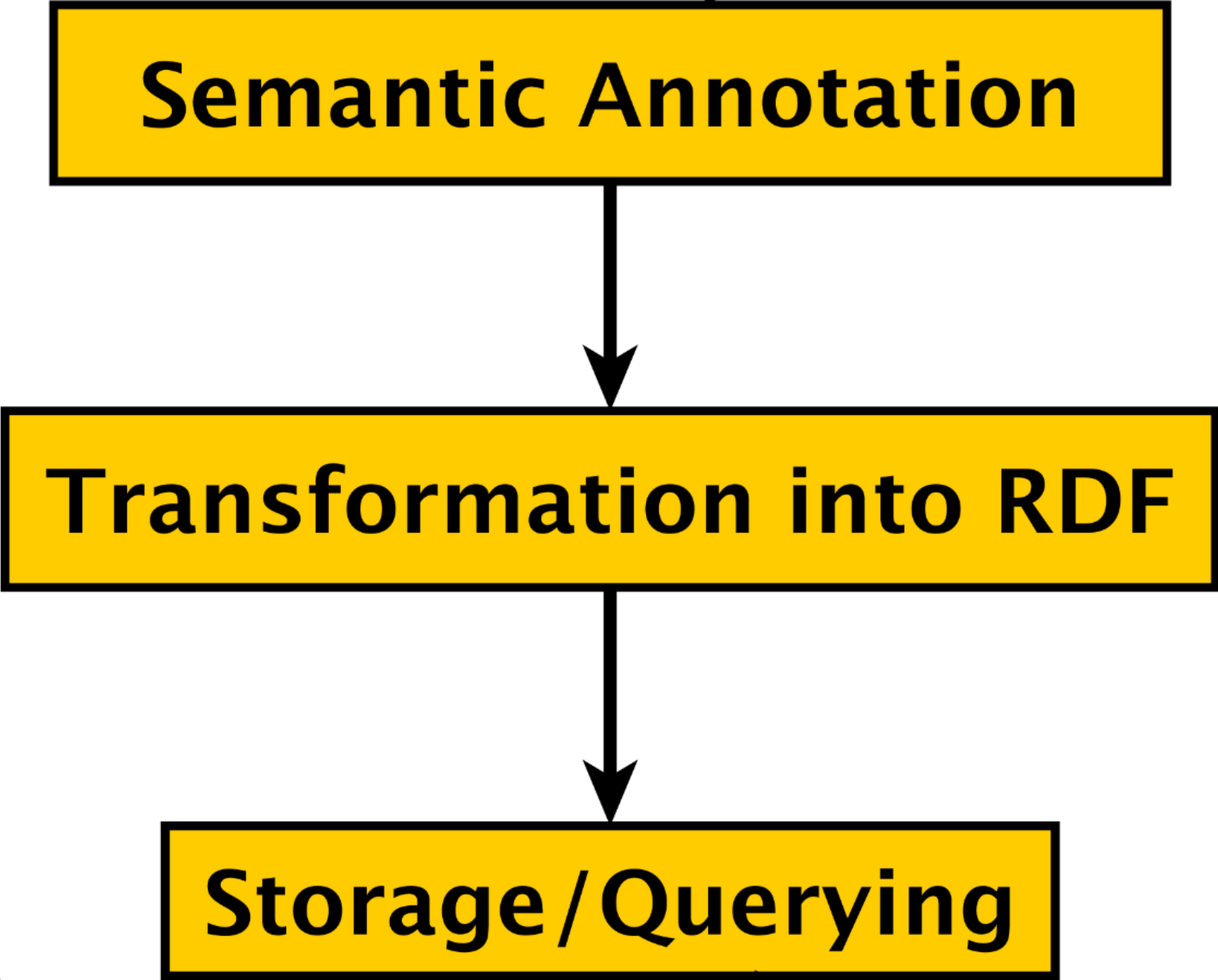
negative examples
for port areas



Corine

DLR

Urban Atlas



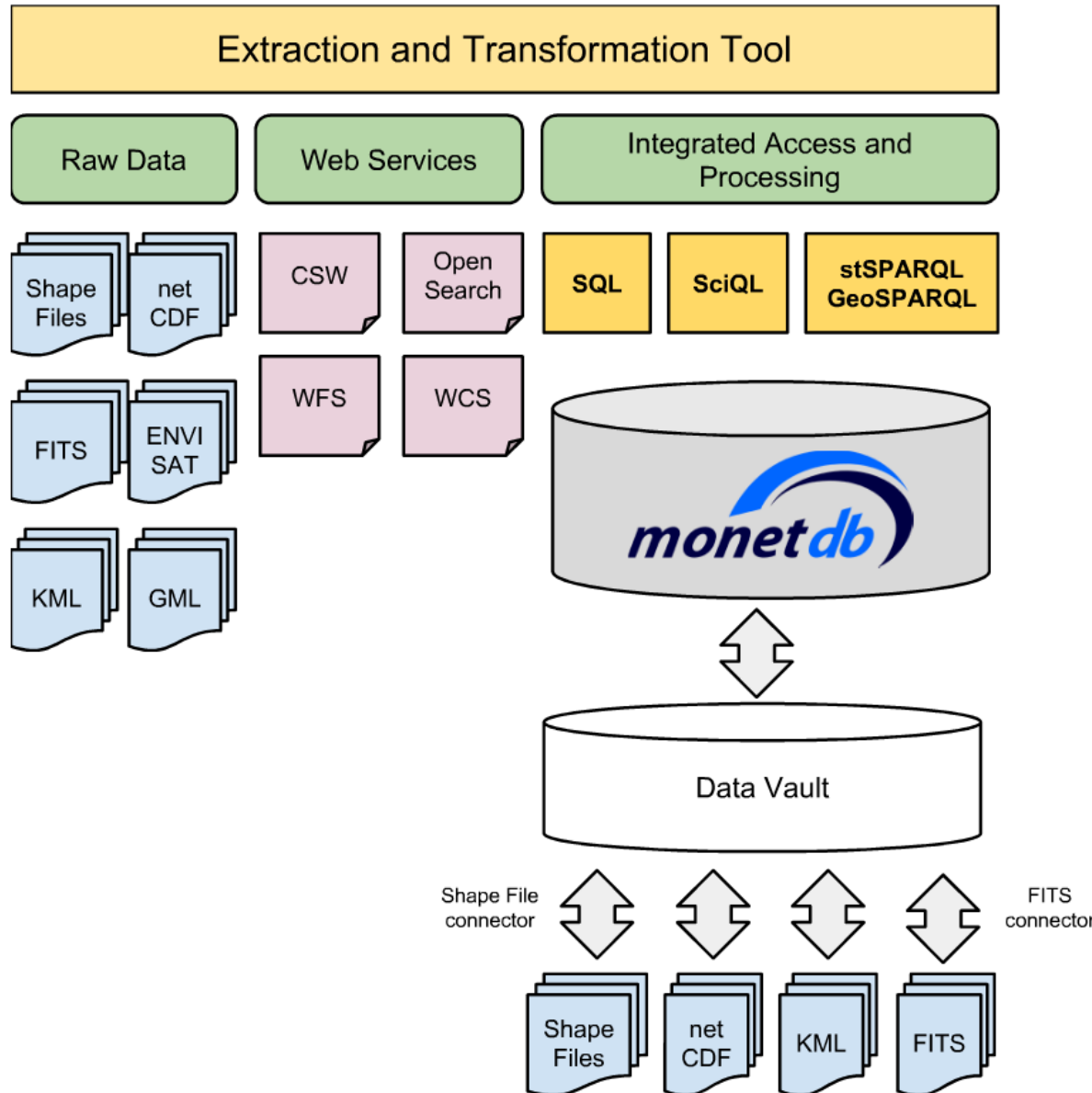
```
graph TD; A[ ] --> B[Semantic Annotation]; B --> C[Transformation into RDF]; C --> D[Storage/Querying]; D --> E[ ]
```

Semantic Annotation

Transformation into RDF

Storage/Querying

Transformation into RDF



```
graph TD; A[ ] --> B[Storage / Querying]; B --> C[Da];
```

Storage / Querying

Da

The data model stRDF and the query language stSPARQL

ESWC
2010, 2013

Extensions of RDF and SPARQL for representing and querying geospatial information that changes over time.

RDF extensions:

- Allow the representation of **geometric information** using OGC standards
- Allow the representation of **valid time** of triples using time instants and time periods

SPARQL 1.1 extensions:

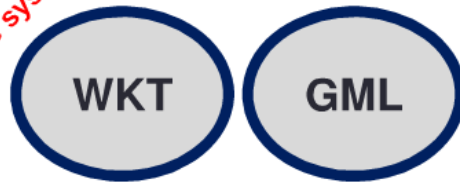
- Allow spatial or temporal terms to be used in the **SELECT**, **FILTER**, and **HAVING** clause of a query
 - **Spatial functions**: OpenGIS Simple Features Access OGC Standard, Egenhofer relations, RCC-8 relations, spatial aggregates
 - **Temporal functions**: Allen's interval algebra, temporal aggregates.

ISWC 2013

The system Strabon

ISWC
2010, 2012

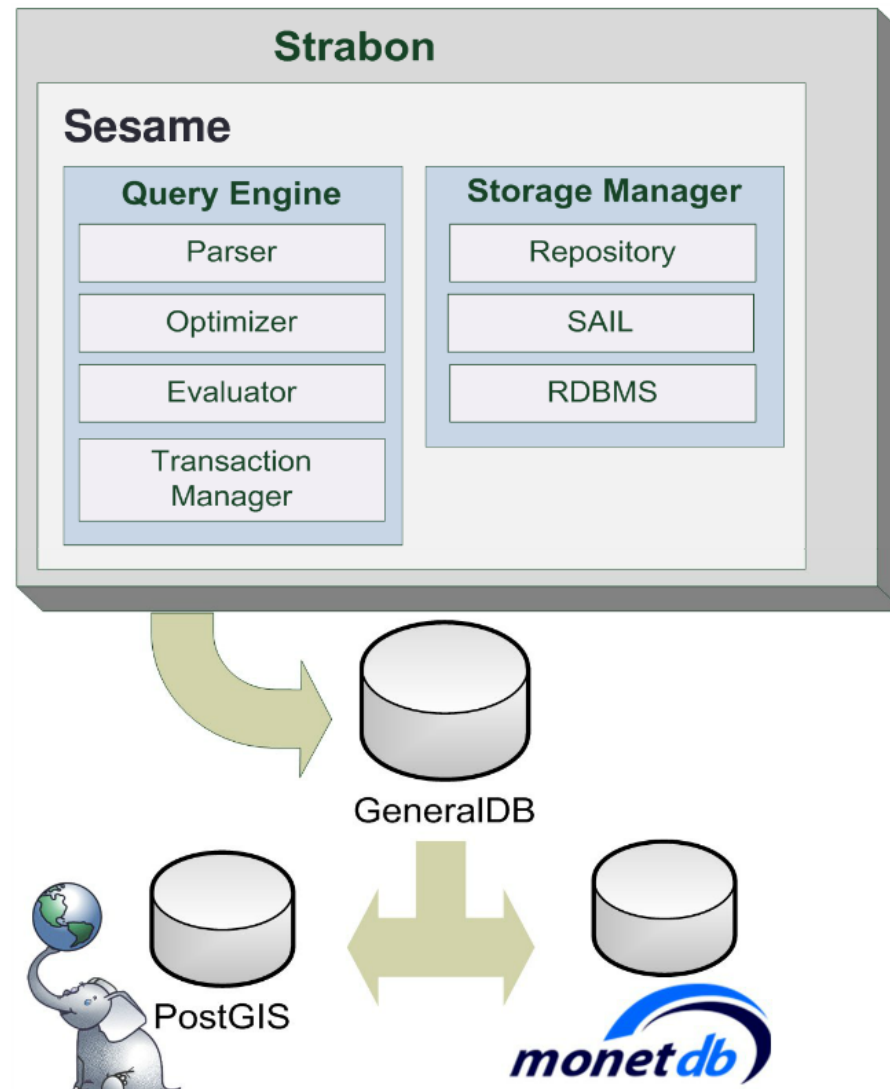
support for multiple
coordinate systems



stRDF
graphs



stSPARQL/
GeoSPARQL
queries



<http://strabon.di.uoa.gr>

The benchmark Geographica

Systematic evaluation of the performance of spatially-enabled RDF stores:

- **Real-world** workload
 - **Micro** benchmark
 - 29 queries that test primitive spatial functions
 - **Macro** benchmark
 - 4 typical application scenarios
- **Synthetic** workload
 - Closely control thematic/spatial selectivity of queries
- Evaluated the performance of many systems
 - Strabon, uSeekM, Parliament, Virtuoso 6.0 and 7.0 (to-do 7.1), and two more proprietary RDF stores.

<http://geographica.di.uoa.gr>

The framework RDFi

RR 2013

We define a new type of literals for representing values of properties that exist but are **unknown** or **partially known**.

Goes beyond stSPARQL and GeoSPARQL which cannot query **incomplete** information.

RDFi enables the representation and querying of topological information among spatial regions for which we **might not have exact** geometric information (e.g., vernacular geography regions) or for which topological relations to other spatial regions are **fixed**.

```
graph BT; Cleaning[Cleaning] --> Publishing[Publishing]; Publishing --> Interlinking[Interlinking]; Interlinking --- UpwardLine[ ]
```

Interlinking

Publishing

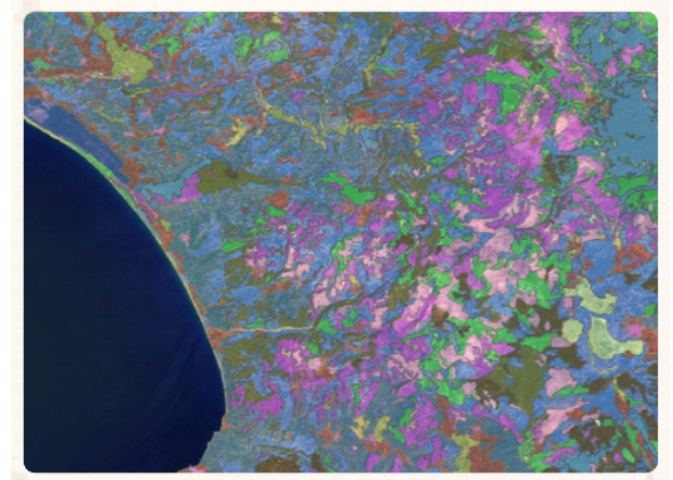
Cleaning

Publishing

- Corine Land Use Land Cover of Europe
- Urban Atlas of Europe
- Greek Administrative Geography
- Coastline of Greece

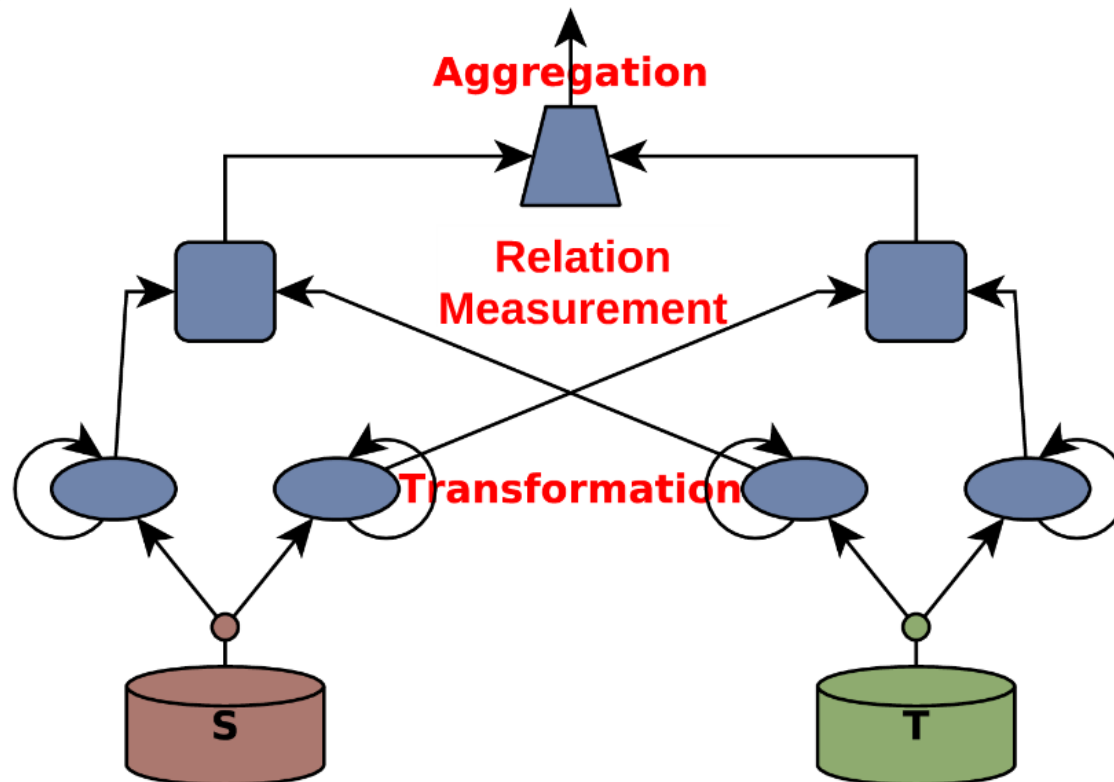


European Environment Agency



available on  **datahub** The easy way to get, use and share data as linked data

Interlinking



We go beyond entity resolution by replacing the **similarity measurement** Layer with the more generic **relation measurement**.

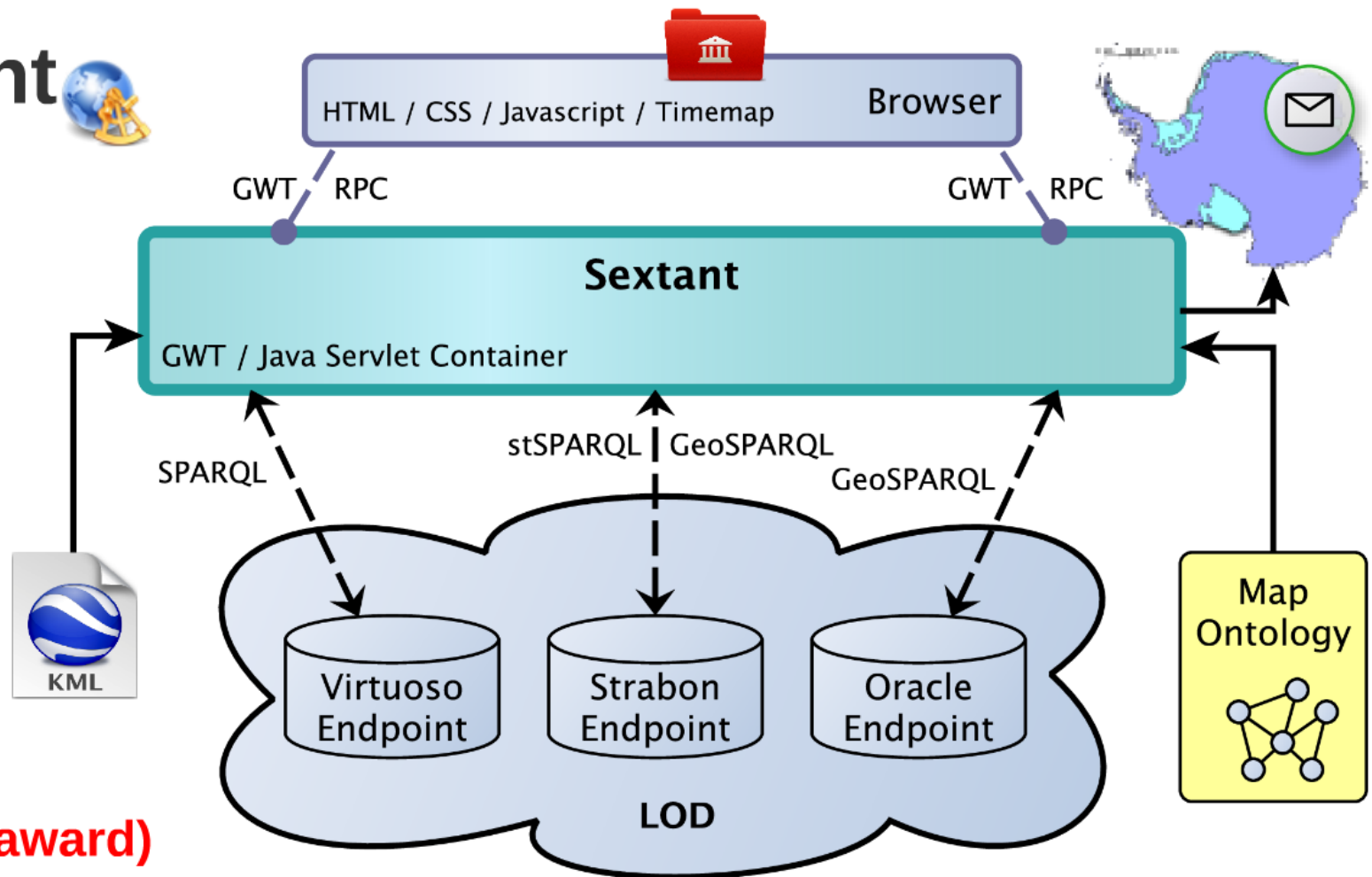
Relations:

- Similarity
- Spatial
 - Containment
 - Nearness
- Temporal
 - Concurrency
- Exploit auxiliary information from Ontologies



Search / Browse / Explore / Visualize

Sextant 



ISWC 2013
ESWC 2013
(best demo award)

<http://sextant.di.uoa.gr/>

Rapid Mapping

ISWC 2012
VLDB 2012
EDBT 2013

Sextant

Endpoints

Layers

☒ Hospitals

☒ Geonames

☒ Rail Network

☒ Road E75

☒ Municipalities

☒ Urban Fabric

☒ Agricultural Areas

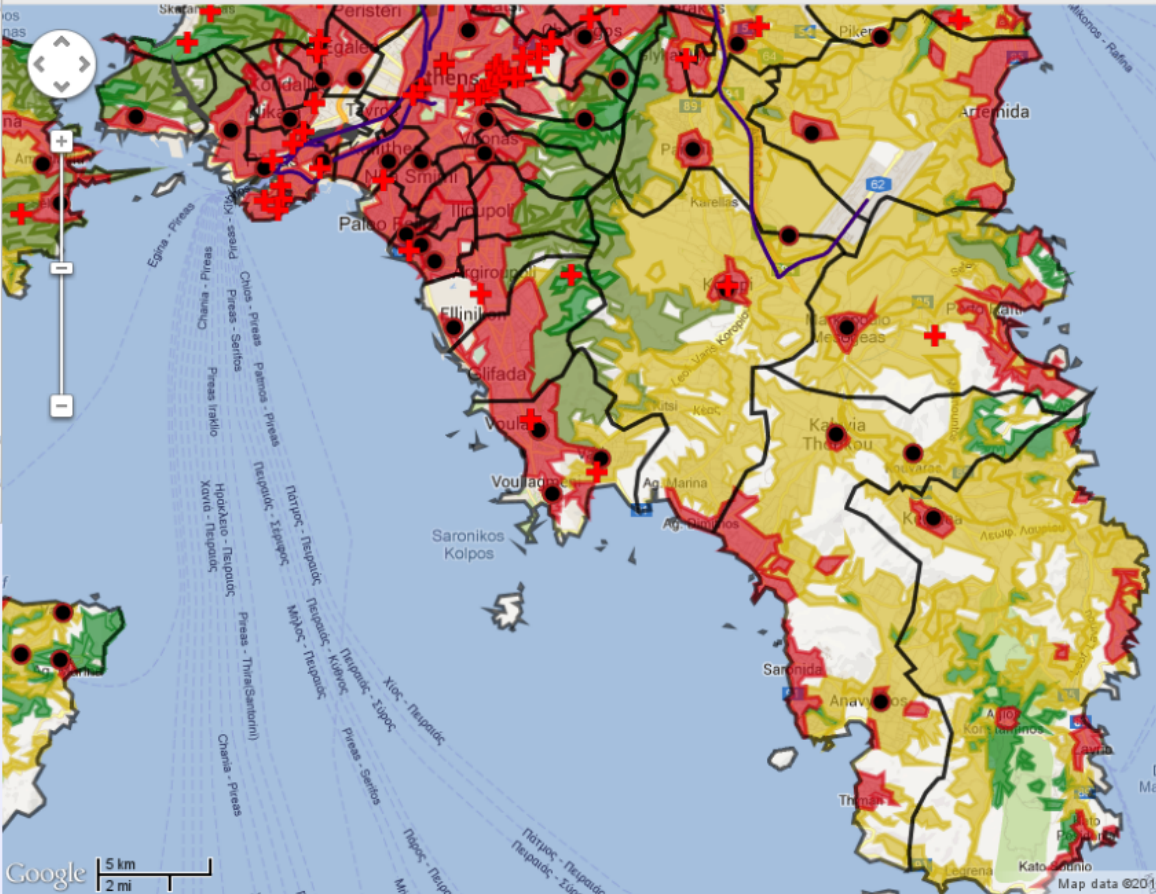
☒ Forest

☒ Shrubland

Query

Explore

Map KML Layers



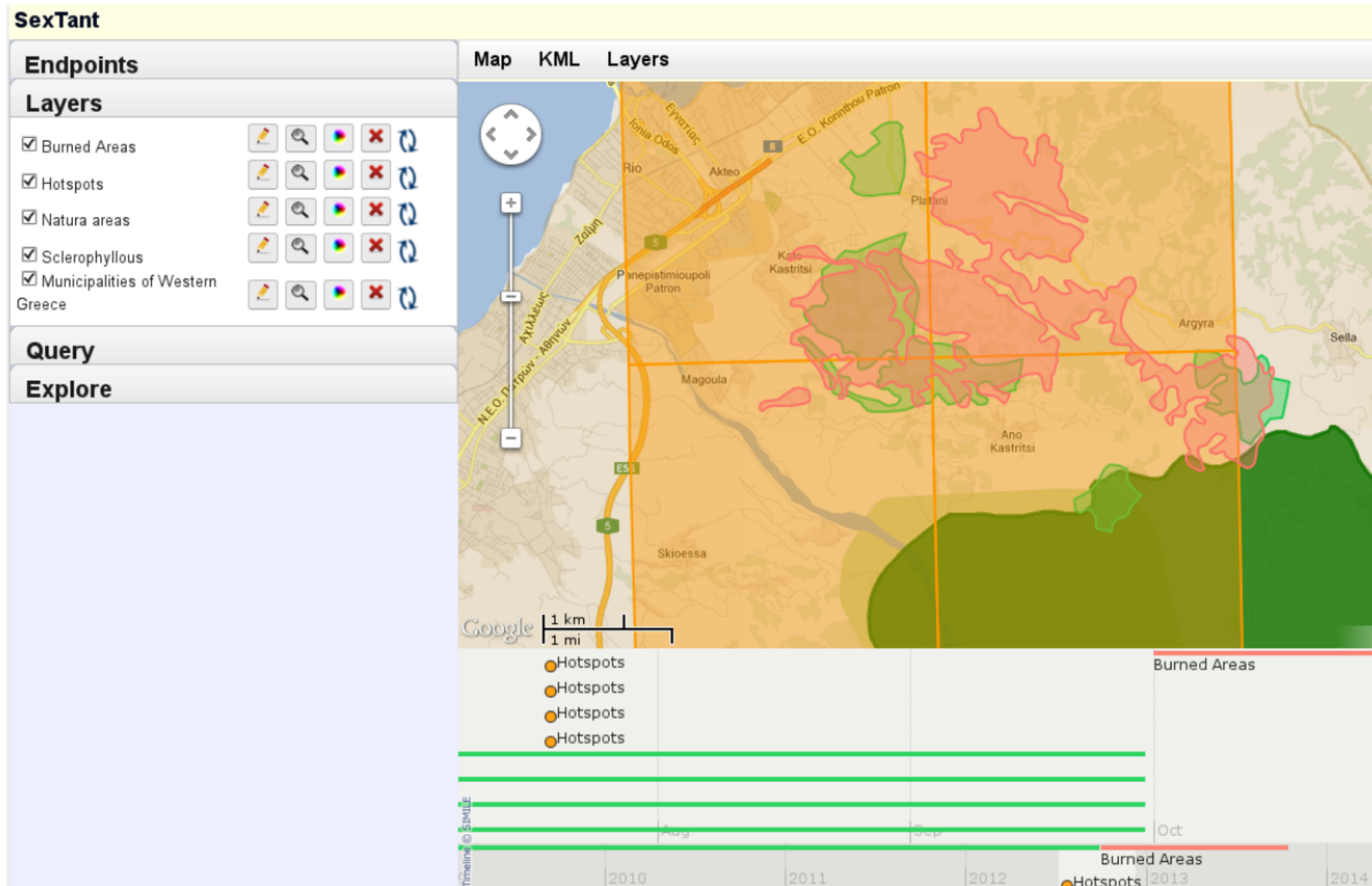
3rd place
Semantic Web
Challenge 2012



<http://bit.ly/sextant-rapid-mapping-attica>

Evolution of Land Cover

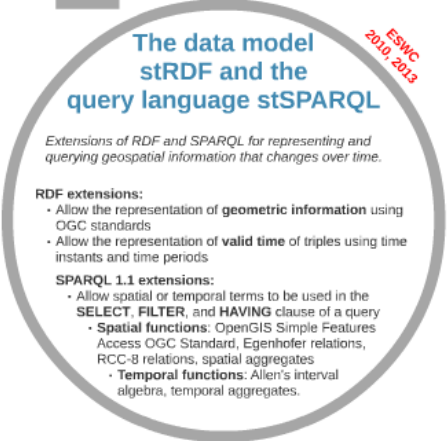
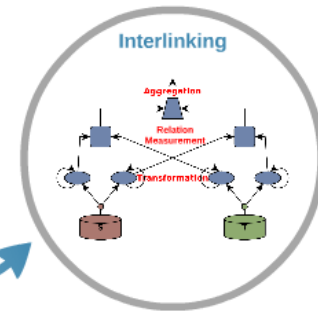
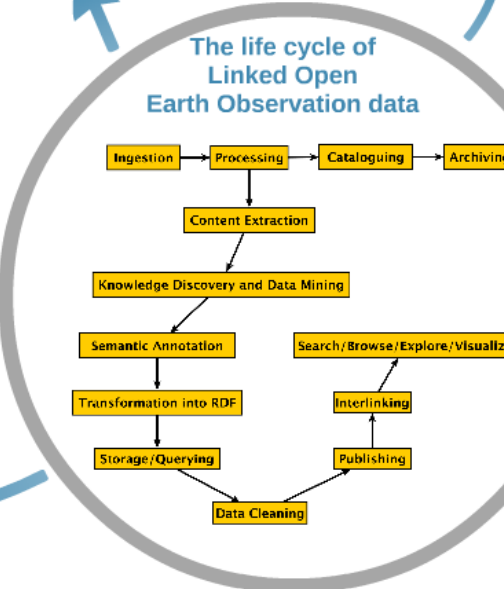
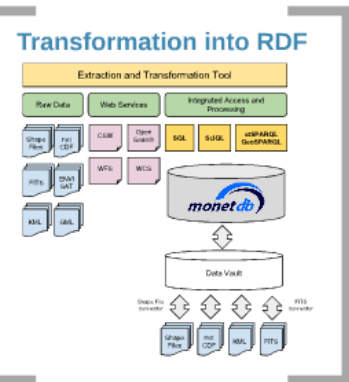
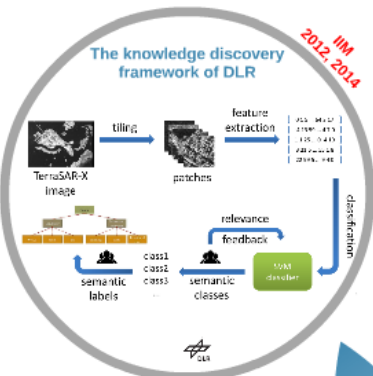
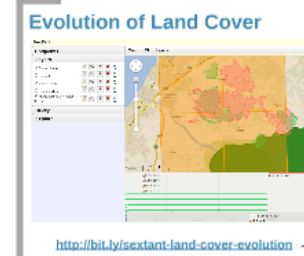
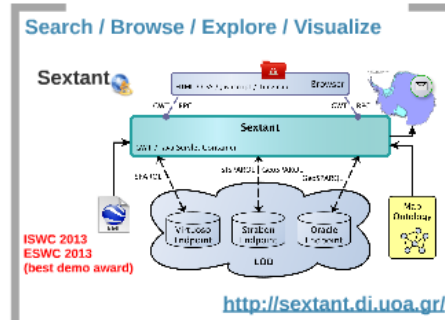
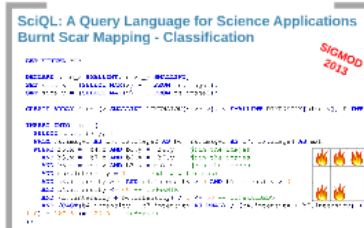
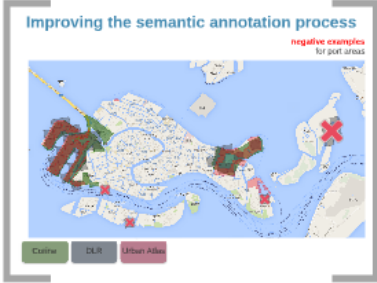
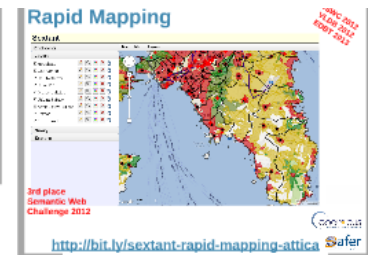
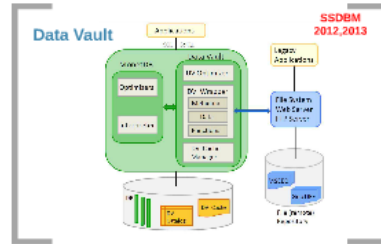
ISWC 2013



<http://bit.ly/sextant-land-cover-evolution>

European Environment Agency

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Linked Earth Observation Data:
The Projects **TELEIOS** and **LEO**

