

TEODOOR, a blueprint for distributed terrestrial observation data infrastructures

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- 6: GFZ German Research Centre for Geosciences, Centre for Geoinformation Technology, Potsdam



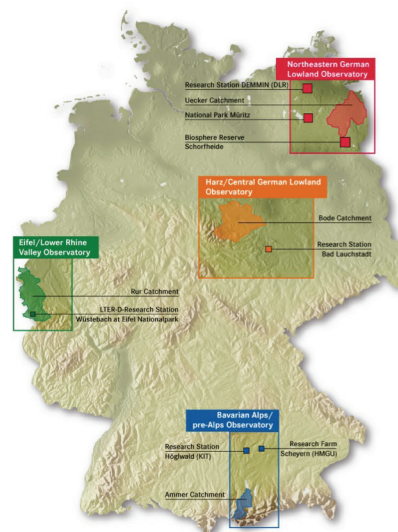
EGU General Assembly 2017, Vienna, Austria, 23 - 28 April 2017



The TERENO network



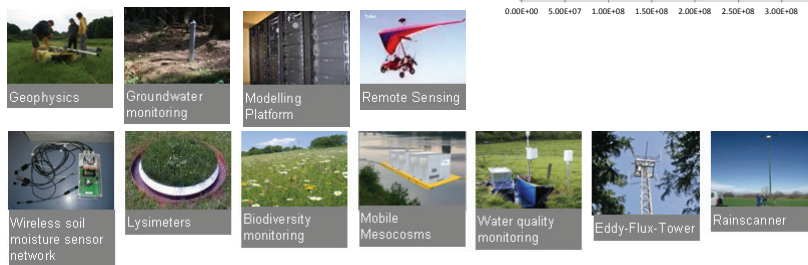
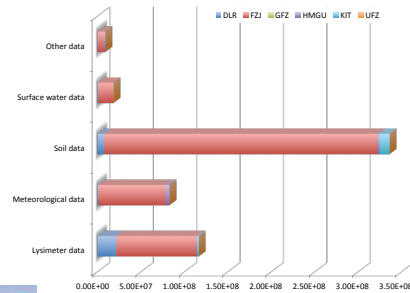
- Regional different effects of global climate change on terrestrial systems
- Global change affects all terrestrial compartments (water, soil, vegetation, atmosphere)
- Most existing observation networks focus on specific compartments and/or scientific questions
- TERENO:
 - Long-term observations (> 15 years) of hydrological and ecological parameters on different scales
 - Investigation of interaction between the different compartments
 - Bridging the gap between measurement, modelling and management
 - Currently 4 observatories, each operated by one individual Helmholtz Center
 - Project duration: 2008 until >2023



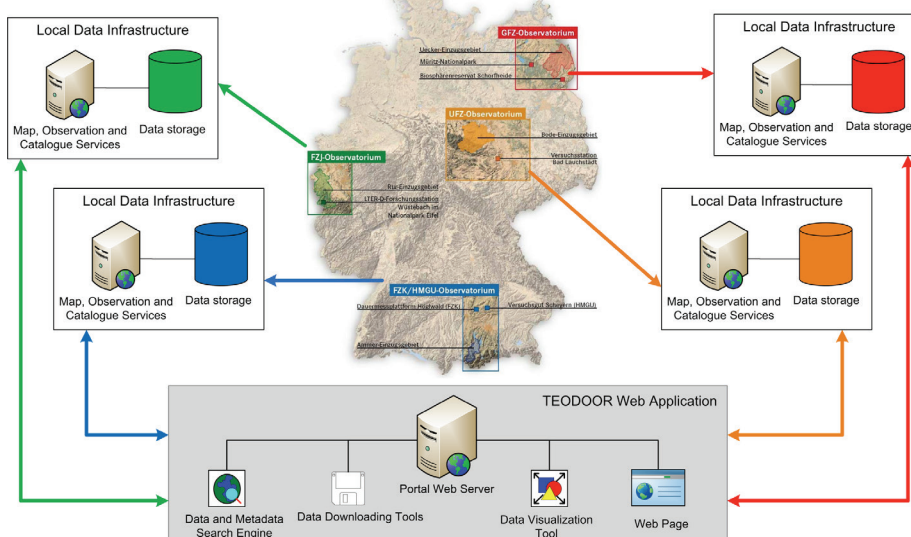
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Multi-scale and multi-compartment monitoring concept of TERENO

- > 1065 stations
- > 3 weather radar devices
- > 129 lysimeters
- > 400 file metadata sets

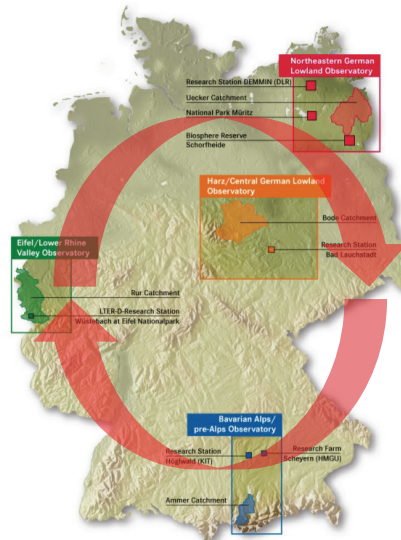


TEODOOR Distributed Spatial Data Infrastructure



Interconnecting observatories

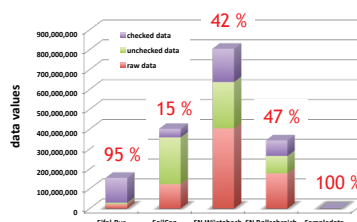
- Common data policy
 - Quality management
 - Time-limits for data delivery
 - Retention times for data publication
 - Accessibility of data
- Syntactical interoperability by consequent usage of standardized (OGC) web services and interfaces
- Semantical interoperability:
 - Common metadata profile
 - Common sensorML profiles
 - Common thesauri
 - Standardisation (parameters, units, ...)



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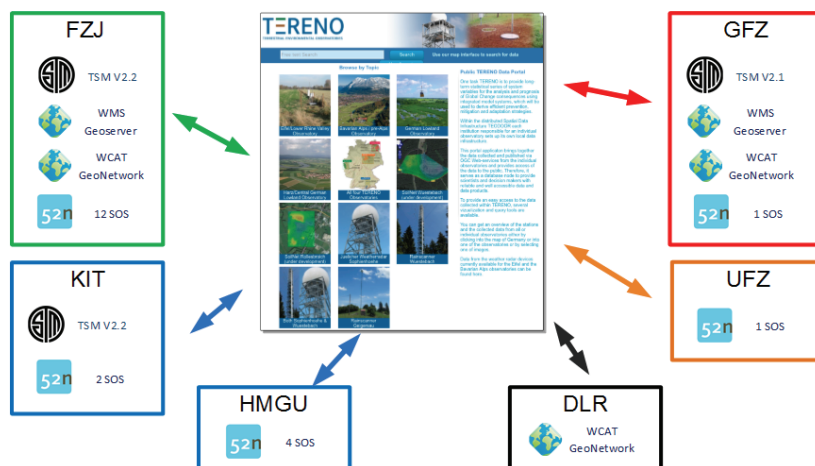
TERENO Quality management policy

- Establishing workflows for data collection, quality assessment and publication
- Nomination of responsible people
- **Prohibition to circulate unevaluated data**
 - **Technical inspection** (mandatory): Identification and tagging of obviously wrong data values
 - **Validity checks** (optional): Checking the continuity of time series and the definite conclusion that the observed data are representing the measured property
- Common system to assign
 - **Quality flags** (good, suspicious, bad data)
 - **Processing status** (unevaluated, quality checked,...)
- Automatic publication of quality assessed data



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Data services connected to the DDP



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TEODOOR: The TERENO Data Portal

<http://www.tereno.net>

- Central portal for information exchange, data search and data access
- Querying the TERENO Metadata Catalogues
- Connected local data infrastructures from FZJ, DLR, GFZ, HMGU, KIT, UFZ
- Custom multi-condition queries
- Predefined queries to data
- Free access to data from more than 900 sites

The screenshot shows the TERENO Data Portal interface. It includes a search bar, a 'Browse by Topic' section with various observatory thumbnails, and a 'Public TERENO Data Portal' text block.

Public TERENO Data Portal

One task TERENO is to provide long-term statistical series of system variables for the analysis and prognosis of Global Change consequences using integrated model systems, which will be used to derive efficient prevention, mitigation and adaptation strategies.

Within the distributed Spatial Data Infrastructure TEODOOR each institution responsible for an individual observatory sets up its own local data infrastructure.

This portal application brings together the data collected and published via OGC Web-services from the individual observatories and provides access of the data to the public. Therefore, it serves as a database node to provide scientists and decision makers with reliable and well accessible data and data products.

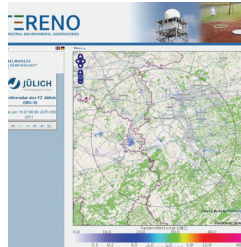
To provide an easy access to the data collected within TERENO, several visualization and query tools are available.

You can get an overview of the stations and the collected data from all or individual observatories either by clicking into the map of Germany or into one of the observatories or by selecting one of images.

Data from the weather radar devices currently available for the Eifel and the Bavarian Alps observatories can be found here.

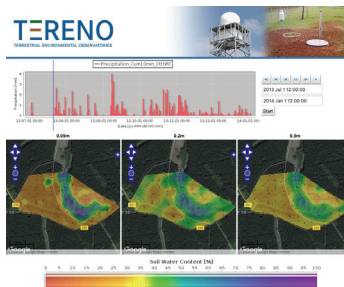
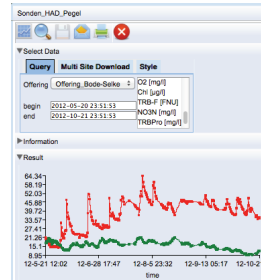
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Client applications using standardized web services



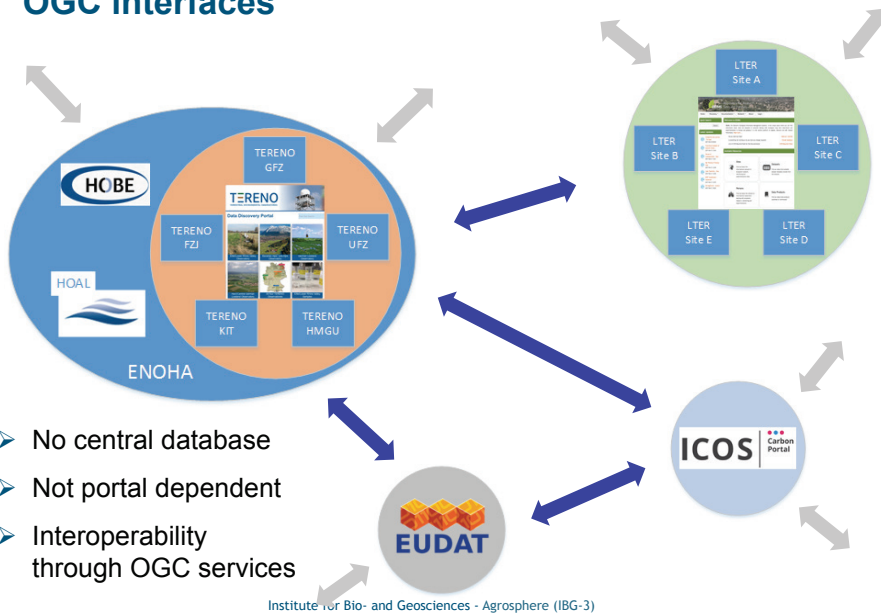
Animation of weather radar data using raster SOS

Visualization and download of time series data



Animation of automatically interpolated soil moisture data using raster SOS

Interconnecting infrastructures using OGC interfaces



Naming issues

- Currently, naming of sites is ambiguous.
 - Different sites have identical names.
 - Sites are renamed.
 - Metadata that allow unique identification are often missing.
 - Institutions have their own naming protocols, no assurance that names are unique on a global scale.
- Access to information about observation sites
 - Need to ensure proper evaluation and facilitate interpretation of data.

DEOS - A Centralized Approach

provides a **resolvable, persistent, interoperable** link

- **resolvable** – standard identifier syntax + network resolution mechanism (Handle System)
- **persistent** – through:
 - technical infrastructure (registry database, proxy support, etc.)
 - social infrastructure (obligations by Registration Agencies)
- **interoperable** - through a data model (semantic interoperability)

Wählen zu Benutzer Sie sind angemeldet als ADMIN | Mein Konto | Abmelden

JÜLICH Metadata Store

Willkommen zu DataCite Metadata Store

Wofür ist dieser Service gut?
Der DataCite Metadata Store ist ein Service für Datenqualitätskennzeichen zum Registrieren von DOIs und zugehörigen Metadaten. Dieser Service stellt eine Registrierung bei einem DataCite-Mitglied voraus. Für Informationen zum Erstellen eines Kontos siehe unsere [häufig gestellten Fragen \(FAQ\)](#).

Wer kann diesen Service verwenden?
DataCite arbeitet zusammen mit Datenqualitätskennzeichen - Organisationen, die Forschungsdaten verwalten und zugänglich machen, in der meisten Fällen werden diese existierende und öffentliche Datenbanken sein, welche durch institutionelle Kennzeichen und Datenqualitätskennzeichen sind. Dieser Service dient auf wissenschaftliche Datenqualitätskennzeichen. Die Datenqualitätskennzeichen sind Jülich bei einem DataCite-Mitglied DOI anfordern.

Ich habe Datensätze für die ich DOI registrieren möchte. Wie kann ich Ihren Service benutzen?
Es wird kein öffentliches Web-Zugriff haben sie sich für unseren Service registrieren. Nehmen Sie dazu bitte Kontakt zu einem DataCite-Mitglied auf, der mit Ihren Qualifikations, Voraussetzungen und Verantwortlichkeiten. Wenn Sie qualifiziert sind, wird Ihr DataCite-Mitglied ein Konto für Sie einrichten.

Zwischen sehen Sie unsere [Programmierschnittstelle \(API\)](#) zur DOI-Registrierung verwenden. Es wird empfohlen, dass Sie die DOI-Registrierung in der Datenqualitätskennzeichen-Registrierung. Können wir nicht eine URL angeben, sollten Sie eine Subdomain unserer Service nutzen, damit die URL der DOI aktualisiert wird.

Wie kann ich Kontakt aufnehmen?
Für eine Mitgliedschaft kontaktieren sie bitte support@datacite.org. Für technische Informationen senden Sie eine E-Mail an tc00@datacite.org.

Startseite | Sprache | | [Anmelden](#)

DEOS - A Centralized Approach

- Registration service currently hosted at FZJ:
<https://deos-id.org/deos/>
- Structure:
TERENO.ER012345
- Generated by DEOS or by users
- Does not replace personal or institutional names
- Building an inventory of observation facilities



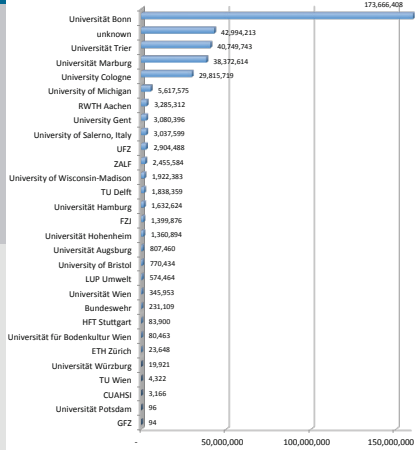
The screenshot shows the Jülich Metadata Store interface. It includes a navigation menu on the left with options like 'Profil', 'Einstellungen', and 'Altkonten'. The main content area features a header with the Jülich logo and the text 'Metadaten Store'. Below this, there are several sections of text, including a welcome message, a section titled 'Wofür ist dieser Service gut?', and another titled 'Wer kann diesen Service verwenden?'. The text explains that the service is for data providers and users, and provides information on how to register and use the service.



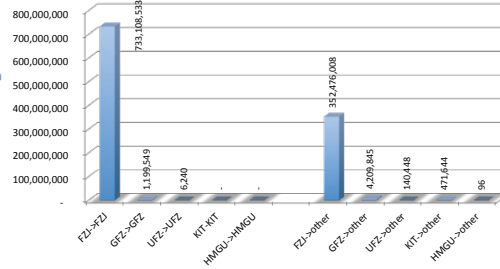
TEODOOR download statistics



Number of data values provided to external institutions by TEODOOR 08/13 - 07/16



Number of data values provided by TEODOOR 08/13 - 07/16



- Number of downloads: 3548
- Number of data series: 140,696
- Number of data values (est): 1,091,393,139
- Mean monthly downloads: 25,000,000

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Persistent data identifiers



- Unique, digital identifier, allowing persistent citation of publications and data
 - Eases access to research data
 - Increases visibility of data
- Identifier refers to "landing page" containing:
 - Metadata (for station or data set)
 - Individual data sets
 - Licensing information (e.g. data policy)
- Landing page (and data, in general) hosted by issuing institution (here: GFZ)
- Internal agreement to be able to link to data from the TERENO portal
- Currently, 24 data sets/stations were identified through persistent identifiers (see <https://search.datacite.org/works?query=TERENO>)
- Drawbacks
 - File based approach
 - "Snapshot creation" of data from data bases required
 - Dynamical referencing to data in planning
 - Manual process
 - Hosting the same metadata on two systems in parallel (GFZ, TEODOOR)

GFZ <http://doi.org/10.5880/TERENO.2016.001>

TERENO (Eifel-Rur), Climate/Runoff/Water Quality station Rollesbroich, Germany

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2016-001

TERENO (Eifel-Rur), Climate/Runoff/Water Quality station Rollesbroich, Germany

Metadata

Responsible Organization

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Conditions For Access And Use

Limitations On Public Access

Litnagge

TERENO EifelRur Observatory

Description

TERENO Eifel-Rur Observatory (TERENO) (TERrestrial Environmental Observations) 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 long-term ecological, social and economic impact of global change at regional level. The central monitoring site of the TERENO Eifel-Rur covers three valleys. Characterized by the dominant area of the Rur fluvial system in the northern part of the Eifel and extensive forest land use gradient. The Eifel region in the northern part is characterized by urbanization and intensive agriculture whereas the river catchment range in the southern part is sparsely populated and includes several drinking water reservoirs. Furthermore, the Eifel National Park is situated in the southern part of the Rur catchment serving as a reference site. Intensive test sites are placed along a transect across the Eifel catchment in representative low cover, soil, and geological settings. The Eifel-Rur site is located in the river transition range (TR) into the German-Belgian border and covers the area of the small Rollesbroich catchment (rd 100

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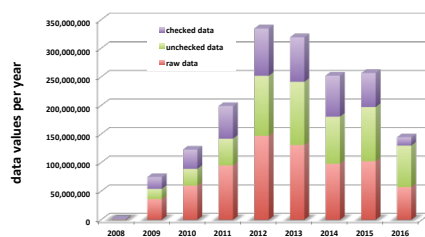
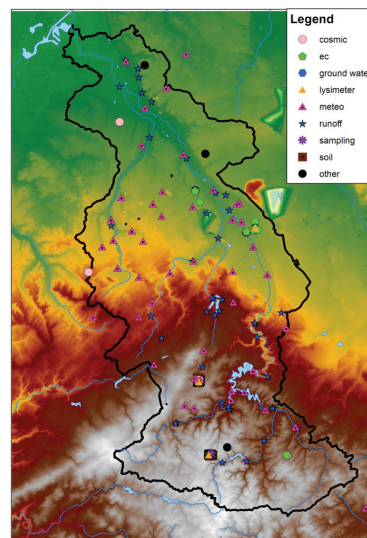
Examples

- Graswang
 - TERENO: „Graswang“ (<http://tereno.imk-ifu.kit.edu/Graswang/>)
 - ICOS: „DE-GWG“ (<https://meta.icos-cp.eu/edit/stationentry/>)
 - Fluxnet: „DW-GWG“ (<https://fluxnet.ornl.gov/site/4147>)
- Bad Lauchstädt
 - TERENO: „Lysimeterstation Bad Lauchstädt“ (multiple entries, e.g. <http://teodoor.icg.kfa-juelich.de/ibg3searchportal2/dispatch?searchparams=freetext-lauch&metadata.detail.view.id=urn:ogc:object:feature:Sensor:UFZ:970>)
 - LTER: „TERENO - Bad Lauchstaedt“ (https://data.lter-europe.net/deims/site/lter_eu_de_019)
- FZJ Climate Tower
 - TERENO: RU_K_001 (http://teodoor.icg.kfa-juelich.de/ibg3searchportal2/dispatch?searchparams=freetext-RU_K&metadata.detail.view.id=RU_K_001)
 - ICOS: JUE (<https://meta.icos-cp.eu/ontologies/stationentry/AS/N2>)

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Local Infrastructure „Eifel-Rur“

- Static data (usually file based)
 - Descriptive data (reports)
 - Geodata
 - Other static data (statistics, ...)
- Time series data
 - Runoff, water quality, soil, climate
 - 589 stations (10'-60', offline)
 - Eddy-Covariance
 - 7 stations (20 Hz-10')
 - Weather radar
 - 2 radar devices (5-10')
 - Lysimeters (SoilCan)
 - 36 lysimeters (1'-15')
 - Regular sampling campaign data



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Time series Management System

Developed based on open source software and open standards.

