



Management and publishing of TERENO data from distributed data bases

CT Data Management

TERENO Workshop

17.+18. Januar 2011, Bonn



Coordination team Data Management

➤ Tasks:

- facilitate the acquisition, provision, integration, management and exchange of heterogeneous digital data resources
- develop a joint data management concept to guarantee data access compatibility for the different TERENO sites
- define data storage and data exchange standards

➤ Members:

- Ralf Kunkel (FZJ)
- Rainer Gasche (KIT)
- Mark Frenzel (UFZ)
- Olaf Kolditz (UFZ)
- Frank Neidl (KIT)
- Karsten Rink (UFZ)
- Mike Schwank (GFZ)
- Jürgen Sorg (FZJ)



Environmental observations data

➤ Heterogeneous data in various resolutions

- Point data (sensors)
- Raster data (radar data, remote sensing)
- Vector data (river networks, boundaries)
- Time series data
- File based data, e.g. documentations, pictures, reports etc.

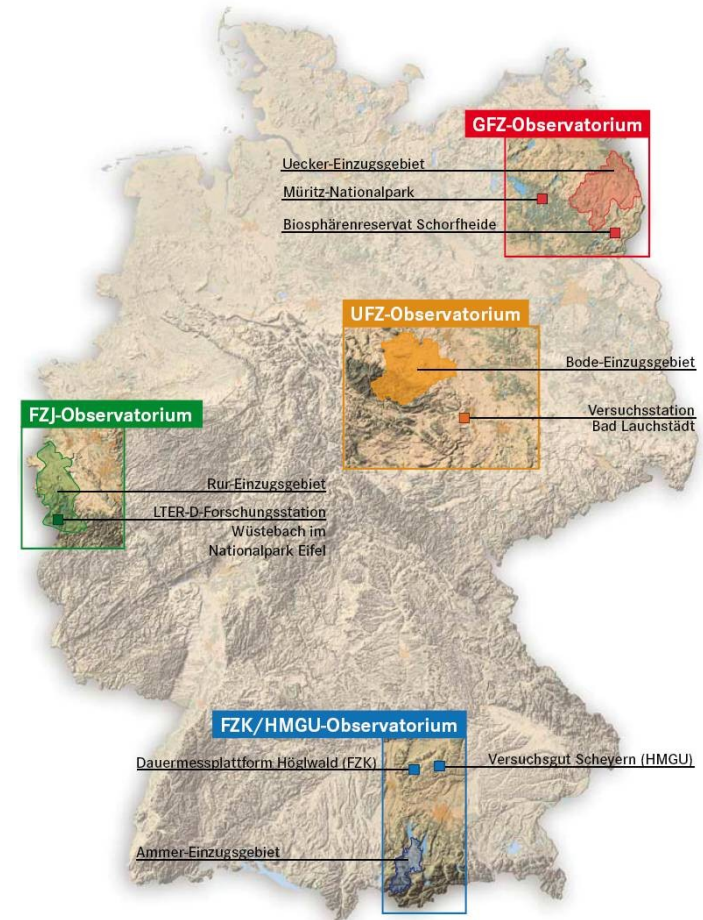
▪ Different topics, e.g.

- Biodiversity
- Climate
- Remote sensing
- Water
- Socio-economy

➤ Different research groups

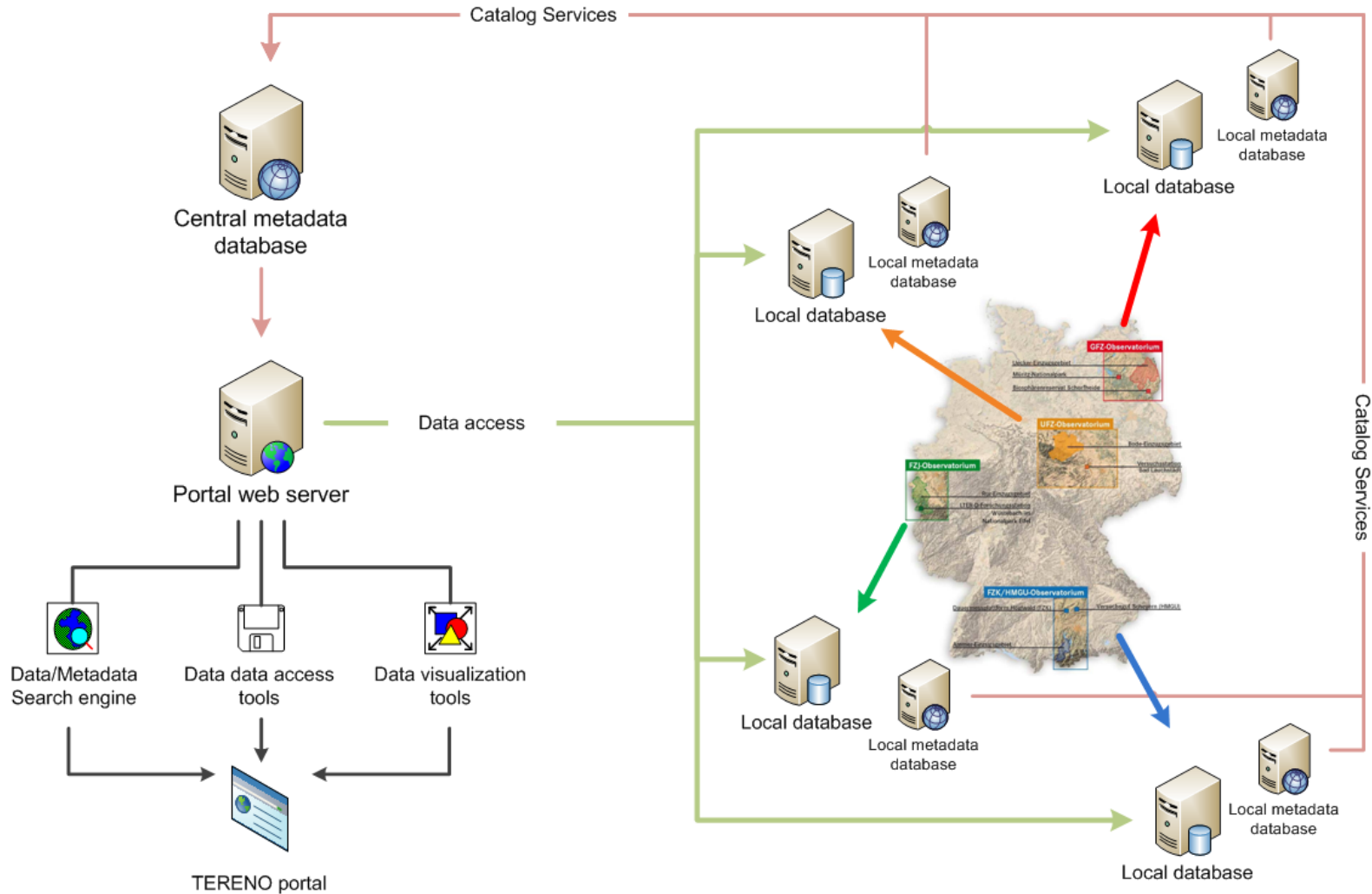
➤ Different institutions

➤ Different usage





TERENO data infrastructure layout



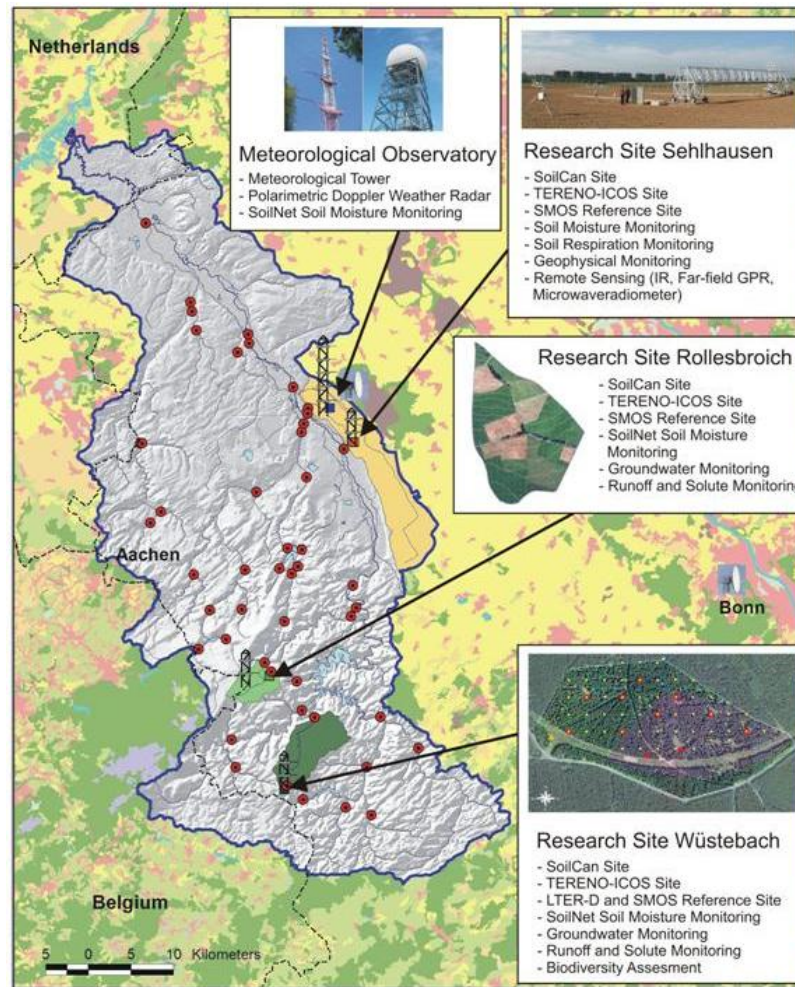


TERENO data management infrastructure setup

- Data management plans: query of data management issues in the different observatories (2009)
- Data policy agreements (2010)
- Communication interfaces definition (2010)
- Standard metadata profile definition (current work)
- Infrastructure implementation
 - Local databases (since 2009)
 - TERENO data portal (since 2009)
 - Data query, visualization and access tools (since 2010)
 - Central Catalogue Service (2010)
 - Coupling TEODOOR with local databases (since 2010)
 - Publishing data from local databases (e.g. weather radar, sensor data) (since 2010)



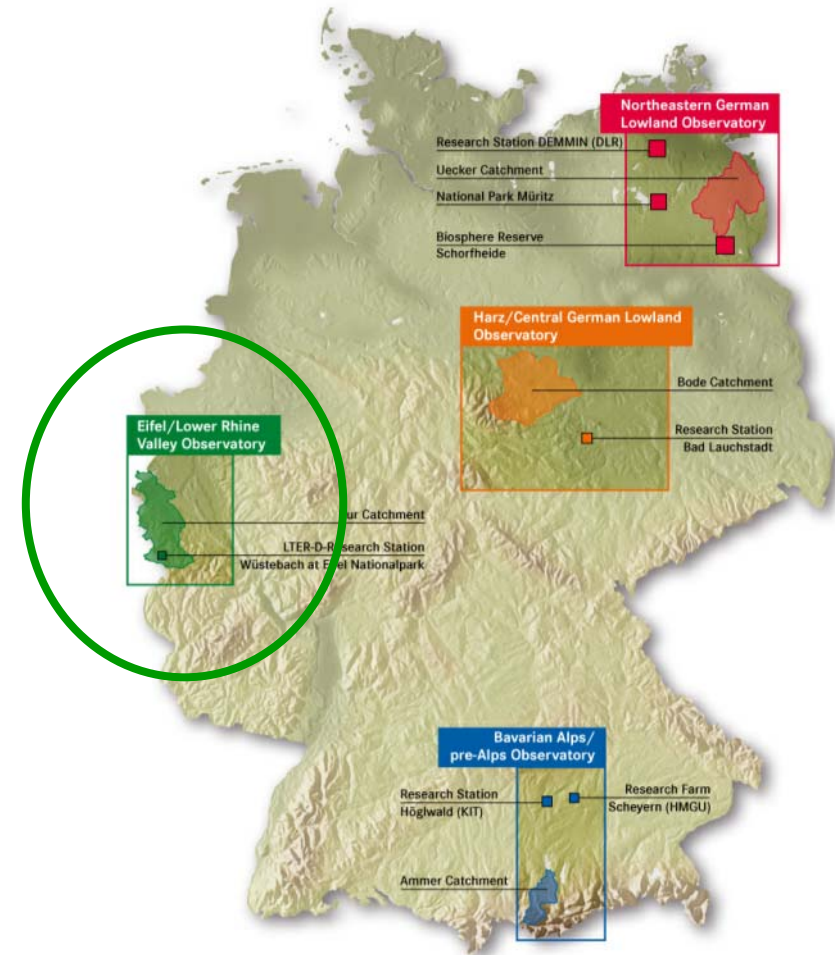
TERENO Eifel / Lower Rhine Valley Observatory





Tereno data being processed at FZJ/IBG-3

- Logger data with different temporal resolution:
20 GB a⁻¹ (100 GB in total)
- Eddy-Covariance data:
150 GB a⁻¹
- GIS-Data: 30 GB
- Remote sensing data:
100 GB a⁻¹ (500 GB in total)
- Dokument and other file based data: 10 GB a⁻¹
- Weather radar: 1 TB mon⁻¹
(one scan each 5 minutes)





Frontend: AIDA

INSTITUT FÜR CHEMIE UND DYNAMIK DER GEOSPHERE (ICG)

JÜLICH
FORSCHUNGSZENTRUM

>>Startseite

Anmelden
Übersicht

Website durchsuchen

nur im aktuellen Bereich
Erweiterte Suche...

Startseite | Agrosphäre

INDEXSEITE
— abgelegt unter: [datenmanagement](#)

Zur Navigation bitte ein Symbol anklicken

Agrosphäre

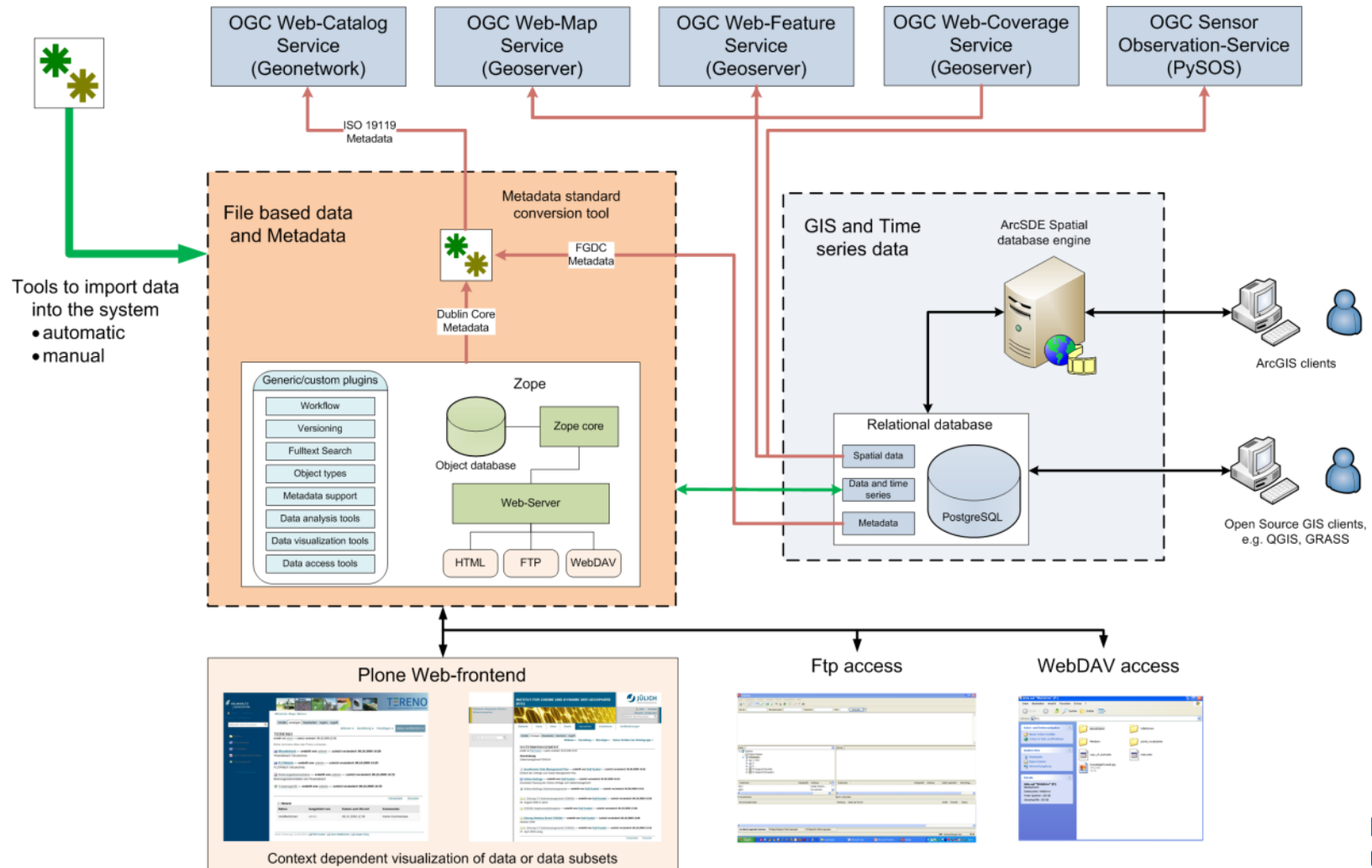
Biospec	Modelling in heterogeneous soils	Technik
Chemicals in soils	Soil-root interaction	Analytik
Hydrogeophysics	TERENO	Mitarbeiter
Modelling and management of catchments	Veterary pharmaceuticals in soils	Doktoranden
Model and software development	Yangtze-project	Hilfe und Anleitungen

Versenden Drucken

System in operation since 2009



Backend: FZJ/IBG-3 data infrastructure (AIDA)





TEODOOR: The TERENO Data Portal

➤ Portal Web-application

- <http://www.tereno.net>
- presentation of the Tereno project (public area)
- Communication platform of the Tereno community (internal area)
- Data query
- Data visualization and download

➤ Provides access to remote data from local database (practically no “own” data)

➤ Communicates to local databases via standardized (OGC-conformal) Web-services

TERENO
 TERRESTRIAL ENVIRONMENTAL OBSERVATORIES

WELCOME TO TERENO

Global change has triggered a number of environmental changes, such as alterations in climate, land productivity, water resources, atmospheric chemistry, and ecological systems. Finding solutions to the impact of global change is one of the most important challenges of the 21st century.

TERENO is embarking on new paths with an interdisciplinary and long-term research programme involving six Helmholtz Association Centers. TERENO spans an Earth observation network across Germany that extends from the North German lowlands to the Bavarian Alps. This unique large-scale project aims to catalogue the longterm ecological, social and economic impact of global change at regional level. Scientists and researchers want to use their findings to show how humankind can best respond to these changes.

TERENO Terrestrial Environmental Observatories

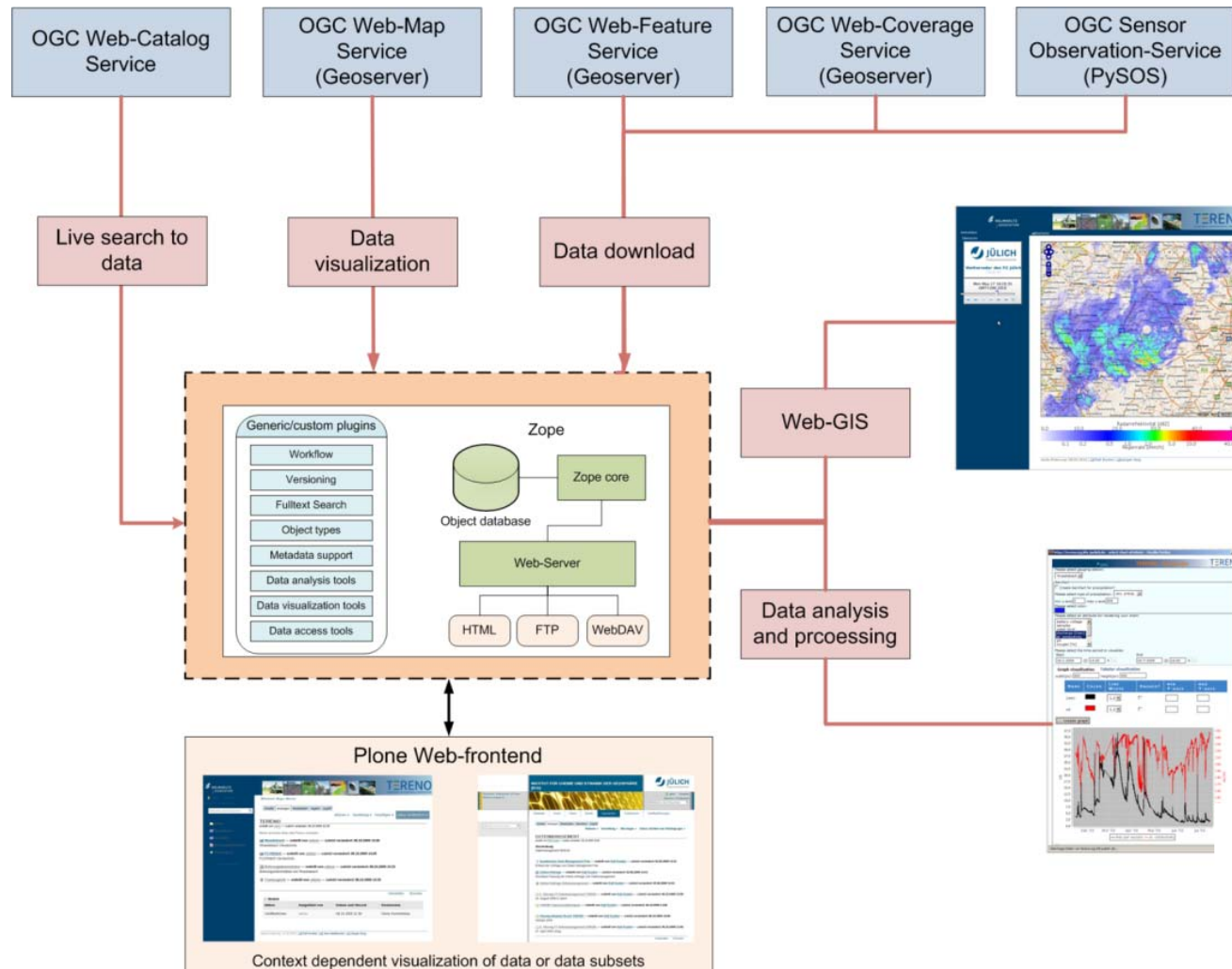
click on map for more information ...

TERENO is supported by the following Helmholtz Research Centers:

- Forschungszentrum Jülich - FZJ
- Helmholtz Centre for Environmental Research - UFZ
- Karlsruhe Institute of Technology - KIT
- Helmholtz Zentrum München - German Center for Environmental Health - HMGU
- German Aerospace Center - DLR
- German Research Centre for Geosciences - GFZ



Backend: interfaces and functions





Data policy

- Data sets are categorized into different processing levels with different access rights
 - Level 0: Original raw data (e.g. voltages from the data logger) are not necessarily archived at a local TERENO database
 - Level1: Processed data by the site investigator (archived long-term)
 - Level2: Reviewed, quality checked and formatted data (e.g. consistent units)
 - Level3: Gap-filled, derived, spatially and/or temporally aggregated data
- Data types are categorized into different groups:
 - Basic monitoring data especially setup for online access (full public access to level 0 and 1 data)
 - Further monitoring data, acquired within research projects (restricted access within retention time)
 - Third party data (restricted access)
- Definition of time periods for data delivery
- Approval of data access for higher level data by the data originators and data owners (within “retention time”)



Central Tereno Metadata Catalogue

- Metadata (data describing the „real“ data sets) are required to find and interpret the data
- Central Tereno OGC-Catalogue Service geonetwork
 - Developed by FAO, WFP and UNEP
 - Supports multiple metadata standards (ISO19115, FGDC, DublinCore)
 - Open source, widely used
 - Online metadata editor
 - Different sharing / security levels
 - Online synchronization with other catalogues

The screenshot displays the GeoNetwork OpenSource interface. At the top, it says 'GeoNetwork OpenSource Geographic data sharing for everyone'. Below the navigation bar, there's a search section with a 'What?' field and a 'Where?' map viewer. The main content area shows search results for 'Niederschlagsraster' (precipitation raster) data. Each result includes a logo, a file name (e.g., '2010_08_04_15_45_33.GEOTIFF'), an abstract, and keywords like 'weather radar, Germany, Eifel-Rur'. There are buttons for 'Metadata' and 'Interactive Map' for each result. The bottom of the page shows the 'ASSOCIATION' logo.



Metadata policy

- No data without metadata
 - Each data set is described by a metadata set
 - Metadata from the individual observatories need to be merged into one central metadata catalog
 - Metadata need to be compliant to a common metadata profile

- No metadata without data (if possible)
 - All metadata contain the location of the real data
 - Data should be downloadable from specified location
 - Access rules should be defined



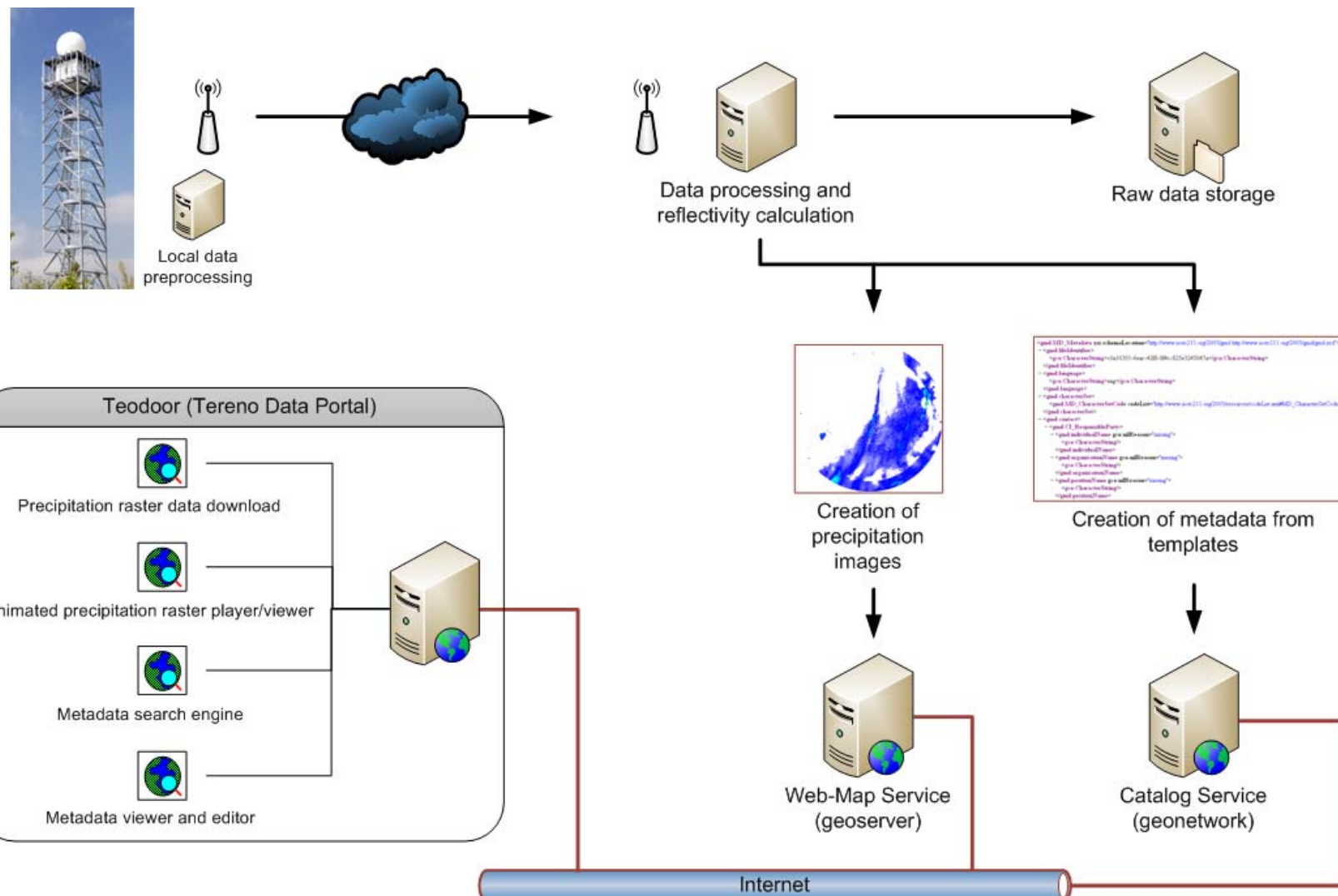
Metadata profile

- Common Tereno metadata profile (currently developed)
- Compliant to common standards (e.g. ISO 19115/19139, INSPIRE, GDI-DE)
- Contains
 - Data description
 - Data location
 - Contact information

Theme	Element	Multiplicity	ISO 19115 core	
Identification	Resource title	1	Dataset title	M
	Resource abstract	1	Abstract describing the dataset	M
	Resource type	1		
	Resource locator	0..*	Online resource	O
	Unique resource locator	1..*		
Classification	Resource language	0..*	Dataset language	M
	Topic category	1..*	Dataset topic category	M
Keywords	Keyword value	1..*		
	Originating controlled vocabulary	0..1		
Geographic location	Geographic bounding box	1..*	Geographic location of the dataset	C
Temporal reference	Temporal extent	0..*	Additional extent information for the dataset	O
	Date of publication			
	Date of last revision	1..*	Dataset reference date	M
Resolution and validity	Date of creation			
	Lineage	1	Lineage	O
Access constraints	Spatial resolution	0..*	Spatial resolution of the dataset	O
	Conditions applying to access and use	1..*		
Responsible party	Limitations on public access	1..*		
	Responsible party	1..*	Dataset responsible party	O
Metadata metadata	Responsible party role			
	Metadata point of contact	1..*	Metadata point of contact	M
	Metadata date	1	Metadata date stamp	M
	Metadata language	1	Metadata language	C



Managing and publishing weather radar data





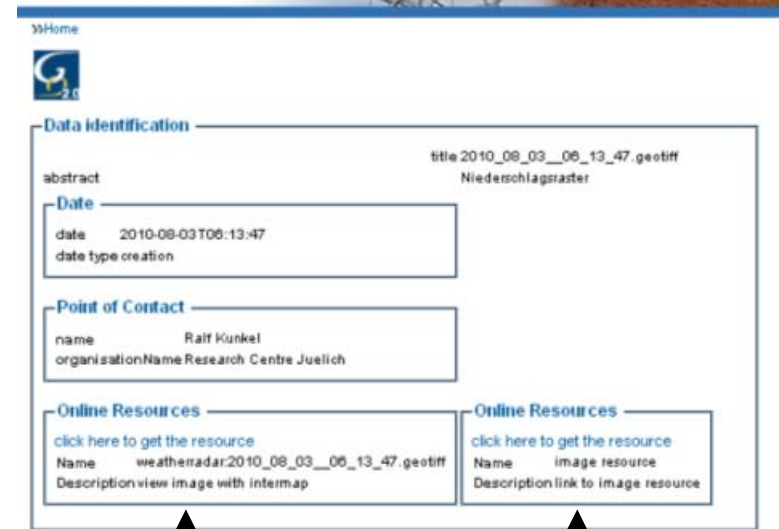
Frontend for weather radar data publishing



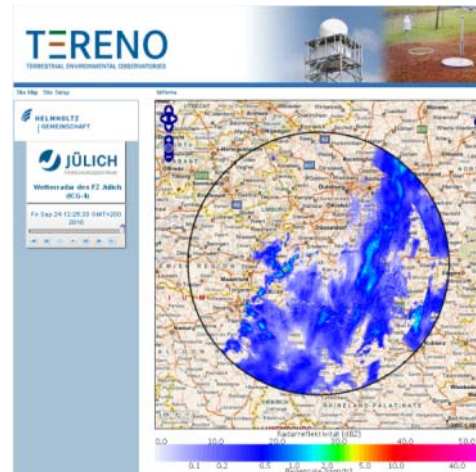
Live search to metadata

Detailed view

Metadata display (ISO 19139 subset)



Online access to data
(download raster or raw data)



Weather radar data player/viewer

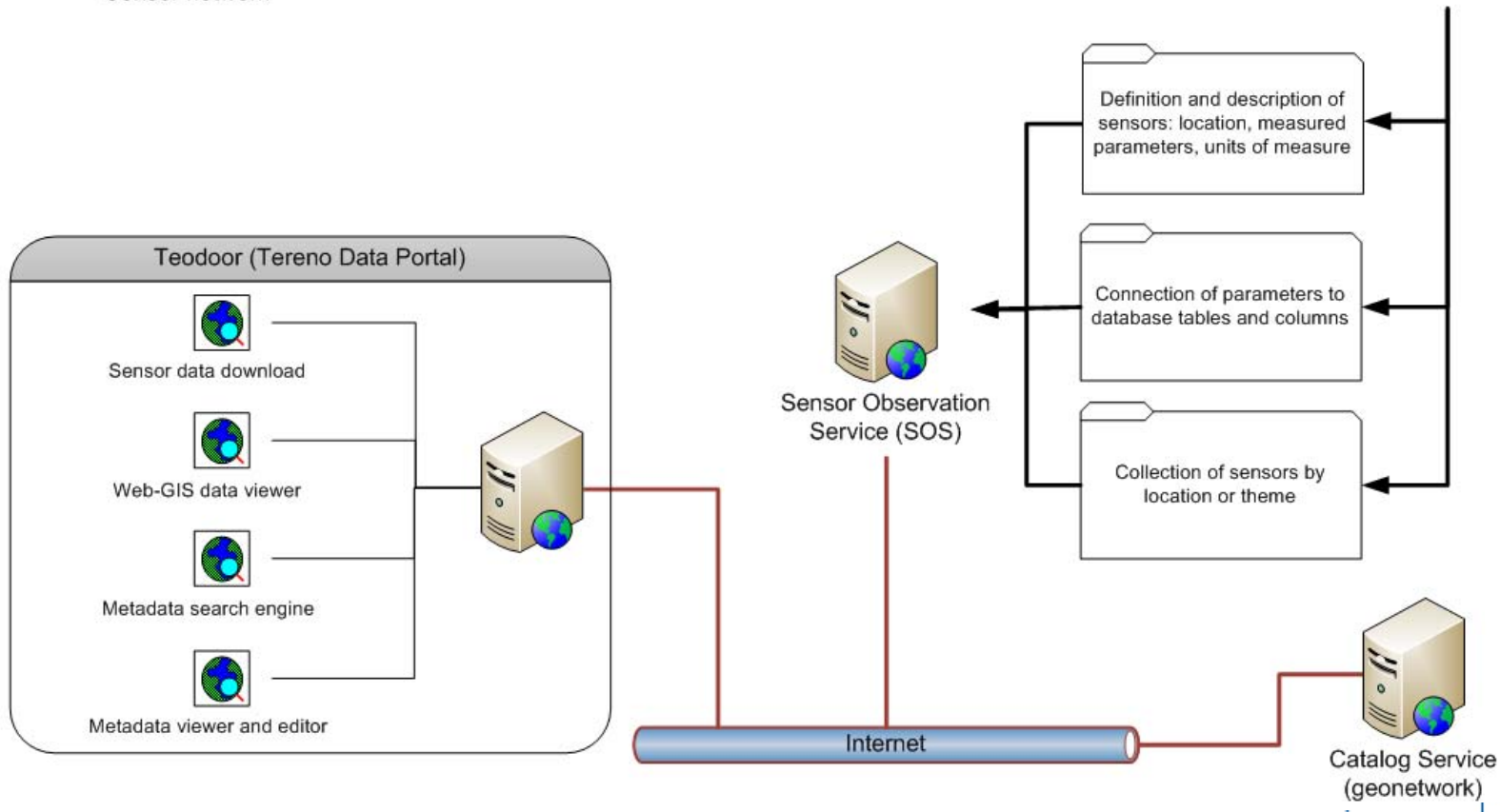
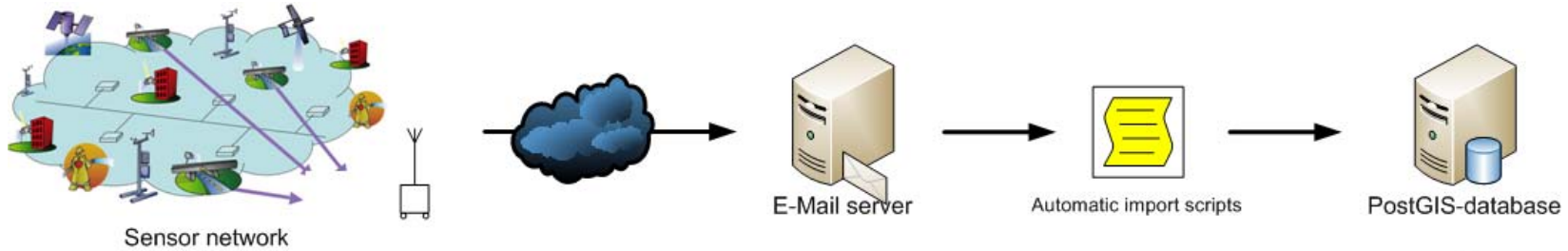


Sensor Observations Service (SOS)

- Web-Interface to provide access to observations from sensors and sensor systems in a standard way
- Standardized by Open GIS Consortium (OGC)
- Access to data through standardized requests:
 - GetCapabilities
returns information about the offerings that are available from each service.
 - DescribeSensor
returns detailed metadata for selected sensor
 - GetObservation
Access to observations data for selected parameter(s), sensor(s), time period(s)



Managing and publishing sensor data





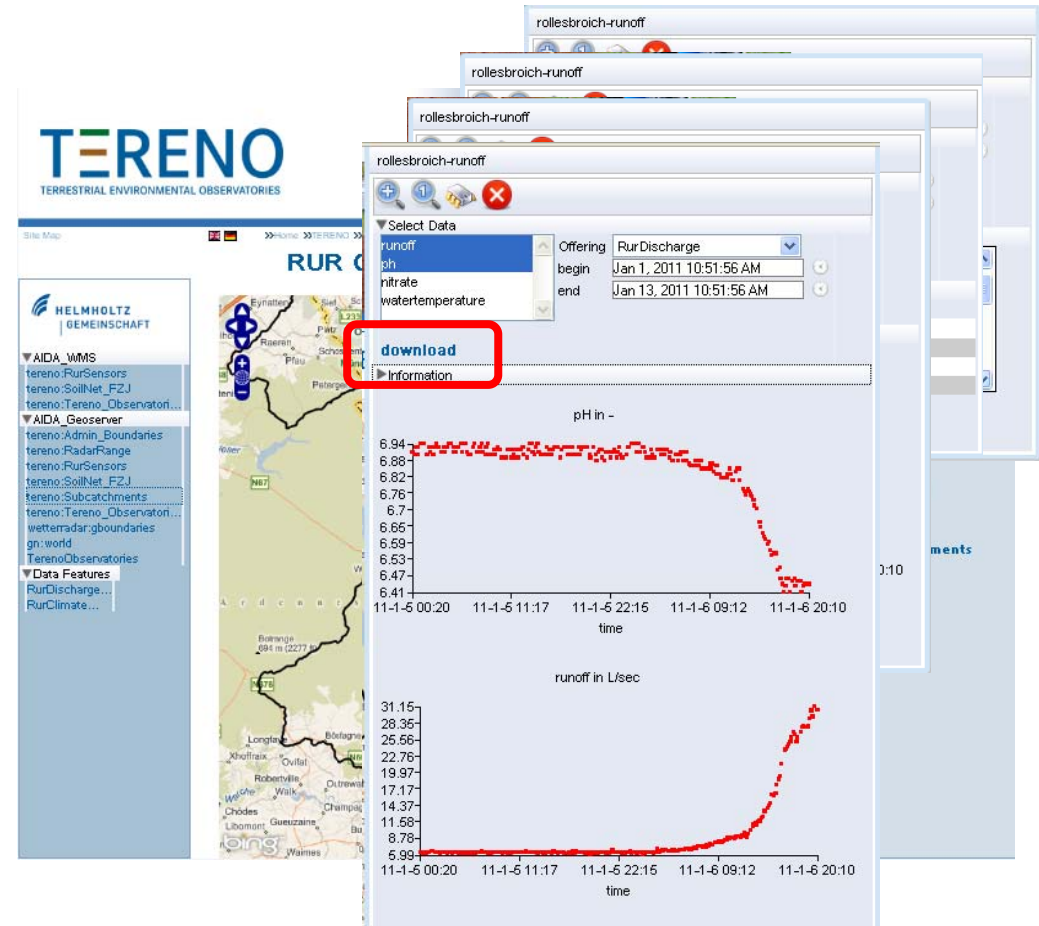
Data visualisation and download

- Implemented using OpenLayers
- Supports multiple OGC-WMS and OGC-SOS
- Customized
 - Default content
 - Default region
 - Visible WMS
 - Visible SOS
- Plone workflow support for adjusted data views and access



SOS data query in TEODOOR

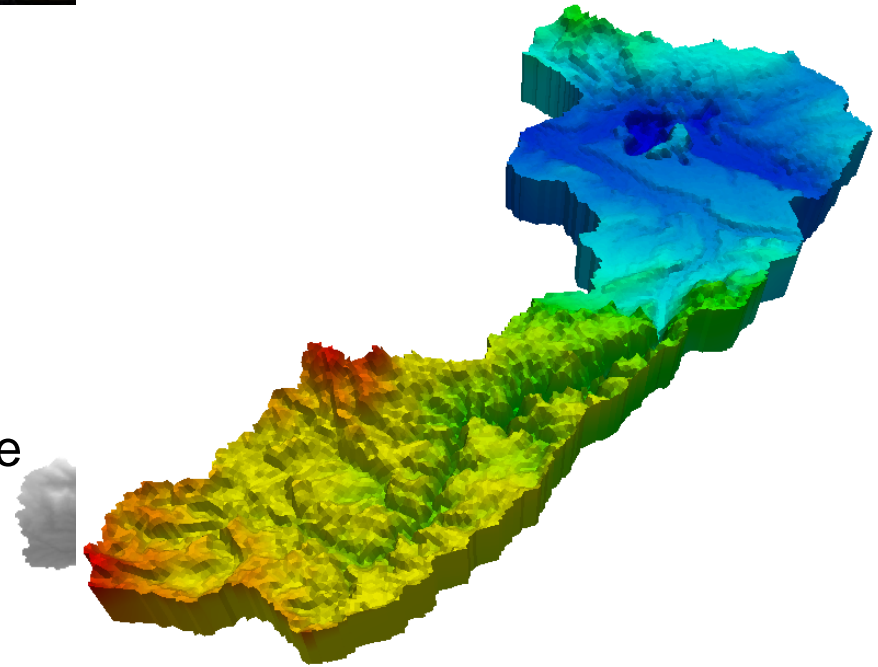
- Standardized queries to remote SOS
- Sensor data are assessed independently of observatory database setup
- Data visualisation and access for selected sensor(s):
 - Sensor metadata
 - Newest observations
 - Graphs for selected parameter(s)
 - Download for selected parameter(s)



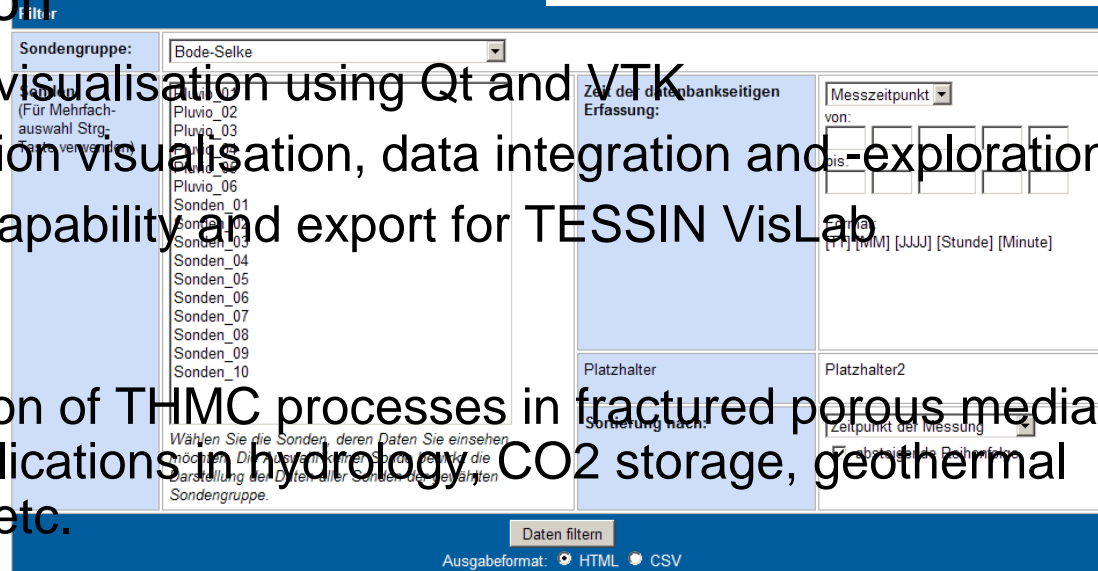


OpenGeoSys

- Platform independent interface
- Data Management
 - Import and export of standard file formats
 - Database interface
- Visualisation

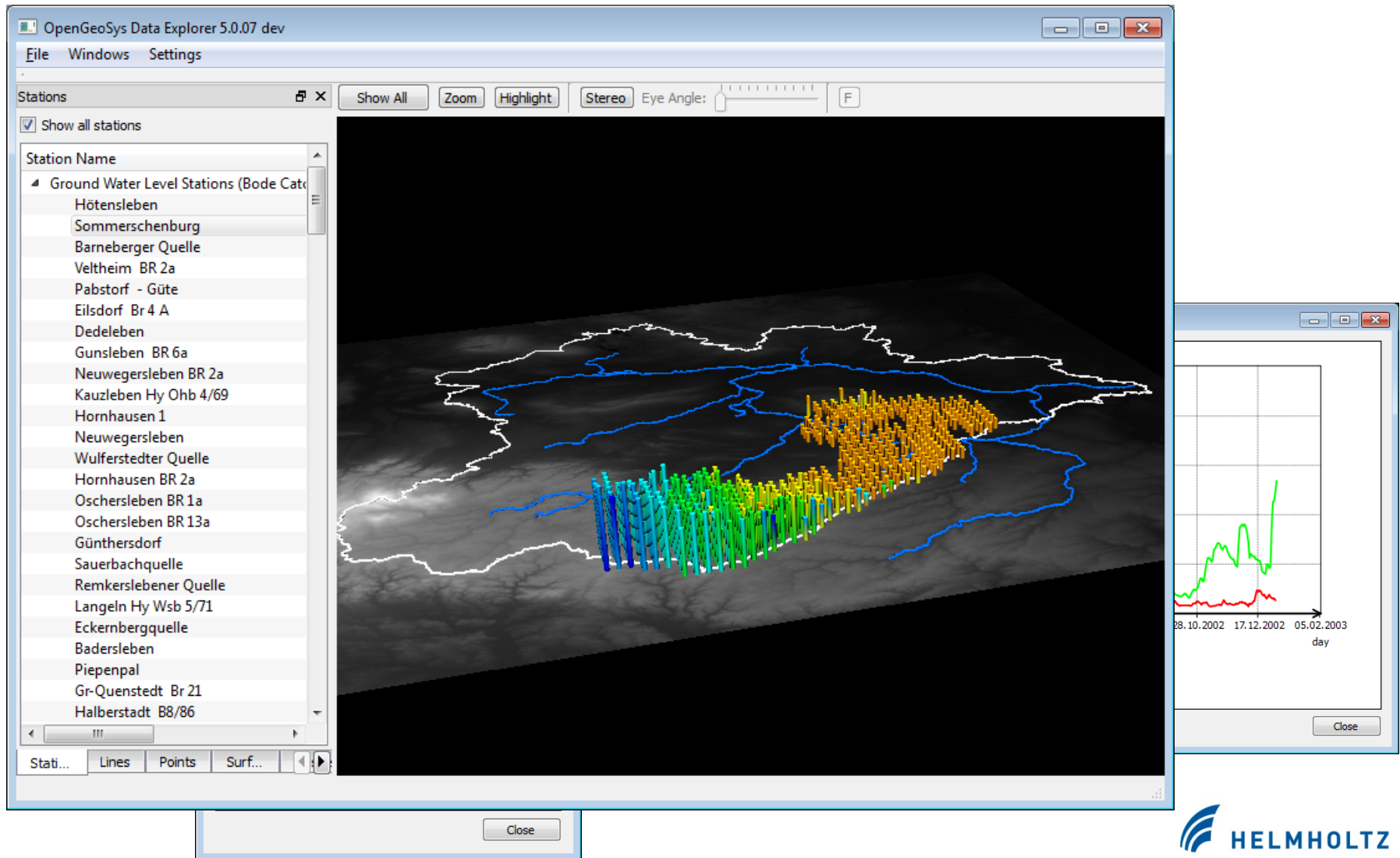


- 2D / 3D visualisation using Qt and VTK
 - Information visualisation, data integration and -exploration
 - Stereo capability and export for TESSIN VisLab
- Numerics
 - Simulation of THMC processes in fractured porous media with applications in hydrology, CO2 storage, geothermal energy, etc.





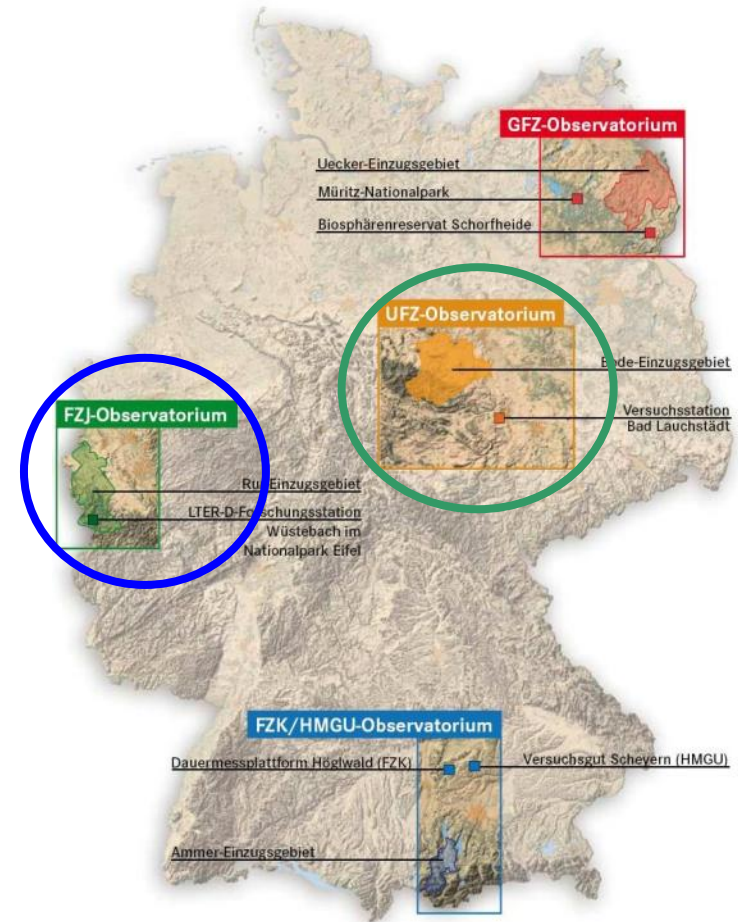
OpenGeoSys Data Explorer





Pilot projects

- Three pilot projects already established to develop and test
 - Local data infrastructure for meteorological, hydrological and pedological data
(FZJ – Eifel / Lower Rhine Valley Observatory)
 - Local data infrastructure for biodiversity data
(UFZ – Harz / Central German Lowland Observatory)
 - Data communication and data exchange
(all observatories, coordination FZJ)





Outlook and current work

- More sensors, metadata, higher level data
- Additional data analysis tools and data products
- Connecting other observatories
 - Remote catalogue services
 - Remote OGC-Web services (WMS, SOS)
 - “Standard“ Web-GIS layout for each Tereno observatory
- Definition of a Tereno Metadata profile
 - Compliant to common standards (e.g. INSPIRE, ISO 19139)
 - Conversion tools from other metadata standards
- Extended hierarchical search to remote metadata