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TERENO
TERRESTRIAL ENVIRONMENTAL OBSERVATORIES

TERENO General Overview – Status, Network Activities, Accessibility and International Integration

H. Vereecken and the TERENO team

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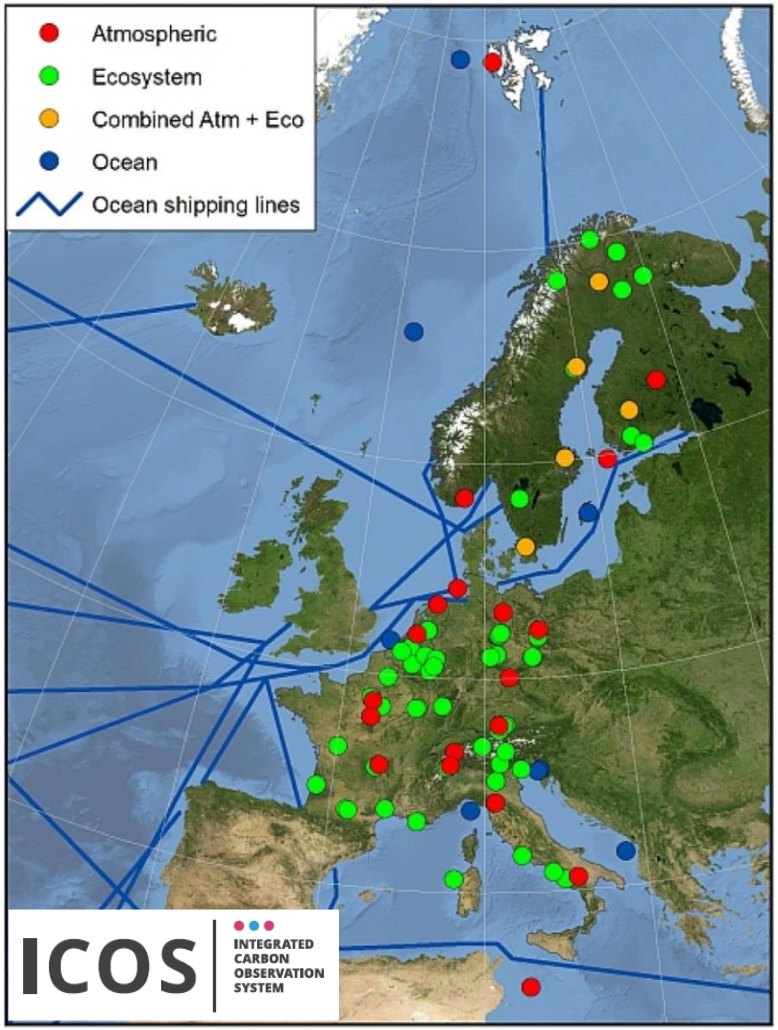
ICOS-D officially launched

ICOS integrated carbon observation system
A European infrastructure dedicated to high precision monitoring of greenhouse gas fluxes

On 5 December 2016 ICOS-D (the German ICOS network) was officially launched by Minister Alexander Dobrindt



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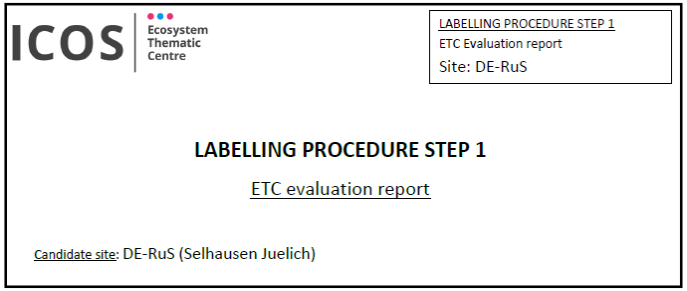
ICOS-D site-labelling of two TERENO sites

- The first part of the ICOS-D site-labelling was successful for the TERENO sites Selhausen and Hohes Holz



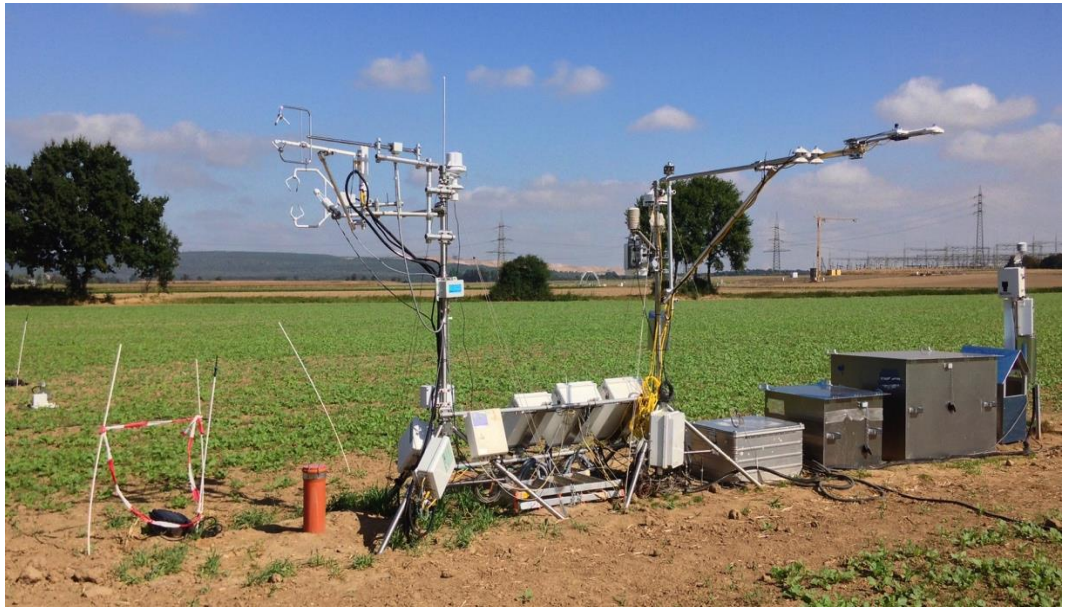
ICOS Ecosystem Thematic Centre

LABELLING PROCEDURE STEP 1
ETC Evaluation report
Site: DE-RuS

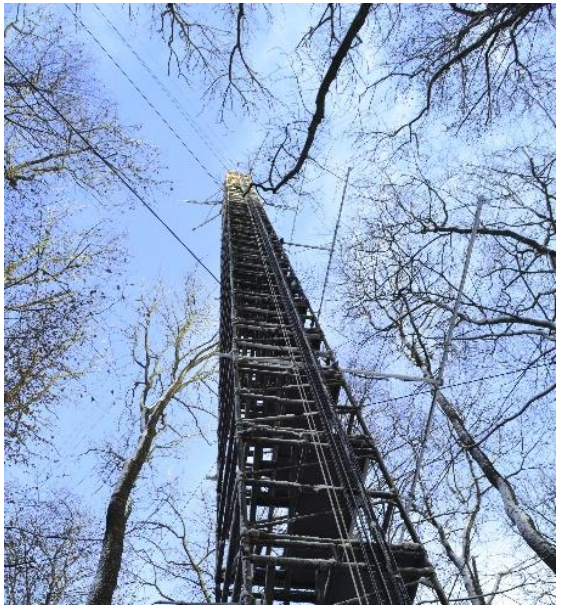
LABELLING PROCEDURE STEP 1

ETC evaluation report

Candidate site: DE-RuS (Selhausen Juelich)



TERENO/ICOS Station Selhausen



TERENO/ICOS Station Hohes Holz

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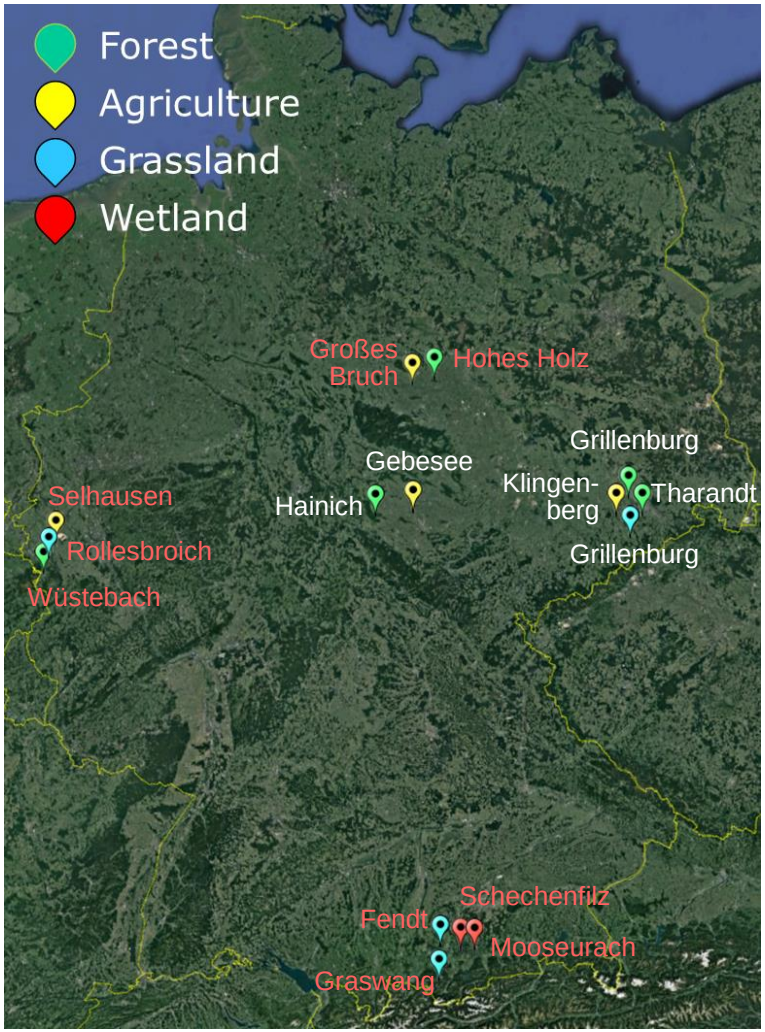
ICOS-D implementation status



Station	Class 1	Class 3
TERENO Selhausen (Agriculture)	Step 2 started	--
TERENO Fendt (Grassland)	Awaiting Step 1	--
TERENO Hohes Holz (Forest)	Step 2 started	--
Tharandt (Forest)	Step 1 approved	--
Gebesee (Agriculture)	Step 1 approved	--
TERENO Graswang (Grassland)	--	Awaiting Step 1
Grillenburg (Grassland)	--	Step 1 acknowledged
Hainich (Forest)	--	Awaiting Step 1
Klingenberg (Agriculture)	--	Step 1 acknowledged
TERENO Mooseurach (Moor)	--	Awaiting Step 1
TERENO Wüstebach (Forest)	--	Awaiting Step 1
TERENO Rollesbroich (Grassland)	--	Awaiting Step 1
TERENO Schechenfilz (Moor)	--	Awaiting Step 1
Hetzdorf (Forest)	--	Step 1 acknowledged
TERENO Großes Bruch (Agriculture)	--	Awaiting Step 1

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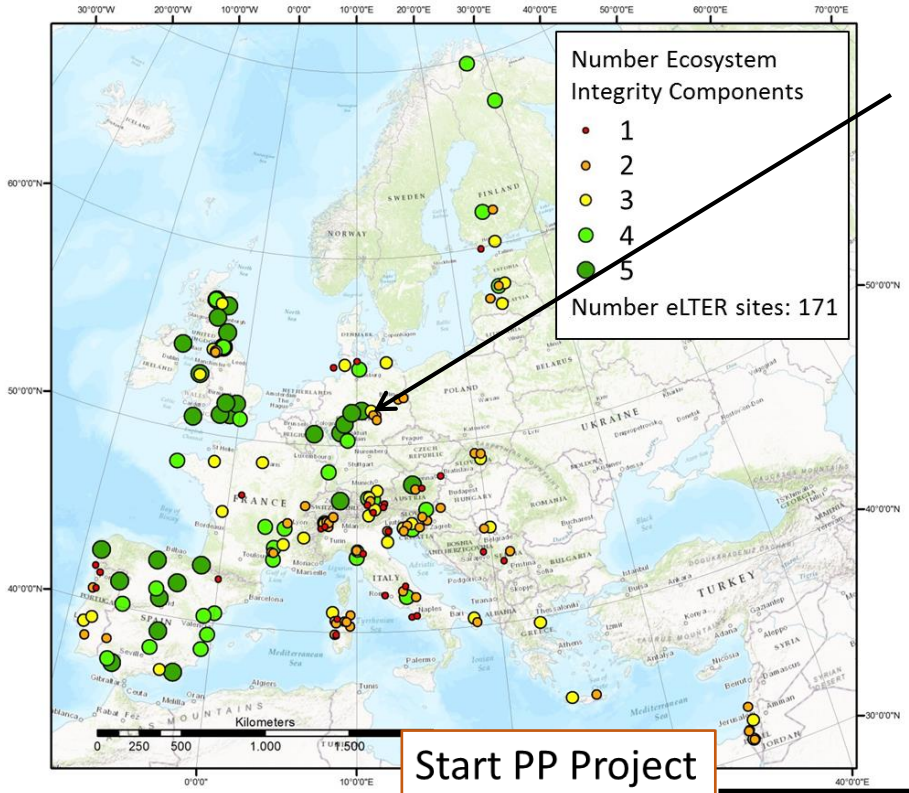
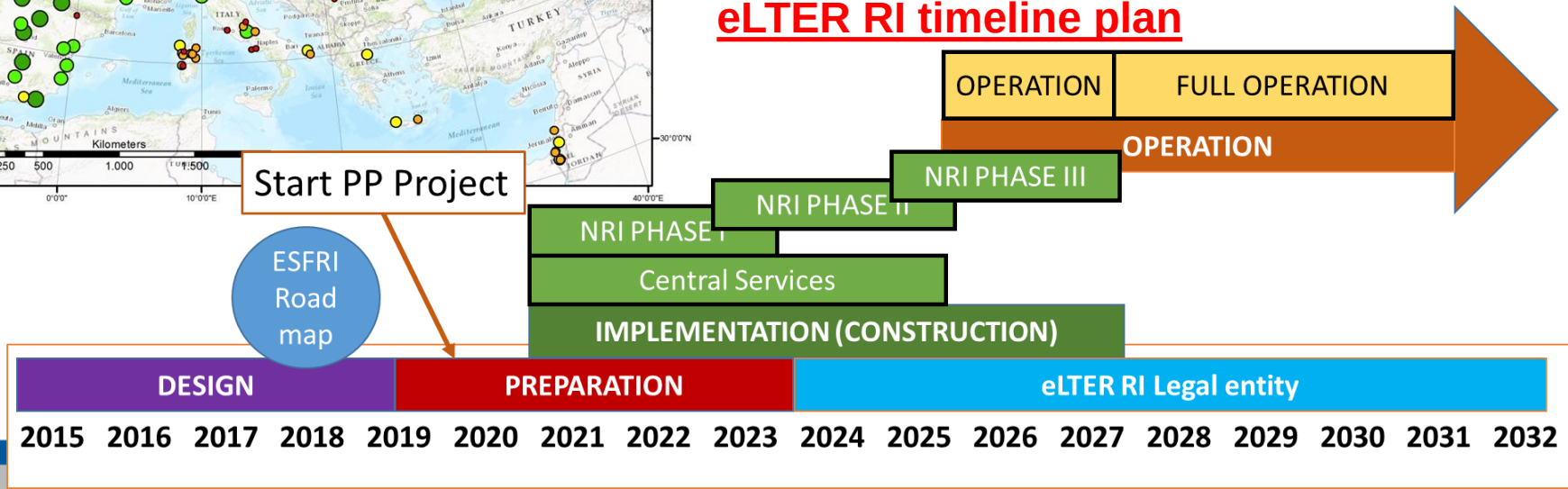
eLTER-ESFRI – Integrated European Long-term Ecosystem Research Infrastructure



TERENO sites and concepts:

- eLTER Head Office (Germany)
- eLTER Service Centers
- Topic Centers
- Data management concepts
- IT infrastructure e.g. Dynamic Ecological Information Management System (DEIMS) and Data Integratip Portal (DIP)

eLTER RI timeline plan



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European Network for hydrological observation and experimentation

enoha
European Network of Hydrological Observatories

- Towards better integration of hydrological research in existing Environmental and Earth System Research Infrastructures
- New ENOHA website: **www.enoha.eu**
- TERENO data management as a framework for ENOHA
- Data portal using TEODOOR as blueprint
- New Vadose Zone Journal Special Section on Hydrological Observatories
- Submission deadline March 2018

Vadose Zone Journal

Hydrological Observatories

Guest editors:

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DANUBIUS-RI

- DANUBIUS-RI pan-European distributed research infrastructure
- Dedicated to interdisciplinary studies of large river–sea systems
- Included in the 2016 ESFRI Roadmap
- EUSDR Flagship Project (EU Strategy for the Danube Region)
- Partners in eleven European countries.
- It aims to become operational by 2025
- TERENO brings in competence in hydrological monitoring and modelling

DANUBIUS-RI | International Centre for Advanced Studies on River-Sea Systems

Satellite image of the Elbe River Estuary

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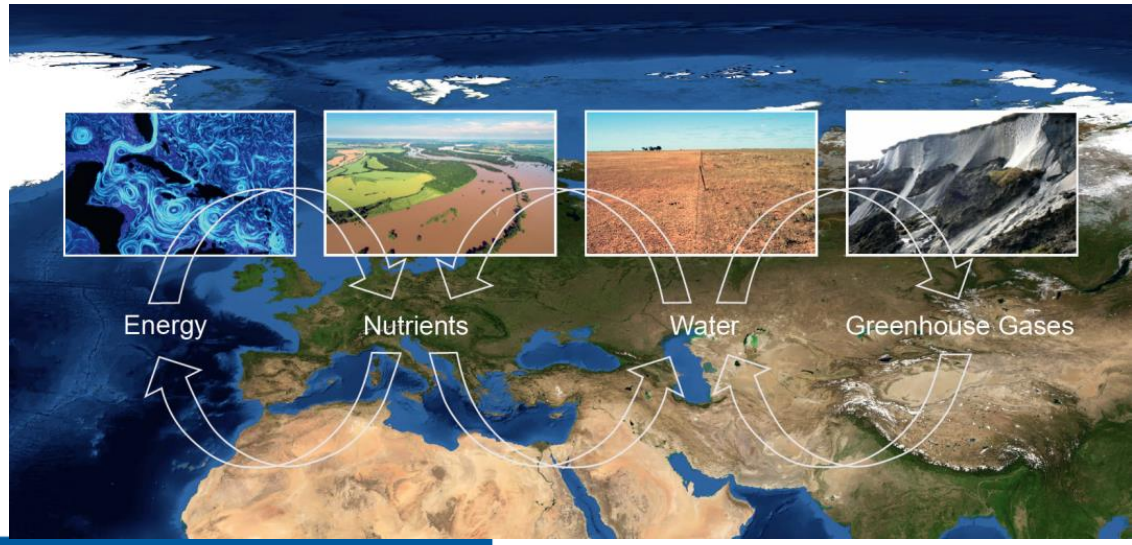
Status of MOSES
(Modular Observation Solutions for Earth Systems)

- Eight Helmholtz centers participate MOSES
- First expansion phase from 2017-2021 was approved by the Helmholtz Association and is funded with 30 Mio Euro.
- Monitoring modules will focus on:
  - heat waves (TERENO involved)
  - hydrologic extremes (TERENO involved)
  - ocean eddies
  - permafrost thaw events



Presentation of Ute Weber

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Proposal graduate school GO-CZO

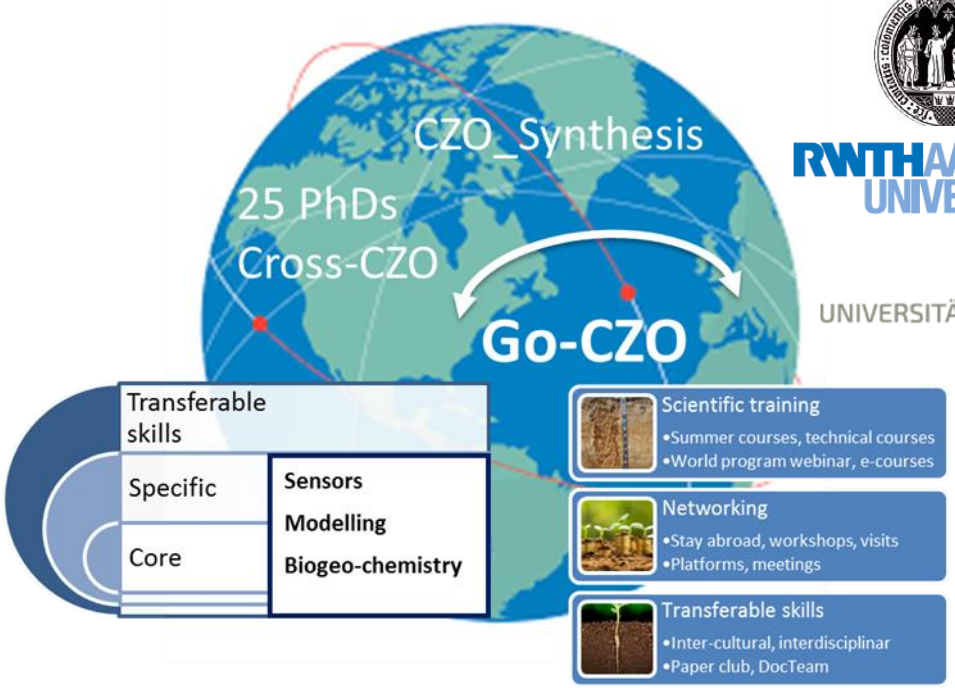
- Helmholtz International research school: decision end 09/2017
- 6 year program
- Germany-USA exchanges CZO researchers/PhDs

Global-oriented Network of Critical Zone Research: from Observation to Prediction

National Partners: TERENO Helmholtz partners, ABC/J Geoverbund Univ. Aachen, Bonn, Köln

International: CZO National Office, Pennsylvania State University

Global: CZEN Critical Zone Exploration Network, ISMC International Soil Modelling Consortium



geoverbund aachen bonn cologne jülich

JÜLICH FORSCHUNGSZENTRUM

TERENO TERRESTRIAL ENVIRONMENTAL OBSERVATORIES

ISMC International Soil Modelling Consortium

RWTH AACHEN UNIVERSITY

UNIVERSITÄT BONN

CZO

CZEN

PennState

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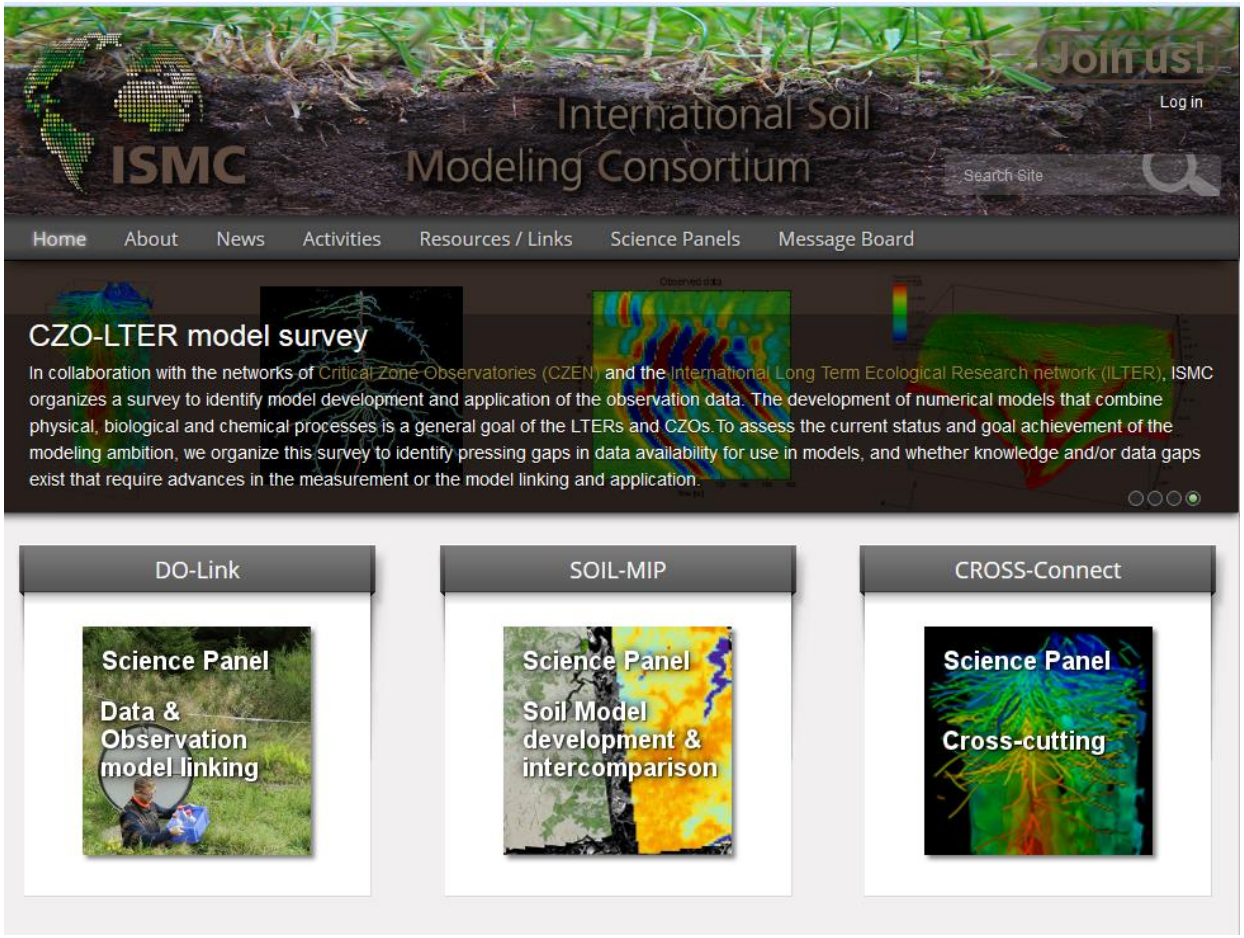
International Soil Modeling Consortium - ISMC

- Website with model and data portal
- CZO-LTER model survey, workshop 2018
- Networking: IUSS and CSDMS group, ISCN, AGMIP, …
- GEWEX SoilWat:
  - SoilOne global model
  - PTF project (paper, workshop)



https://soil-modeling.org/

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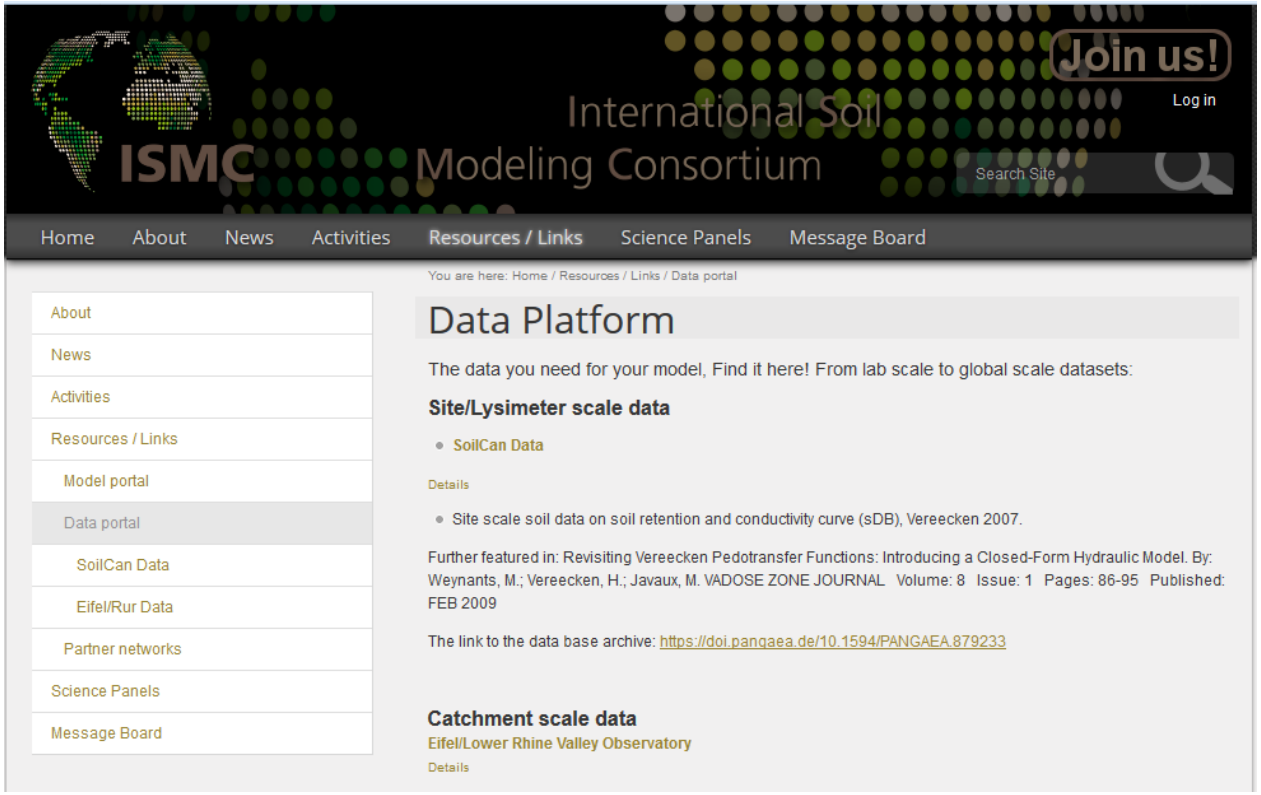
ISMC Data Portal

- Links directly to the TERENO data portal



https://soil-modeling.org/resources-links/data-portal

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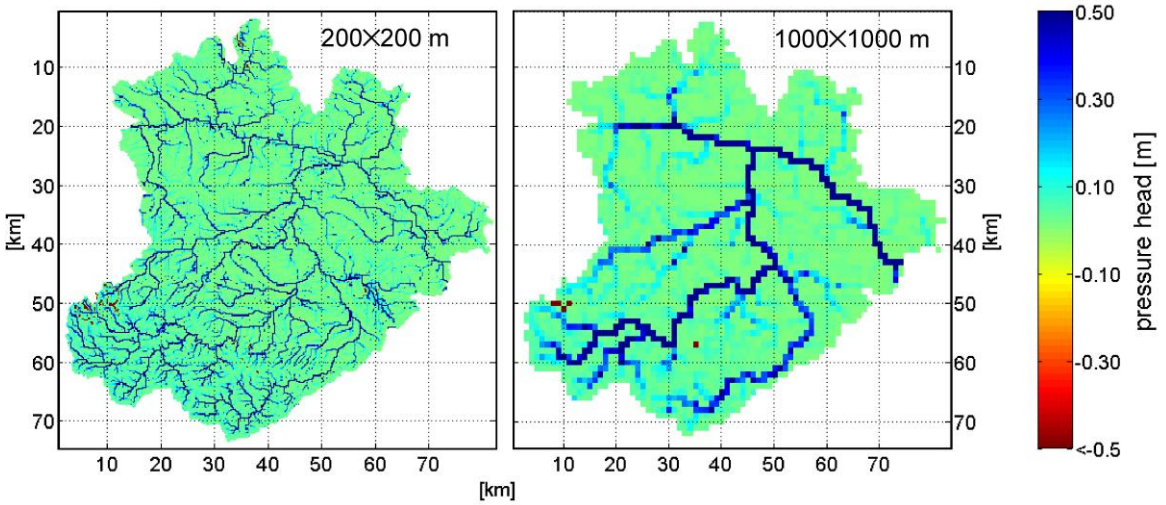
Model comparison study

- In March 2017 UFZ and FZJ associated with the HPSC-TerrSys launched a model inter-comparison project
- Mesoscale Hydrologic Model (mHM) and the Terrestrial System Modelling Platform (TerrSysMP).



TerrSysMP model results: Pressure head distribution at the land-surface for the Bode catchment (model equilibrium stage with well-developed stream network at different resolutions)

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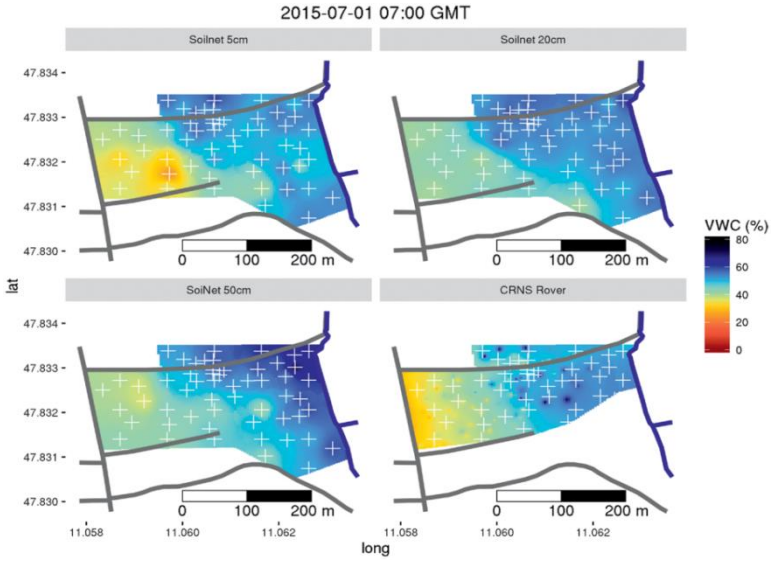
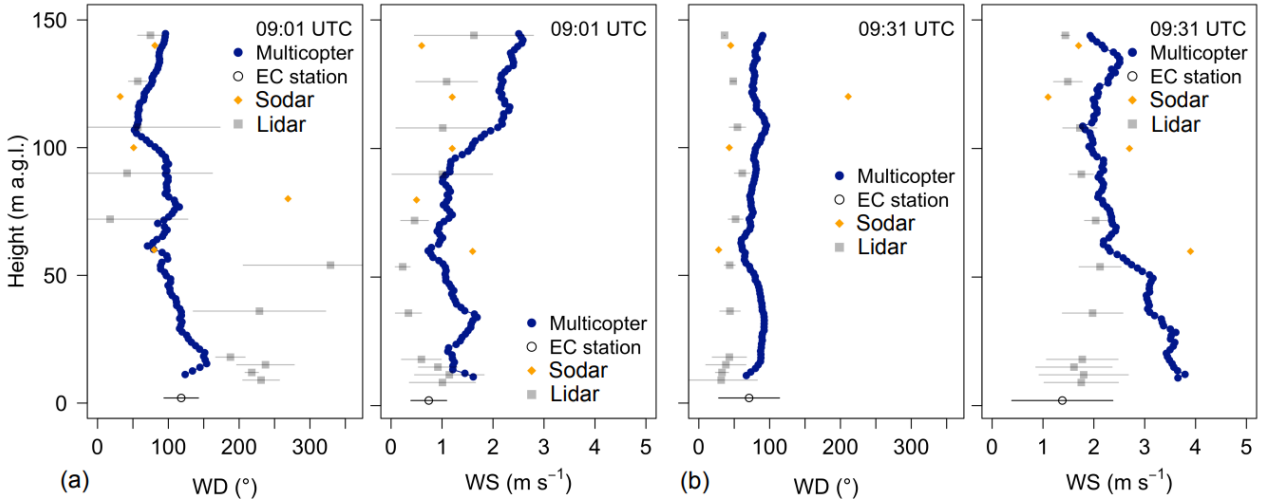
ScaleX Campaign

- **Scale-Crossing Land Surface and Boundary Layer Processes in the TERENO-preAlpine Observatory**
- **Two publications**



Spatial variability of soil water content from wireless sensing Using SoilNet

Wolf et al., BAMS, 2017



Multi-method/ multi-scale profiles of wind speed and direction

Brosy et al., AMT, 2017

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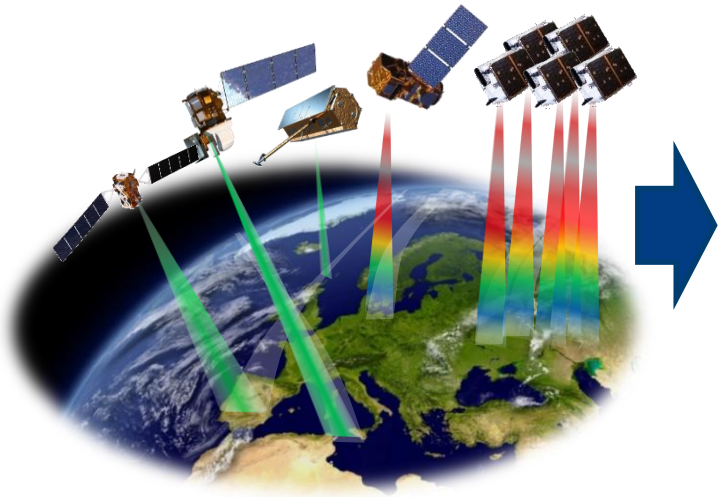
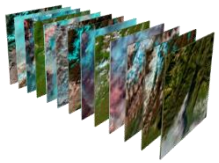
DEMMIN – German study site for remote sensing in TERENO-NE and official partner of JECAM



time series analysis



satellite data

in-situ data

Product development

DLR

GFZ
Helmholtz Centre Potsdam

- Provision of high quality in-situ measurements of environmental variables for modelling and operational use
- Improving infrastructure for atmospheric analysis (EU H2020-HYPERNETS)
- Developing of generic in-situ and remote sensing based earth surface products (EU ERA-PLANET, EU ERA-GAS)

GEOGLAM
Global Agricultural Monitoring

AMIS Agricultural Market Information System

JECAM
Joint Experiment for Crop Assessment and Monitoring

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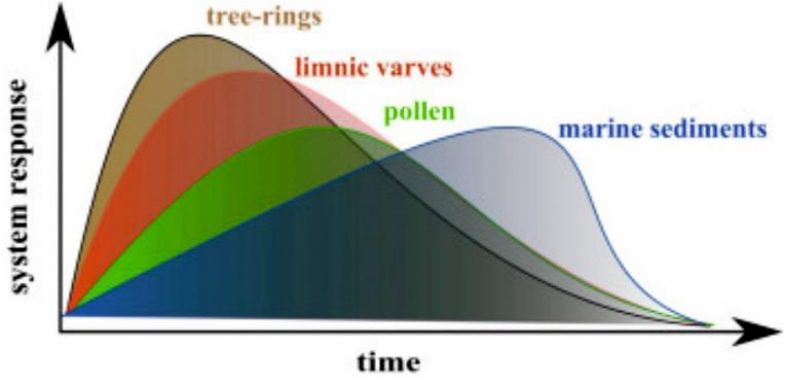
BALTRAP

The **BALT**ic Sea and its southern lowlands proxy- environment interactions in times of **RAP**id change (*Leibniz PAKT Initiative at IOW*)

- Integrating high resolution marine and terrestrial proxy archives (sediments, trees)
- Using data of the TERENO-NE lake sediment monitoring and long sediment records.



- Transect of sediment, water and climate monitoring from NE German lakes to the southern Baltic Sea for a better process understanding


TERENO site Tiefer See


IOW site Baltic Sea

⇒ Deciphering land-sea interactions during Holocene and present-day climate change in the southern Baltic Sea region

Leibniz-Institut für Ostseeforschung Warnemünde IOW

Leibniz Gemeinschaft

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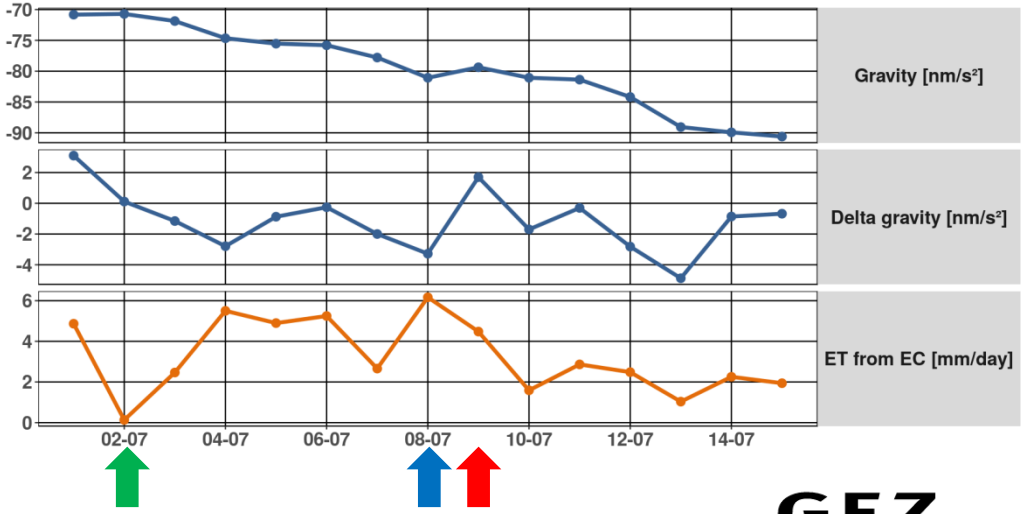
Linking gravimetry and EC measurements

TERENO test site Merzenhausen



Main hypothesis:

Water storage decrease due to ET leads to detectable decrease in the gravity signal

→ Joint dataset for one crop growing season
→ Investigate possibility to use gravimetry for direct ET estimation
→ Verify with additional measurements (soil moisture, precipitation)

GFZ
Helmholtz-Zentrum
POTSDAM

JÜLICH
FORSCHUNGSZENTRUM

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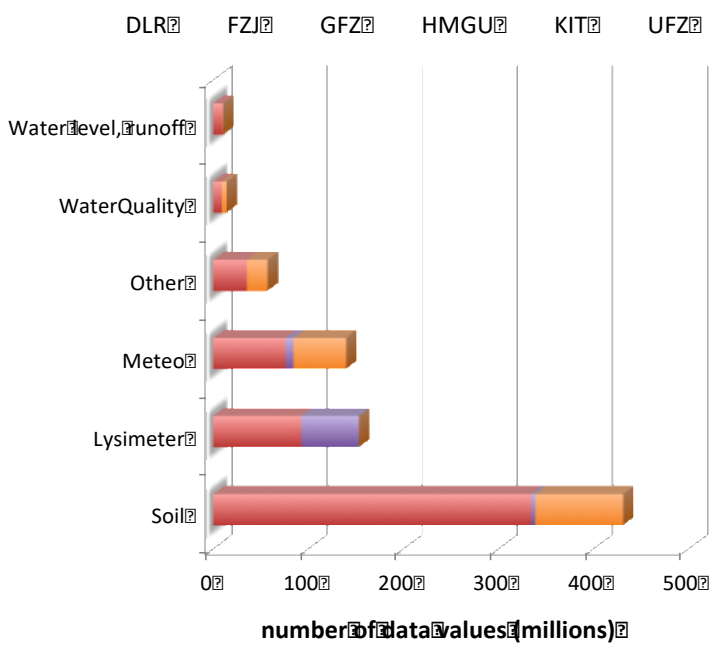
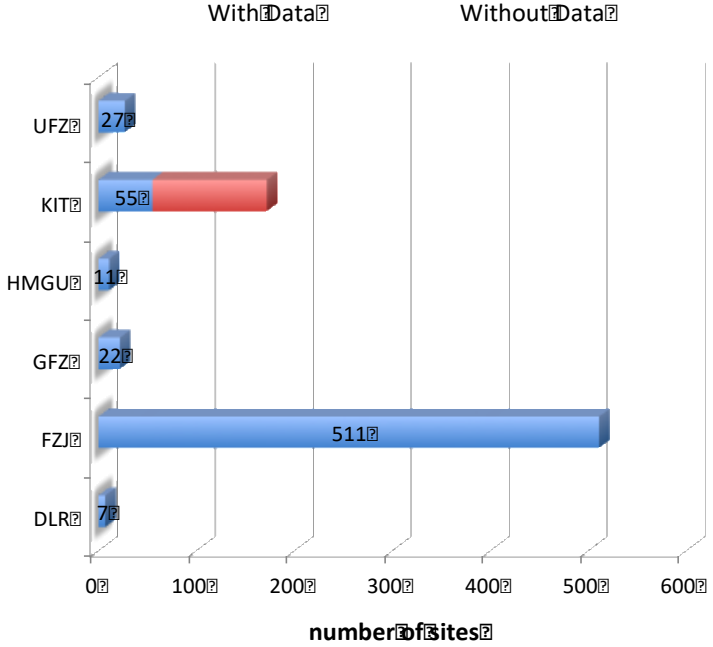
Data management

- Workflows for quality assessment of data as a prerequisite for data publication were further developed and put operational by GFZ, KIT, HMGU, FZJ and UFZ
- The data quality assessment tool INSPECT developed by FZJ has been made available and operational at GFZ and KIT
- In total, 880 million data from 633 sites are currently being published from TERENO





Number of data, parameter groups and sites published by TERENO from the individual observatories

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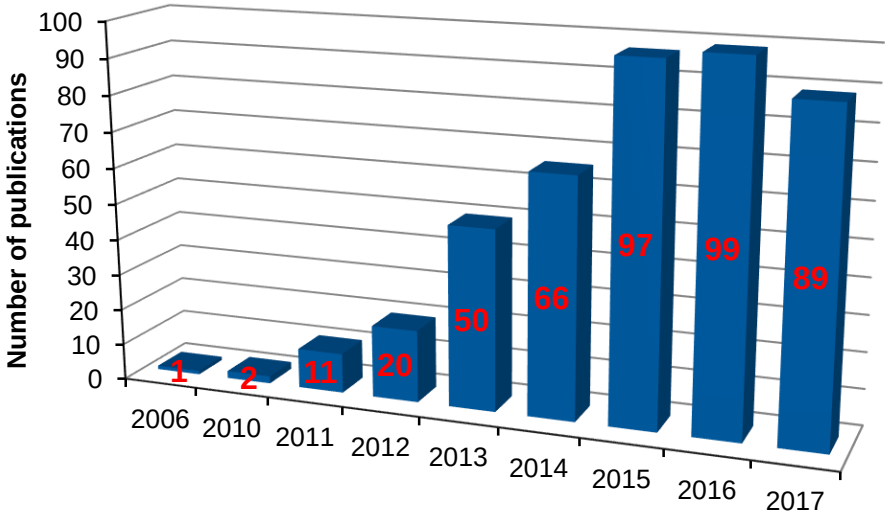
Publications and PhD projects

TERENO-related publications:



PhD projects:

- 12 finished PhD projects before 2016
- 28 finished PhD projects since 2016
- 92 ongoing PhD projects (last year 84)

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Planned activities

Joint meeting TERENO SSC and CRITEX France to develop closer collaboration. CRITEX includes both CZO and LTER sites

Strengthen the analysis of cross observatory data

Increase the number of data papers to improve accessibility to the research community

Continuously make data available

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TERENO Conference in 2018:

Celebrating 10 years TERENO

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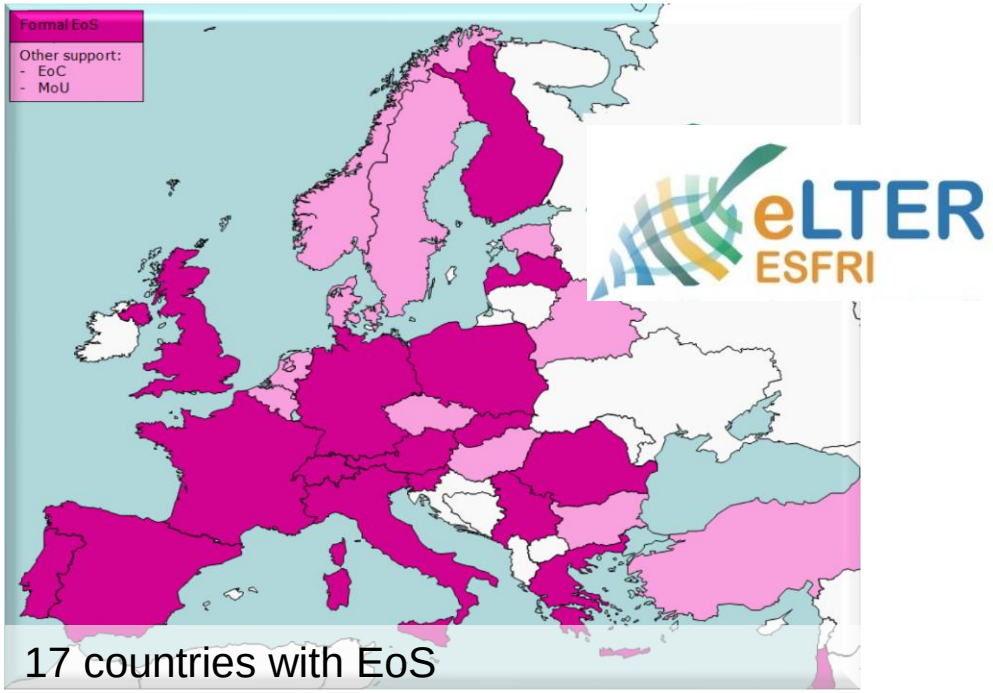
eLTER-ESFRI – Integrated European Long-term Ecosystem Research Infrastructure



17 countries with EoS

78 RPOs with EoCs

160 RPOs in 27 countries signed the Memorandum of Understanding on the eLTER RI science case

29 Letters of Support from major European and global players (e.g. SAEON, NEON, TERN, CERN, ICOS, LifeWatch, etc.)

- **Generic Research Infrastructure** offering basic **services** and baseline activities
- **Harmonized action** of formerly less coordinated elements, enabling new research quality
- **Central steering PLUS adaptive maneuvers** of individual elements
- **Mid- and long-term planning** in close interactions with strategic processes and other RIs

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