

Management and publishing of TERENO data from distributed data bases

Tereno Coordination Team Data Management



TERENO Advisory Board Meeting

25./26. October 2012, Scheyern

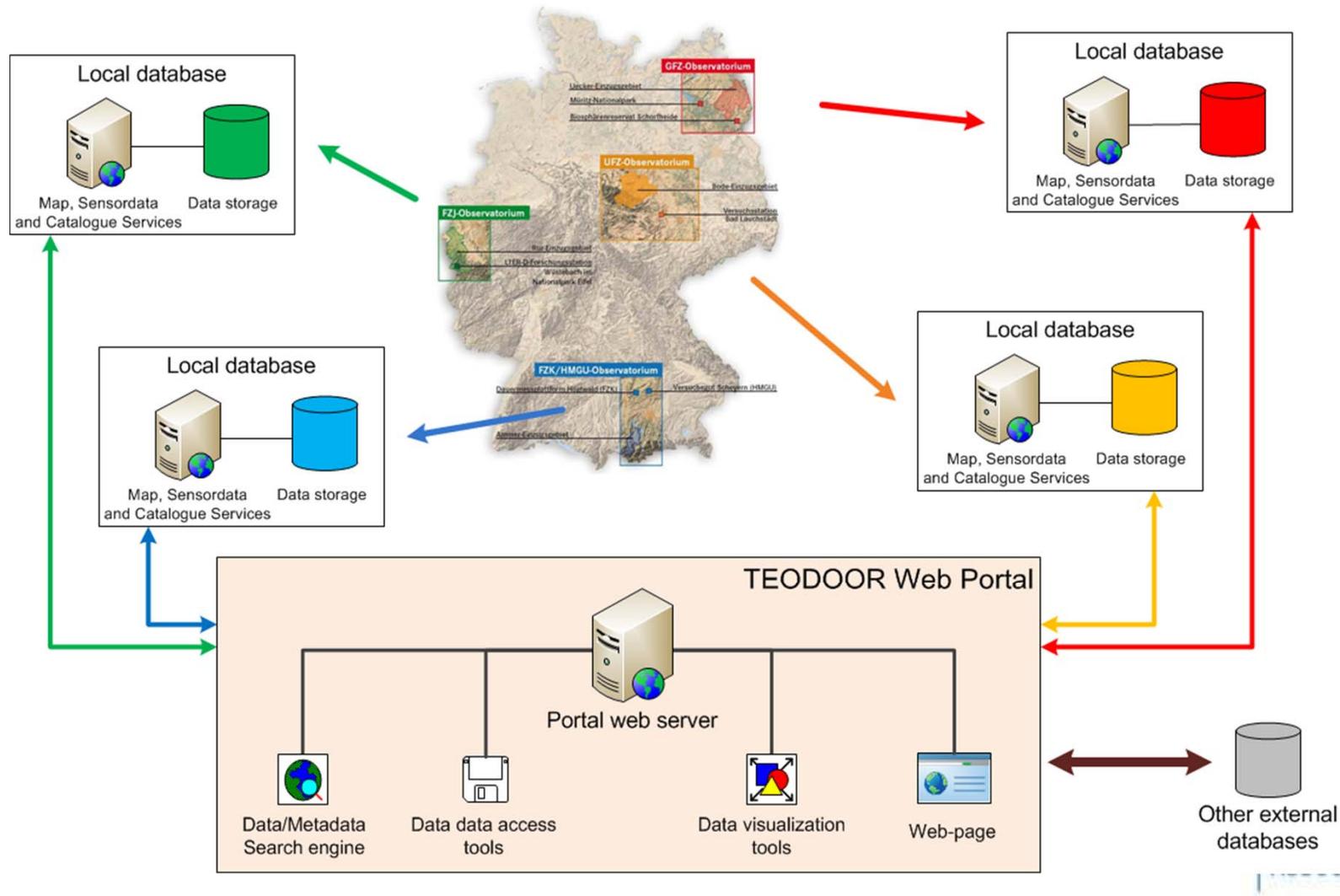


Introduction

- Within TERENO each partner creates local data infrastructures for managing data and metadata
- TEODOOR is a standardized spatial data infrastructure (SDI) for acquisition, integration, management and exchange of heterogeneous data
- The main goal of TEODOOR is to provide scientists and stakeholder with reliable and well accessible data, metadata and data products
- All data is freely accessible to the public after a first quality check was performed



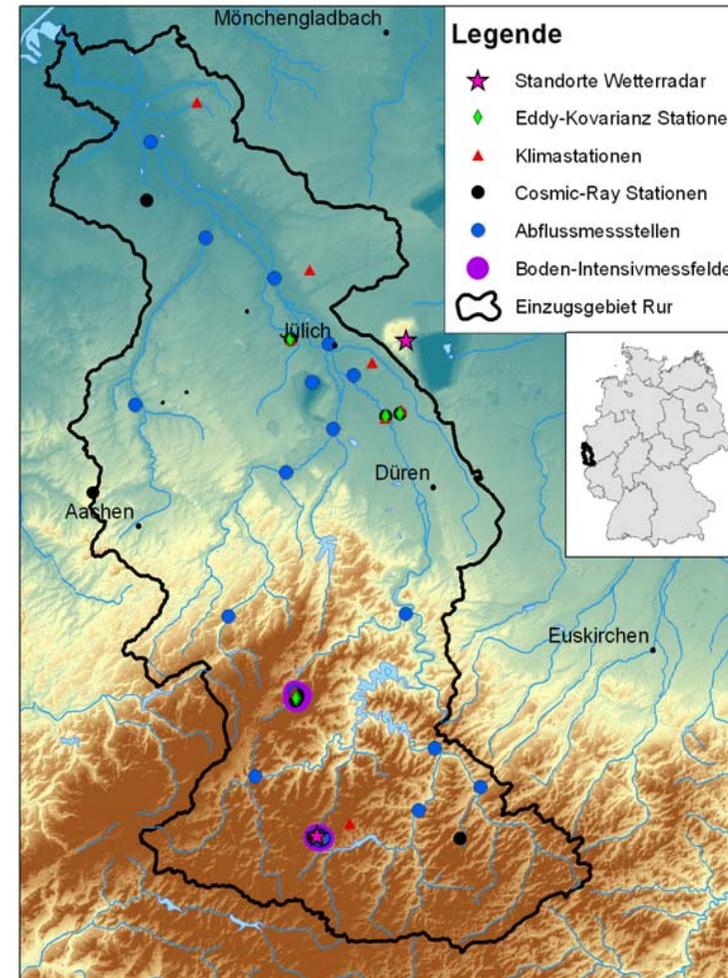
TERENO distributed data infrastructure design





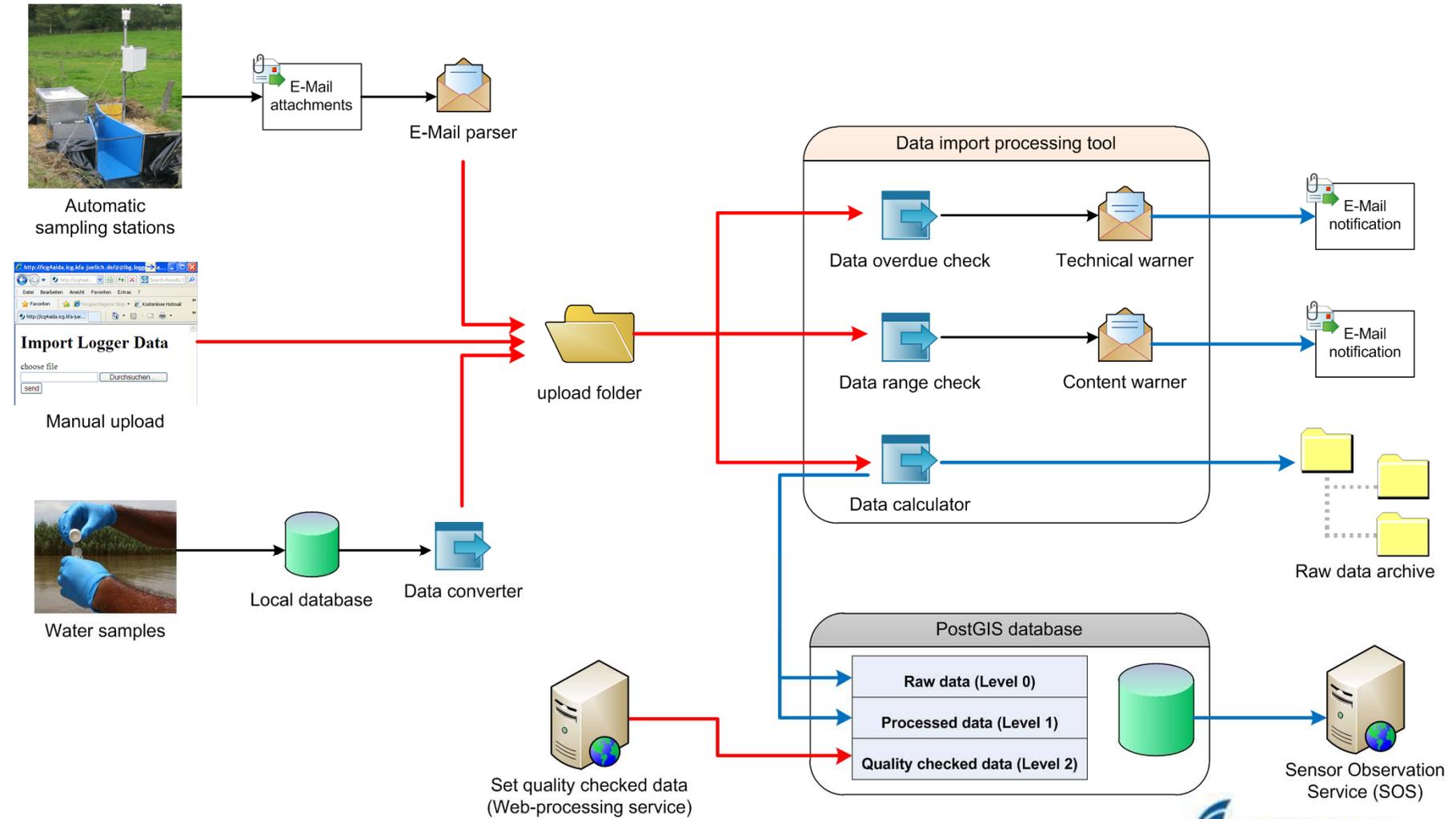
Data Infrastructure „Eifel/Lower Rhine Valley Observatory“

- **Standard stations: meteorological, hydrological and pedological data:**
53 stations, >30.000 values per day
- **SoilNet: soil temperature and soil moisture, meteorological data**
404 sensor nodes, >670.000 values per day
- **Eddy-Covariance stations: mikrometeorological and gas concentration data**
7 stations, >133.000.000 values per day
- **Weather radar: Reflectivity and precipitation data**
2 stations, 1728 grid data per day, >90 GB per day
- **External sources (LANUV, WVER):**
Hydrological and meteorological data





Data import and processing





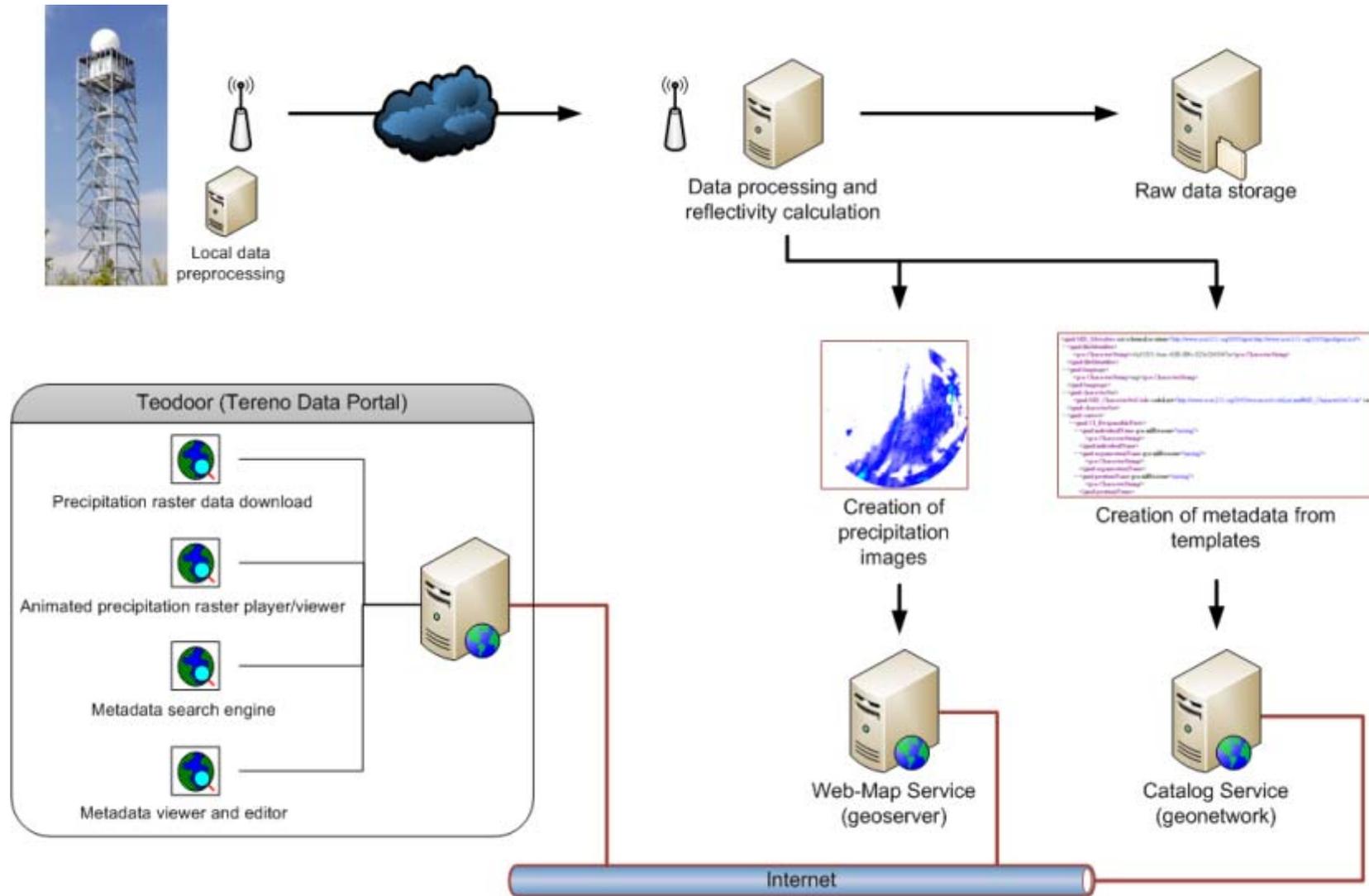
Data model and data publishing

- Comprehensive data model based on the CUAHSI Observation Data Model (<http://his.cuahsi.org/odmdatabases.html>):
 - Sites
 - Sources and metadata
 - Sensors
 - Data classification, categories, data level, attributes
 - Data generation, lab methods, sample handling

- Extension of the model to
 - Specify individual sensors and data import by logger files
 - Store all relevant information in one relational data base
 - Implementation in JAVA using Hibernate3
 - Data base independent processing
 - Automated table generation and management
 - Versioning



Managing and publishing weather radar data





TEODOOR: The TERENO Data Portal

<http://www.tereno.net>

- Implemented in Plone
- Contains practically no own data
- Communicates to local databases via OGC-compliant Web-services
- Internal and external live search to data
- Included Web-GIS functions

The screenshot displays the TEODOOR Online Data Portal interface. At the top, the TERENO logo is visible. Below it, a navigation bar contains links for 'Überzicht', 'Startseite', and 'TEODOOR Online Data Portal'. The main content area is titled 'TEODOOR ONLINE DATA PORTAL'. On the left side, there is a vertical navigation menu with the following items: HELMHOLTZ GEMEINSCHAFT, AIDA_WMS, Weatheradar_wms, AIDA Geoserver, find sensors, Überblick, Koordinationsteams, Observatorien, TERENO Forum, TERENO Newsletter, TEODOOR Online Data Portal, Workshops, Downloads, Links, Kontakt, and Report problems. At the bottom of this menu is a search bar with the text 'Website durchsuchen' and three options: 'Erweiterte Suche...', 'Hierarchische Suche...', and 'Hierarchische Suche...'. On the right side, there is a map of Europe with several yellow markers in Germany and one blue marker in Belgium. The map includes a navigation control on the left side.



Status of data provision

TEODOOR ONLINE DATA PORT

HELMHOLTZ GEMEINSCHAFT

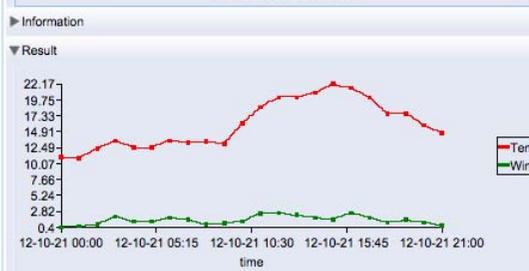
- BaseData
- AIDAGEoserver
- Search
 - Freetext Search
 - Keywords
 - Sensor Name
 - Intended Application



Klimastation Merzenhausen

Select Data

Query	Multi Site Download	Style
Offering: Climate	WindDirection [degN]	
valid: 2011-12-16 - 2012-06-04	WindSpeed [m*s-1]	
begin: 2012-10-20 23:56:32	TemperatureAir [degC]	
end: 2012-10-21 23:56:32	WaterContentAir [%]	
	BarometricPressure [kPa]	



Sonden_HAD_Pegel

Select Data

Query	Multi Site Download	Style
Offering: Offering_Bode-Selke	O2 [mg/l]	
	Chi [µg/l]	
begin: 2012-05-20 23:51:53	TRB-F [FNU]	
end: 2012-10-21 23:51:53	NO3N [mg/l]	
	TRBPro [mg/l]	

Information

Result

Fendt

Select Data

Query	Multi Site Download	Style
Offering: ClimatePublic	RadiationLongwaveOutgoingCorrected [W*m-2]	
valid: 2011-01-01 - 2011-11-02	RadiationLongwaveIncomingCorrected [W*m-2]	
begin: 2010-10-20 23:46:36		
end: 2011-03-22 23:46:36		

Information

Result

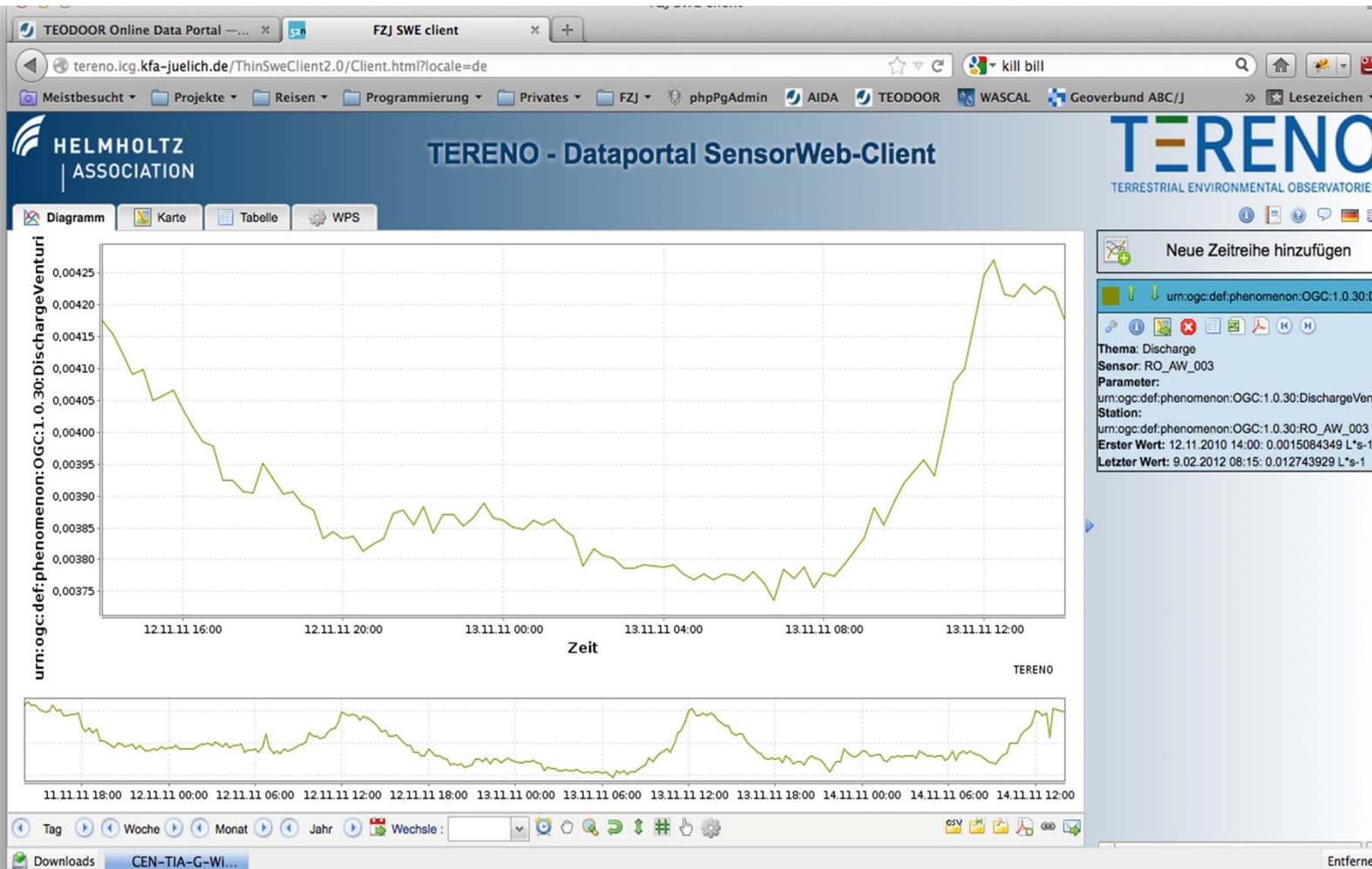


New Features of TEODOOR

- Better visualization tool for data quality check (sensor web client)
- Data provision:
 - It is secured that data download is only possible with TEODOOR
 - E-mail messaging after each download
 - Multisite-download (e.g. sensor network data)
 - Visualization of remote sensors (e.g. weather radar)
- Data search options
 - Hierarchical search
 - Search for key words
 - Search for sensors, parameters, themes (eBRIM)
 - Web-GIS support (spatial search)



Sensor Web Client





Data search

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- BaseData
- AIDAGEoserver
- Search
 - Freetext Search
 - Keywords
 - Sensor Name
 - Intended Application
 - Topic Category
 - Sensor Type
 - Parameter
- Spatial Search (Using I search)
- Überblick
- Koordinationsteams
- Observatorien
- TERENO Forum
- TERENO Online Data Porta
- TERENO Newsletter
- Meetings

▼ Search

▼ Freetext Search

▼ Keywords

▼ Sensor Name

▼ Intended Application

Atmosphere-Winds
Atmosphere-TraceGases
Unknown
Ocean-SurfaceTemperature
Gravity-MagneticGeodynamic

▼ Topic Category

structure
society
location
elevation
intelligenceMilitary

▼ Sensor Type

DetectorType
Satellite
CosmicRaySensor
SensorType
Kippwaage

▼ Parameter

WaterContentSoil80cmSer add

add

delete item

▼ Spatial Search (Using Map Extent)

search

Freetext search OGC-catalogue services

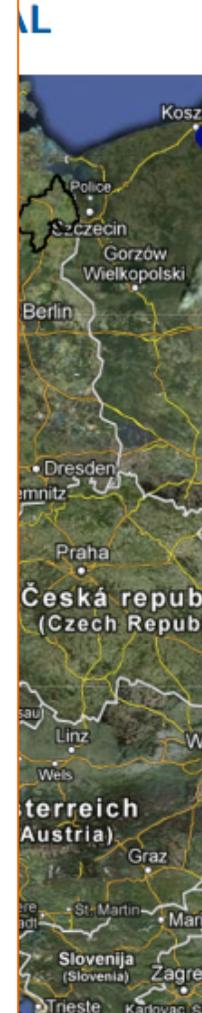
Keyword search

Search for station names and applications

Search for themes and sensor types

Search for parameters

Spatial search



TerenoObservatories

show

Information

opaque: 100%

- Rollesbroich
- Wuestebach
- Rur
- Selhausen
- Merzenhausen
- Garmisch
- UFZ
- Soilnet-Rollesbroich
- Soilnet-Wuestebach



Web-GIS functions in TEODOOR

- Implemented using OpenLayers
- Supports multiple WMS and SOS
- Customized
 - Default content
 - Default region
 - Visible WMS
 - Visible SOS

TERENO
TERRESTRIAL ENVIRONMENTAL OBSERVATORIES

Site Map Site Setup

360xlong 360xshort 360xshort Data Portal Wuestebach

INTERNAL DATA PORTAL WUESTEBACH

view edit sharing

data: wuestebach/area/area actions

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GEMEINSCHAFT

- ▶ Seen
- ▶ Fluesse
- ▼ Observatories
 - Tereno observatories
 - Rur lakes
 - Sophienhoehe radar range
 - Wuestebach catchment
 - Rur rivers
- ▶ AIDA_Geoserver
- Overview
- Coordination Teams
- Observatories
- TERENO Forum
- TERENO Newsletter
- TEODOOR Online Data Portal
- TERENO Presentations
- Meetings
- Workshops
- Projects
- Downloads
- Links

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ASSOCIATION



Data visualisation in TEODOOR

- Connecting to OGC-SOS services
- Graphical selection of stations
- Display of:
 - Station information (sensorML metadata)
 - Latest observations
 - Available parameters

INTERNAL DATA PORTAL WUESTEBACH

Wuestebach AW 14

Select Data

Query | Style

Offering: WaterQuality

begin: 2011-06-14 17:03:00

end: 2011-06-15 17:03:00

Parameters selected:

- water temperature [degC]
- electrical conductivity [microSm-1]
- pH value [noUnit]
- nitrate concentration [mgNO3 L-1]
- chloride concentration [mgCL L-1]

Information

Result

Time	Phenomenon	Data
2011-06-07 22:26:00	WaterTemperature	11.88 °C
2011-06-07 22:24:00	NitrateConcentration	7.664 mg NO3/L
2011-06-07 22:24:00	ChlorideConcentration	104.8 mg CL/L
2011-06-07 22:24:00	OxygenSaturation	93 percent
2011-06-07 22:24:00	PH	6.48 -

TEODOOR Online Data Portal

TERENO Presentations

Meetings

Workshops

Projects

Downloads

1. Seite

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Data visualisation in TEODOOR

- Connecting to OGC-SOS services
- Graphical selection of stations
- Display of:
 - Station information (sensorML metadata)
 - Latest observations
 - Available parameters
- Visualisation of station data time series
- Data download (direct or via E-Mail)





Weather radar data visualization

- Data visualization using distributed OGC-Raster SOS and WMS
- Raster data animation for custom
 - time periods
 - regions of interest
- Reflectivity/precipitation display for a given raster point
- Reflectivity/precipitation time series graphs for a given raster point



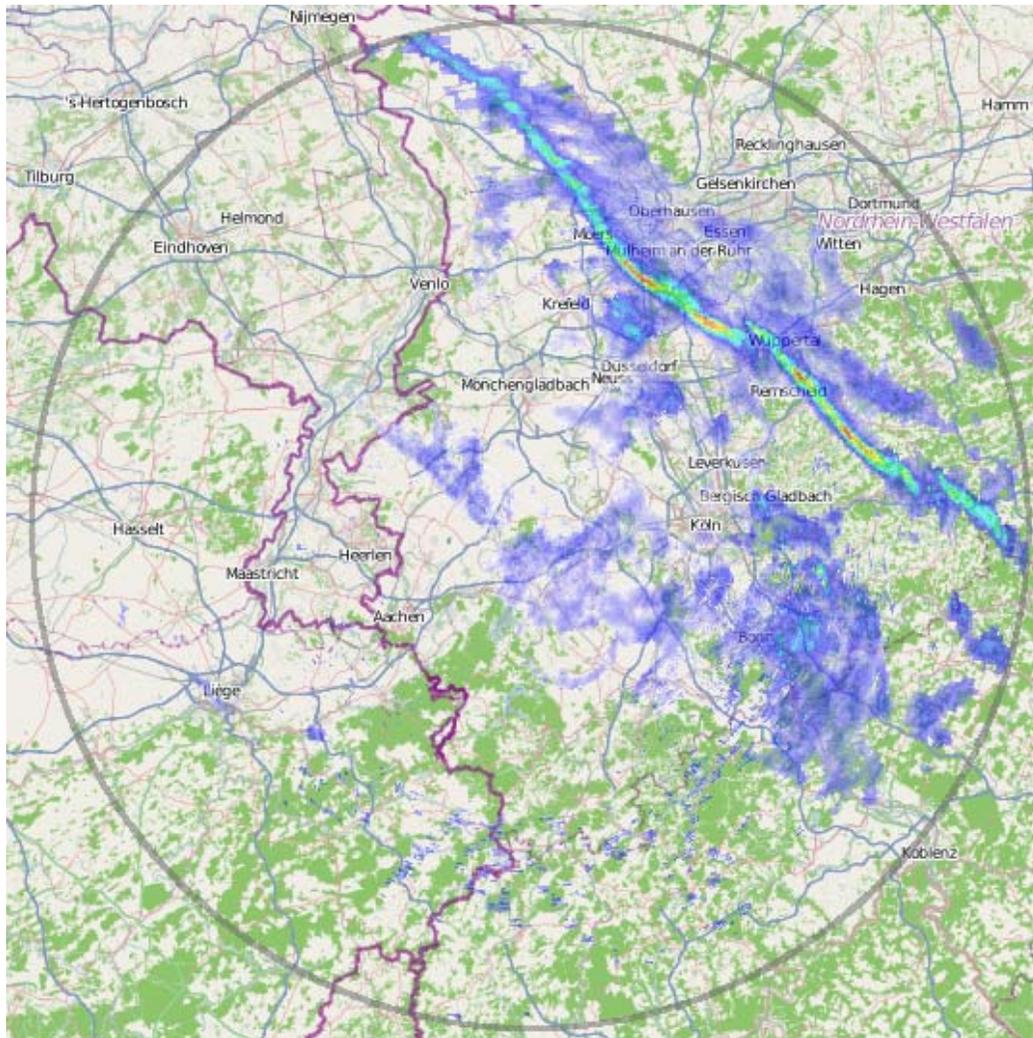


Sensor Observation Service (SOS)

- Most important web-service to provide access to time series observations from sensors in a standardized way
- Widely used for point data
- Although mentioned in OGC-SOS specification, no existing SOS implementation is able to deliver raster data time series (only point data)
- SOS extension implementation (Master Thesis J. Sorg):
 - Data storage in PostgreSQL data base
 - Time series output of rasters or subrasters (spatial filters) as
 - WMS or WCS layer references
 - Discrete coverages (geometries and attributes)
 - Enables the output of time series of individual locations within a raster grid and
 - Zonal detection of specific events (e.g. rain storms)



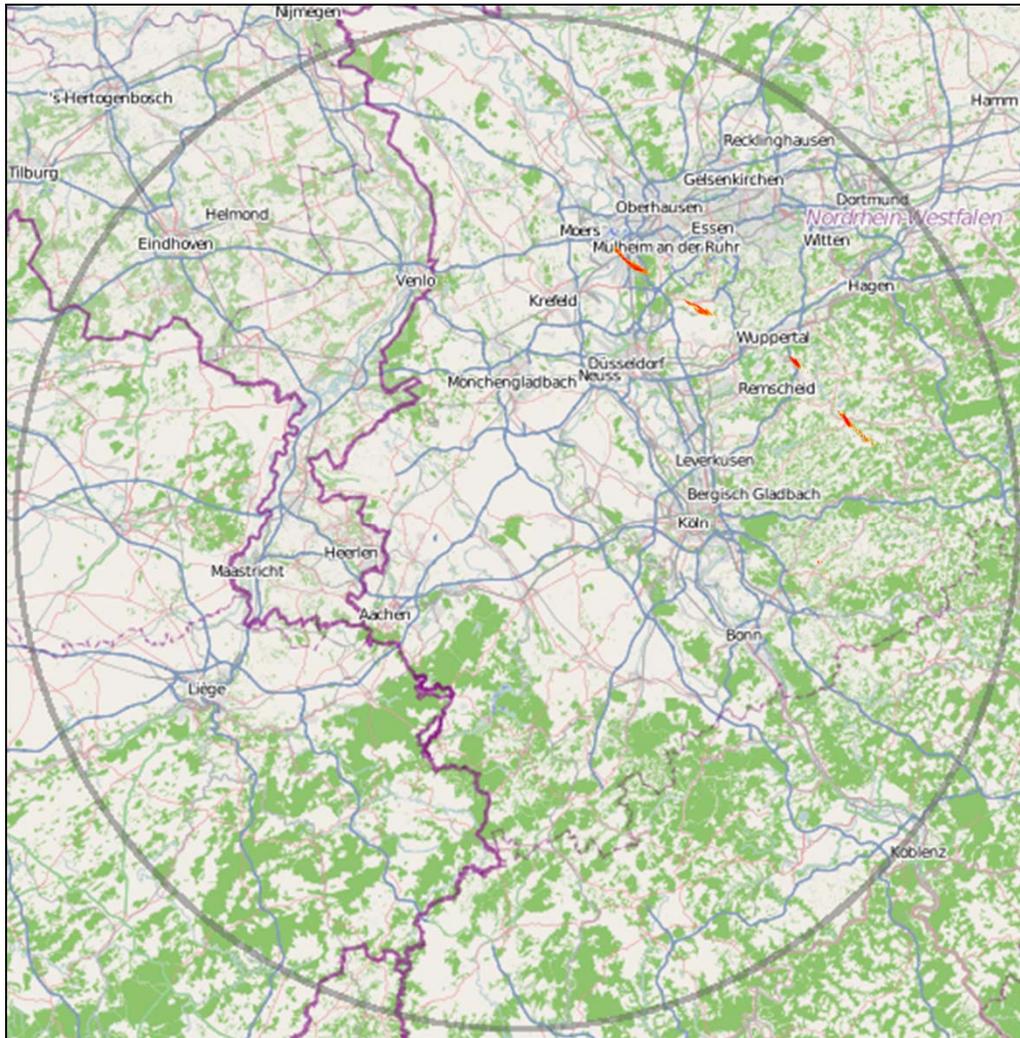
Automated detection of rainstorm events



- Red pixels are indicating rainstorm events



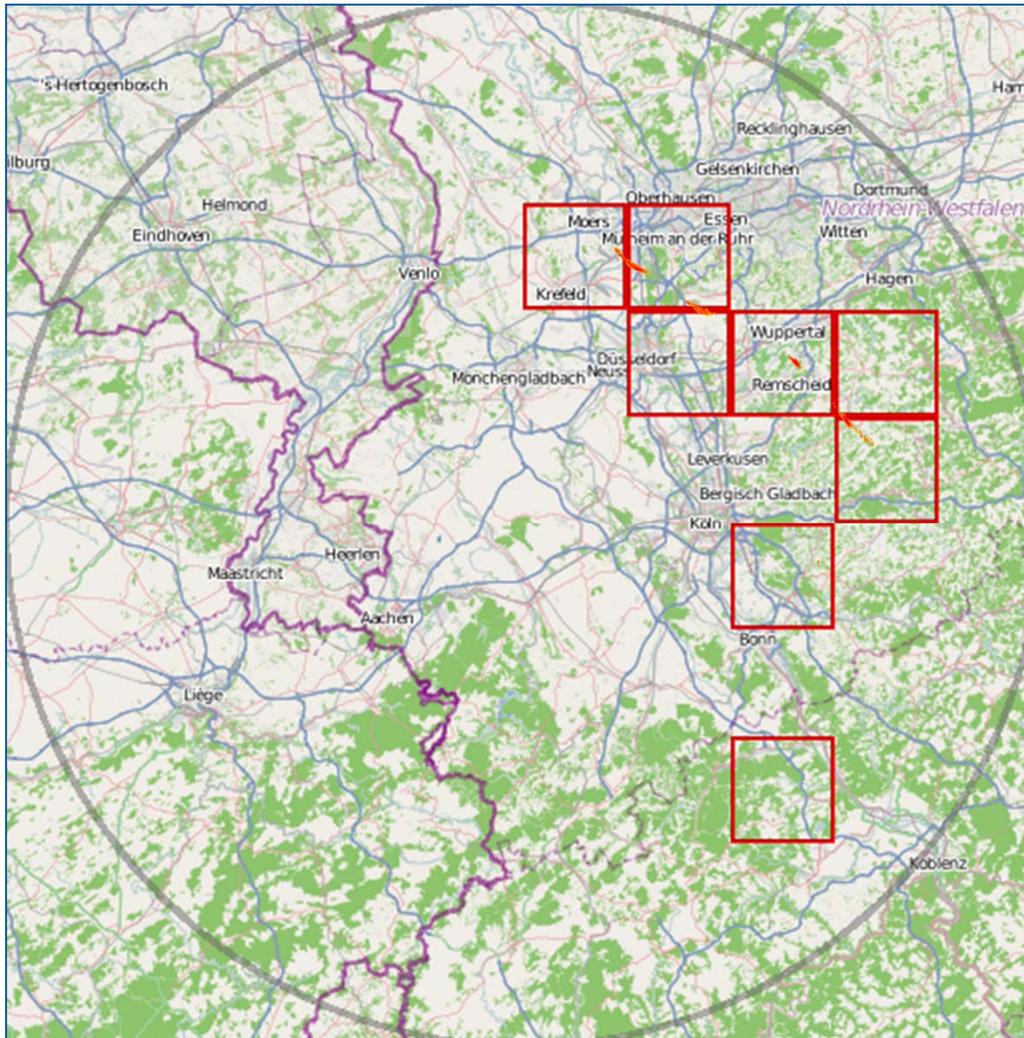
Automated detection of rainstorm events



- Red pixels are indicating rainstorm events
- A GetObservation-request extracts all pixel with reflectivity >35 dBZ



Automated detection of rainstorm events



- Red pixels are indicating rainstorm events
- A GetObservation-request extracts all pixel with reflectivity >35 dBZ
- Combination of selected pixel provides areas affected by rainstorm events
- These areas can be intersected with specific zones
- The rainfall amounts can be assigned to these zones



Conclusions and outlook

- Current status:
 - Internal data import, storage, processing and visualization running for FZJ, KIT, UFZ, HMGU
 - Interfaces for data exchange in place for FZJ, KIT, UFZ
 - Catalogue services online for FZJ, UFZ
 - TEODOOR data portal is able to assess remote data infrastructures

- Outlook:
 - Publish TERENO data products using persistent Digital Object Identifiers (DOI)
 - Further improvement of quality control of the primary data and the descriptive metadata
 - Inclusion of further spatial data sets (e.g. from remote sensing)