



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

H. Vereecken and the TERENO team



# Content

- TERENO Advisory Board
- TERENO and climate extremes in 2018/2019
- Infrastructures and conferences
  - eLTER
  - TERENO/OZCAR
  - Galileo Conference
  - ISMC
- Data management and outreach
- Planned activities



## Resigning Advisory Board Members

- Prof. Volker Wulfmeyer (2010-2018)
- Prof. Hangsheng (Henry) Lin (2008-2018)
- Russell Monson (2008-2018)
- Prof. Beate Jessel (2008-2018)
- Prof. Hannes Flühler (2008-2018)



## New Advisory Board Members



**Prof. Dani Or**, Head of Institute of Biogeochemistry and Pollutant Dynamics, ETH Zürich, Switzerland



**Dr. Nicolas Arnaud**, Director of the National Institute of Sciences of the Universe (INSU) of the French National Centre for Scientific Research (CNRS)

**Dr. Hank Loescher**, Director of Strategic Planning, National Ecological Observatory Network (NEON), USA



**Prof. Jaana Kaarina Bäck**,  
Department of Forest Sciences, University of Helsinki, Finland



**Prof. Alexander Knohl**, Head of the Section Bioclimatology, Faculty of Forest Sciences and Forest Ecology, University of Goettingen, Germany





# MOSES Test Campaigns 2018/2019

## (Modular Observation Solutions for Earth Systems)



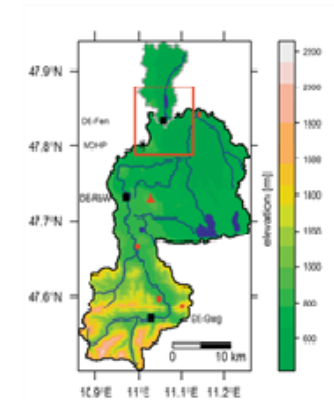
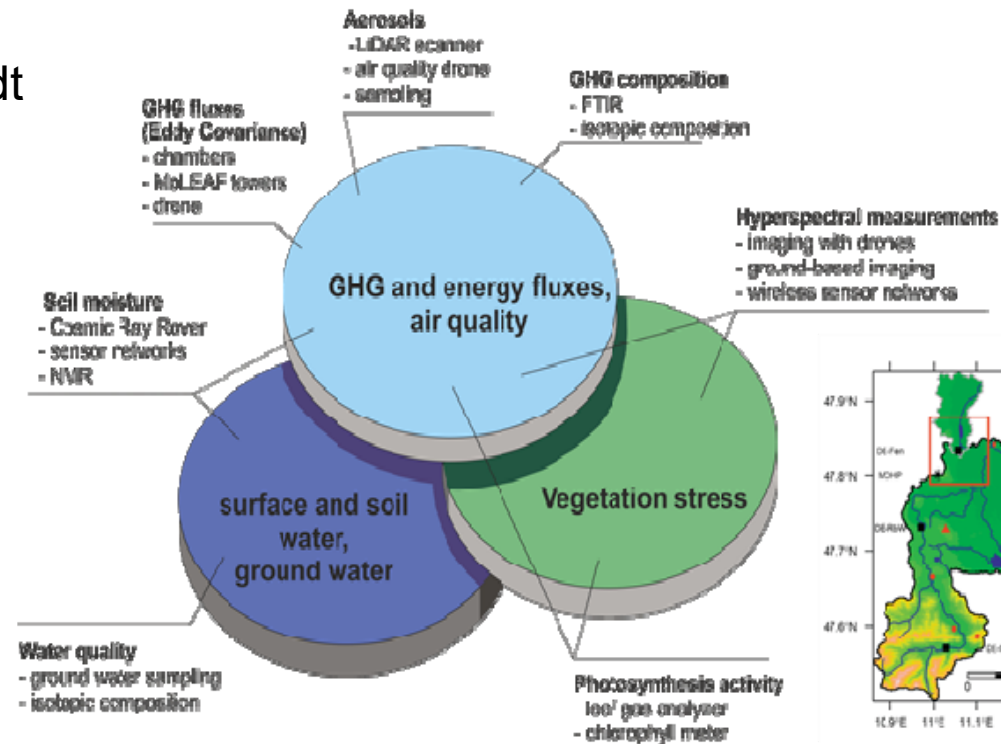
Event	Date	Test Campaign
Heat Waves & Droughts	7/2018	<b>TERENO Eifel</b> : atmosphere chemistry, soil moisture, land-atmosphere fluxes (FZJ)
	4-6/2019	<b>TERENO pre Alpins (ScaleX)</b> : atmosphere chemistry and dynamics, vegetation stress, land-atmosphere fluxes, soil moisture (KIT)
	2019(20)	<b>Ad hoc campaign “heat and drought”</b> in Germany (UFZ)
Hydrological Extremes	5-7/2019	<b>Müglitztal</b> : Heavy rain and flood generation (KIT)
	4-9/2019	<b>Elbe Estuary</b> : Impact on water quality from Geesthacht to Helgoland (AWI)
	2020	<b>Elbe catchment</b> (TERENO Harz) and estuary (COSYNA): dominant processes during high and low flows (UFZ)
Permafrost	8/2018	Mackenzie Delta (Canada): GHG emissions, thermokarsts (AWI)
	2020	Lena Delta (Siberia, Russia): GHG emissions (AWI)
Ocean Eddies	2019/20	Cape Verde: Low oxygen eddies (HZG)





# Heat Wave & Drought Test Campaign 2019 (ScaleX)

- TERENO Pre-Alpine site Fendt
- 13.05. – 21.06.2019
- Coordinated by KIT-IFU (Garmisch)
- Involved centres: FZJ – IBG3, GFZ, HMGU, UFZ
- Partners: Cosmic Sense, SUSALPS, University of Hohenheim

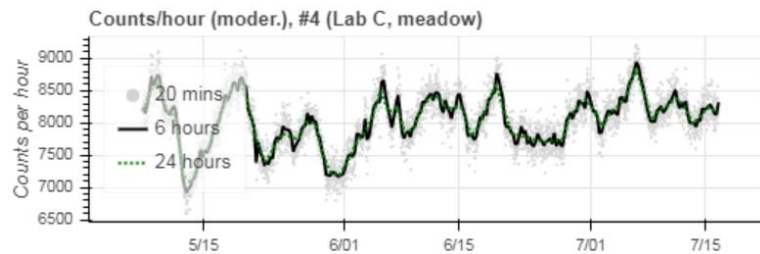




# Heat Wave & Drought Test Campaign 2019 (ScaleX)

- Cooperation with Cosmic Sense DFG project
- Massive coverage of cosmic ray sensors (23 detectors)
- Cosmic rover campaigns

Measured neutron counts during the campaign of one Cosmic ray station:



TERENO Pre-Alpine site Fendt

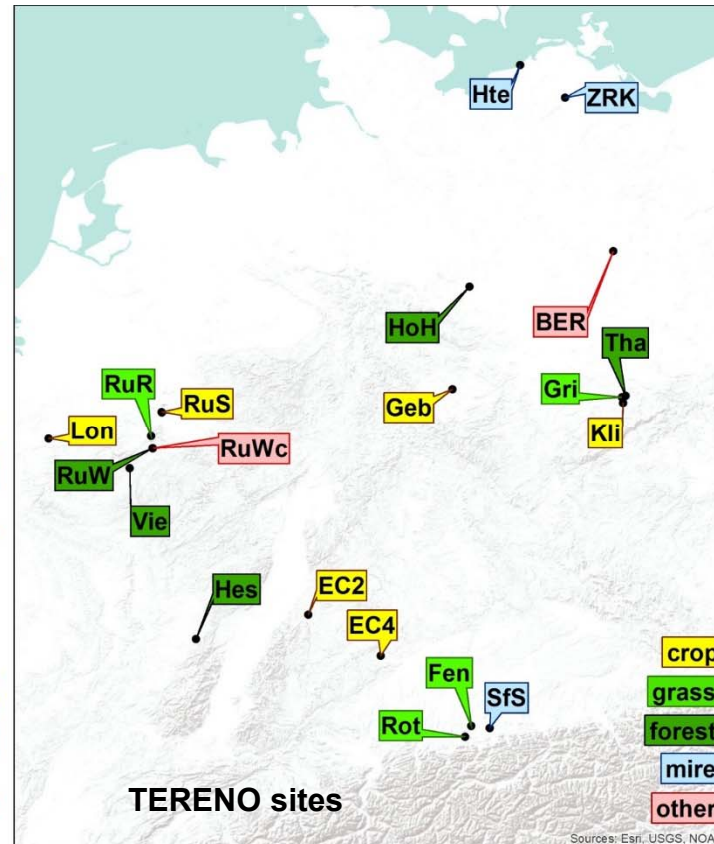
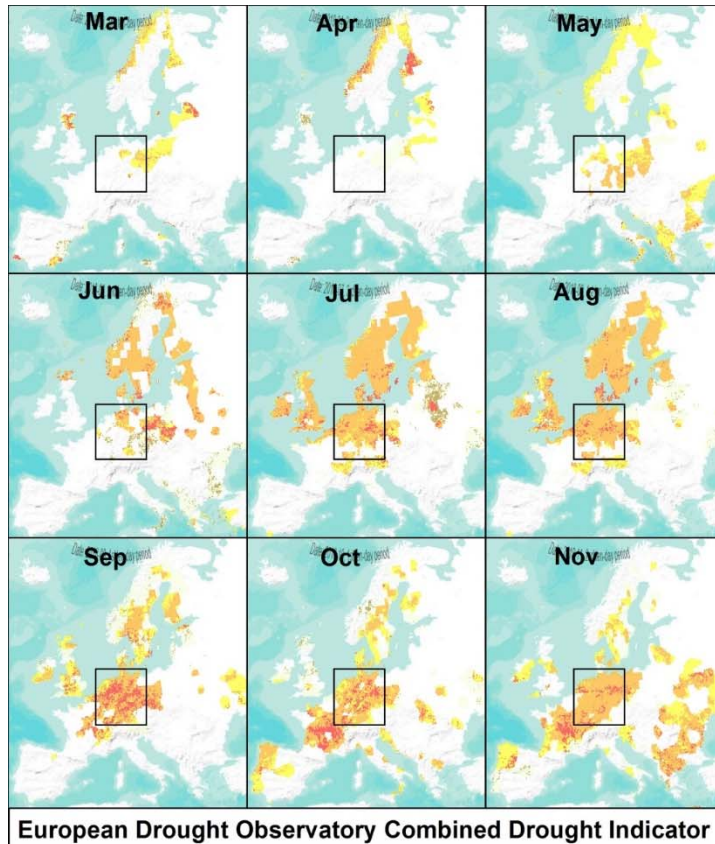






# Exceptional drought year 2018

## How did the land surface in central Europe react?

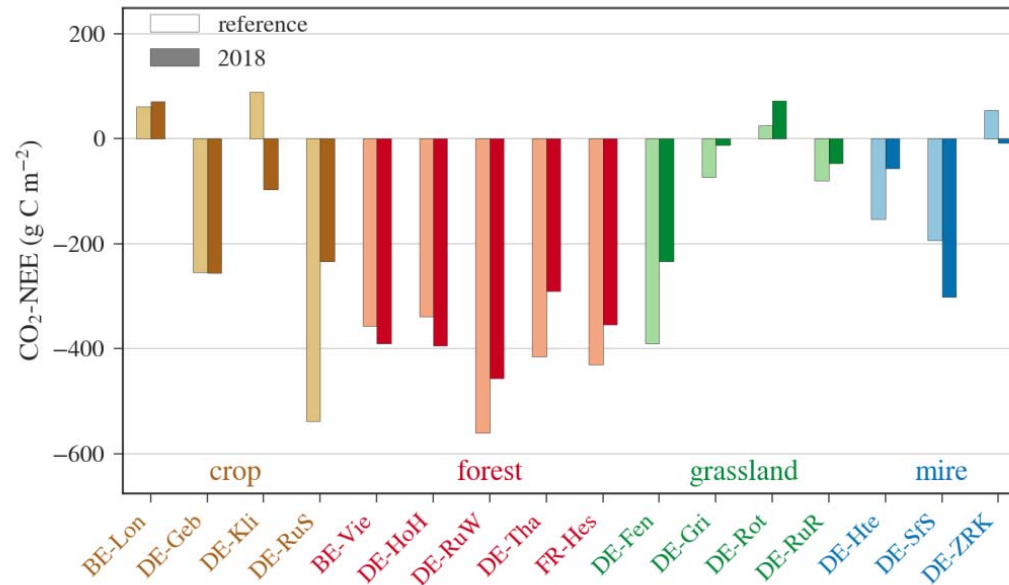






# Exceptional drought year 2018

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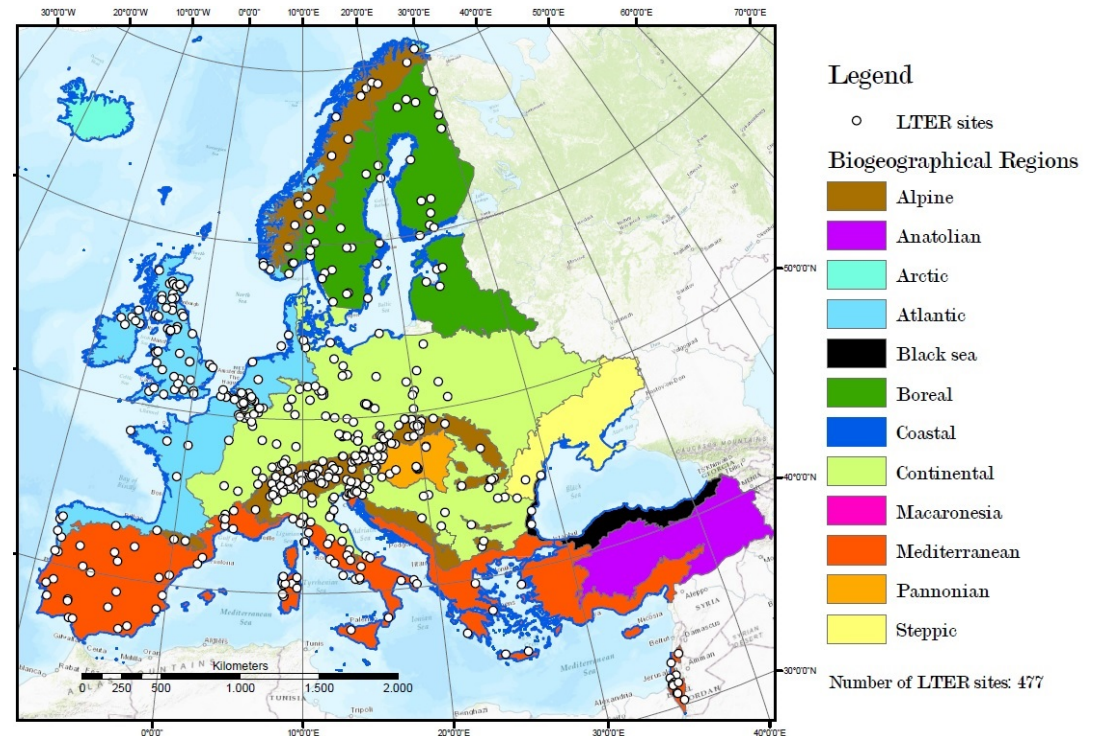


- most sites **less CO<sub>2</sub> uptake** (less growth, closed stomata, early harvests)  
=> carbon storage function weakened



# eLTER RI – Integrated European Long-term Ecosystem Research Infrastructure

- eLTER RI is on the 2018 ESFRI Roadmap on Large Scale Research Infrastructures
- eLTER RI capitalizes on about 450 existing sites of LTER and Critical Zone research in Europe
- eLTER RI features a unique "whole system approach" to observe, explore and analyze the environment
- 17 countries committed 142 M€
- EC approves 14 M€ funding for the projects eLTER PPP and eLTER PLUS

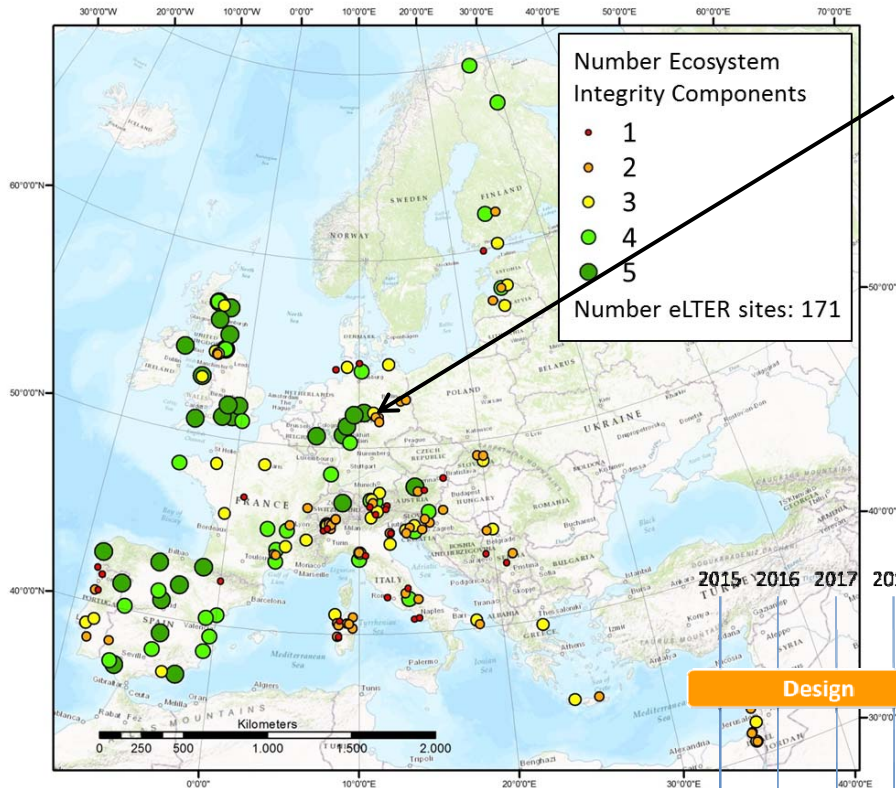






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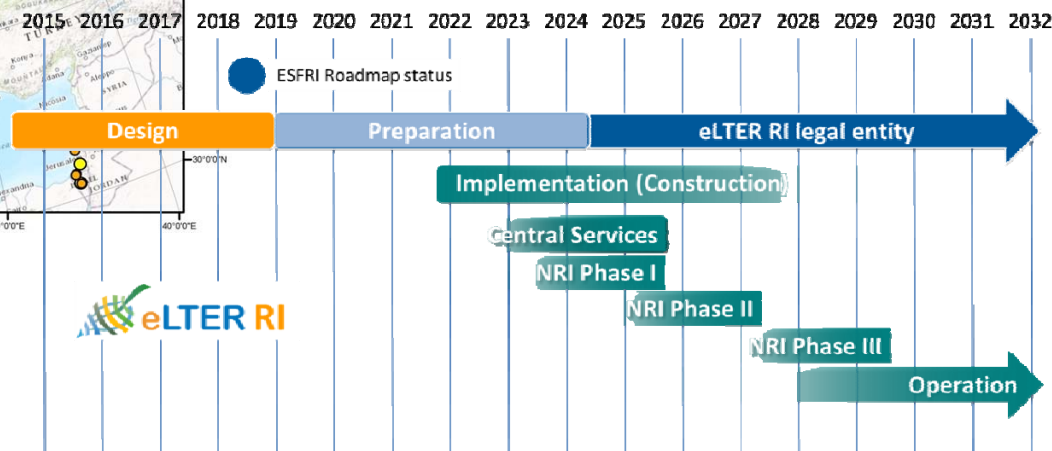
# eLTER-ESFRI – Integrated European Long-term Ecosystem Research Infrastructure



## 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









## Joint conference of OZCAR and TERENO



- OZCAR is a French critical zone long-term observatory networks
- TERENO and OZCAR want to strengthen their scientific cooperation
- Organization of an international conference alternatively in France and in Germany every two years
- First joint conference: Sep. 29 – Oct. 1, 2020 at Strasbourg, France



Venue: CCI Strasbourg







# Joint conference of OZCAR and TERENO



## Planned sessions

- Innovative sensing methods for the Critical Zone
- Long-term environmental and biodiversity observation – understanding of the Earth system in the Anthropocene
- Integration of in-situ and remote sensing data for a better understanding of the SVA
- Temporal variability of Critical Zone processes using high-resolution bio-and geoarchives
- Measuring and modelling water storage dynamics and residence time
- Surface – groundwater interactions
- Management and integration of environmental observation data
- Monitoring and modelling water and solid transport during extreme events
- Biogeochemical processes at the soil and catchment scale
- Earth System models: water and carbon cycle
- Model data fusion : improving model predictions and process understanding
- Rates and processes of the Critical Zone formation
- Mineral/biota interaction in the Critical Zone
- Hydrogeophysics (incl. ITN « ENIGMA »)
- Intermittent streams and rivers
- Mountain Critical Zone and sustainability in a changing world
- Challenges in understanding Critical Zone processes in Africa








HB7



**TERENO**  
TERRESTRIAL ENVIRONMENTAL OBSERVATORIES

## European network for hydrological observation and experimentation



-  **EGU** European Geosciences Union Galileo conference:  
“European Vision for Hydrological Observation and Experimentation”
- Oct. 5-8, 2020 - UniNA Congress Center, Napoli, Italy

### Science questions

- How is climate change affecting major hydrological fluxes?
- What observations are needed to test hydrological hypotheses?
- What are the controls on lateral surface and subsurface flow?
- How do land use and land cover changes control hydrological fluxes?
- What are the controls for fluxes and feed-back mechanisms between hydrological domains?
- How can measurements of hydrological parameters and variables be upscaled?

**HB7**

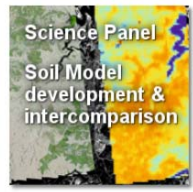
**to be updated**

Heye Bogena, 15/08/2019



# International Soil Modeling Consortium - ISMC

- 3rd ISMC Conference – Advances in Modeling Soil Systems
- Sep. 24-27, 2020 at Tianjin, China

DO-Link	SOIL-MIP	CROSS-Connect
<p>Science Panel</p> <p>Data &amp; Observation model linking</p> 	<p>Science Panel</p> <p>Soil Model development &amp; intercomparison</p> 	<p>Science Panel</p> <p>Cross-cutting</p> 
<p>ISMC - The International Soil Modeling Consortium</p>		
<p>Report of Findings</p> <p>Report of Findings</p> <p>2nd ISMC conference 5-7 November 2018</p> <p>New perspectives</p>	<p>ISMC - linking soil modeling experts</p> <p>The International Soil Modeling Consortium aims to integrate and advance soil systems modeling, data gathering, and observational capabilities, through:</p> <ul style="list-style-type: none"> <li>• bringing together leading experts in modeling soil processes within all major soil disciplines</li> <li>• addressing major scientific gaps in describing key processes and their long term impacts with respect to the different functions and ecosystem services provided by soil;</li> </ul>	

<https://soil-modeling.org> or [@ISMC\\_NEWS](https://twitter.com/ISMC_NEWS)

**Call for Sessions**



**3rd ISMC Conference - Advances in Modeling Soil Systems**



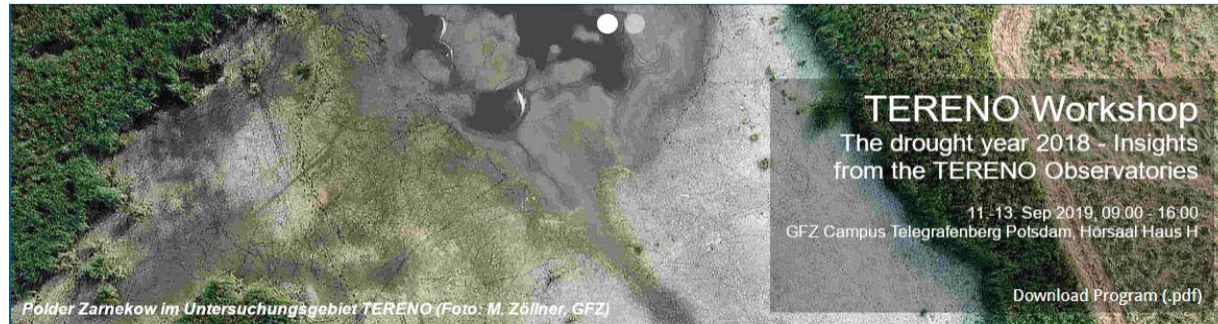
**When:** Sep. 24-27, 2020  
**Where:** Tianjin University, China







# Homepage Relaunch



**TERENO Workshop**  
The drought year 2018 - Insights from the TERENO Observatories

11 -13 Sep 2019, 09:00 - 16:00  
GFZ Campus Telegrafenberg Potsdam, Horsaal Haus H

[Download Program \(.pdf\)](#)

*Polder Zarnekow im Untersuchungsgebiet TERENO (Foto: M. Zöllner, GFZ)*

## Welcome to TERENO

### Introducing the TERENO Network...

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.

[Read More...](#) >

## TERENO Partners



[www.tereno.net](http://www.tereno.net)

## Germany's top models



Two environmental monitoring initiatives are joining forces to assess global change in Europe. Drs Heye Bogena, Clemens Simmer and Matthieu Masbou discuss the work of their respective organisations, their specific roles ...

[Read More...](#) >

## TERENO Newsletter



Our TERENO Newsletters reaching from the latest issue today back to 2008, featuring the latest TERENO activities at the respective time, introducing our test sites and the involved scientists of the various TERENO partners.

[Read More...](#) >

## TERENO Publications



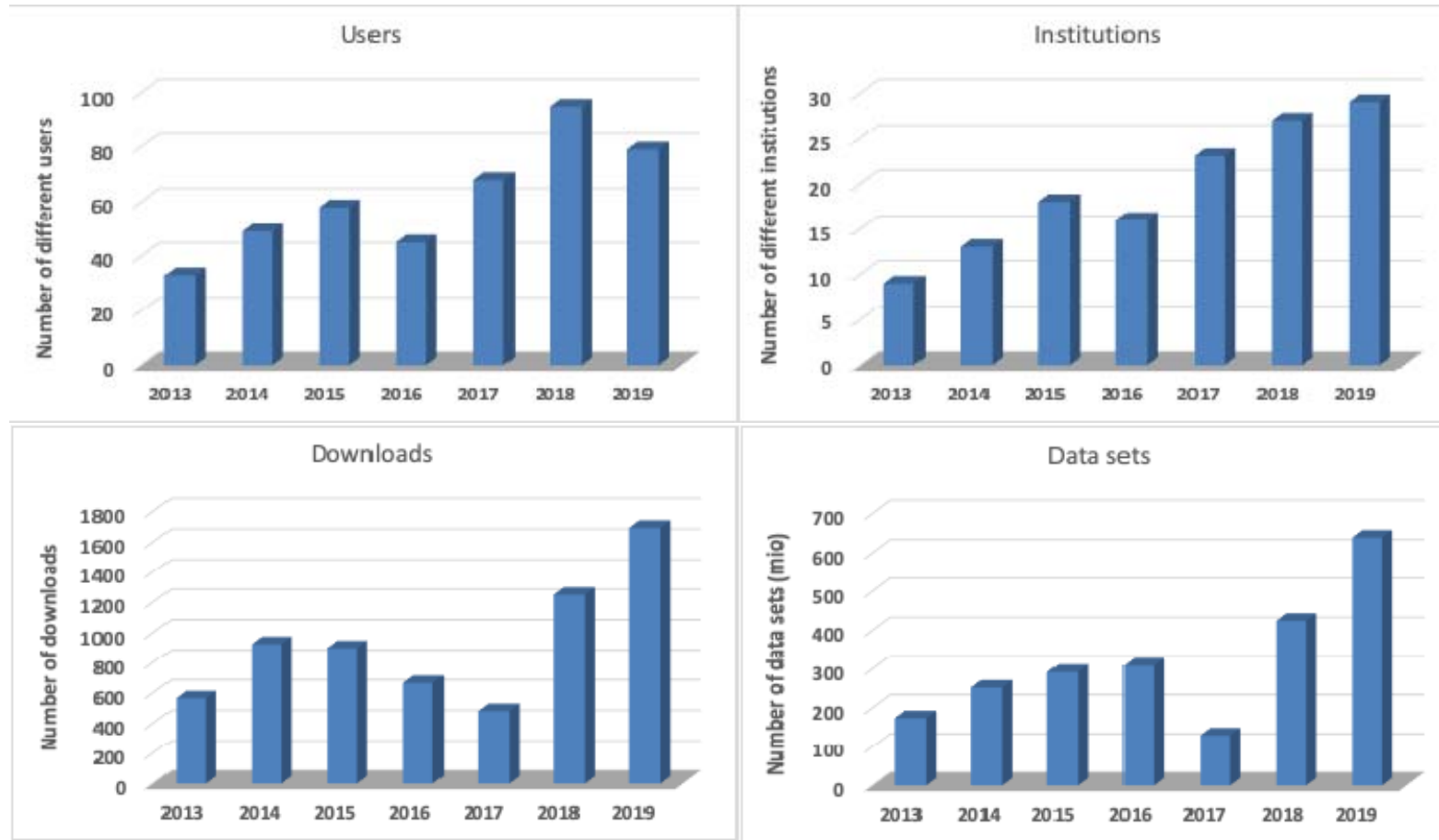
Here you can find TERENO-related publications' references dating back up to the year 2006. If available we provide you with the linked sources for more detailed information on the papers or a download link.

[Read More...](#) >



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# Data management



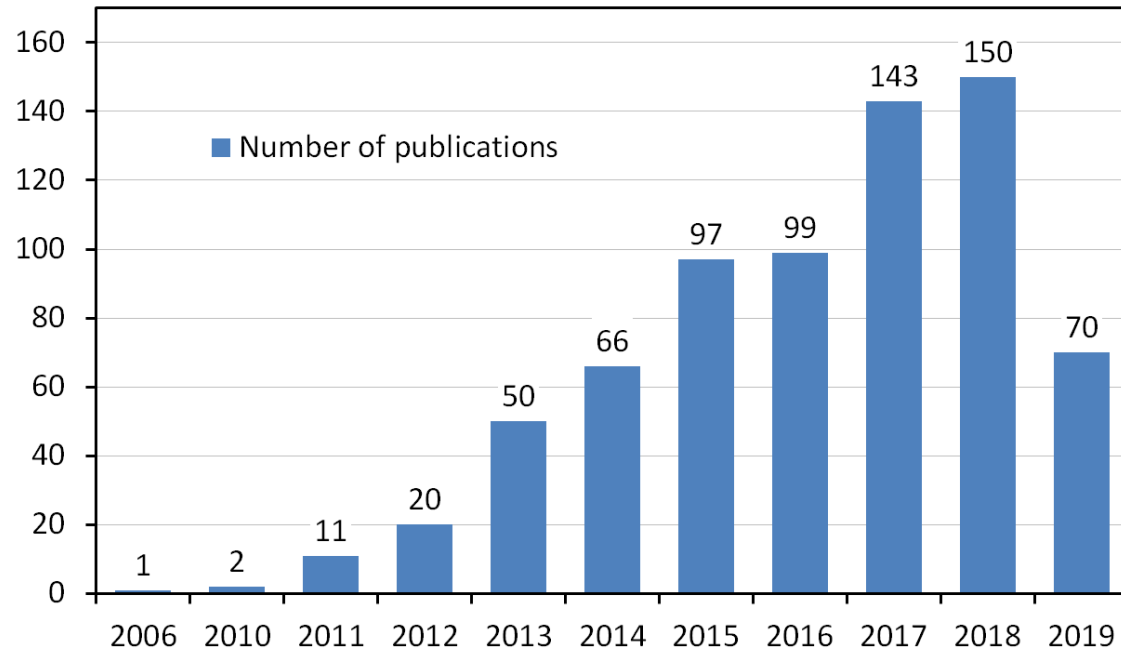
In total, more than 1.5 billion data from 741 sites are currently being published from TERENO





## Publications and PhD projects

- In total 709 TERENO-related publications



- 39 PhD projects were successfully completed
- 90 PhD projects are still ongoing










## Open-access article collection on:

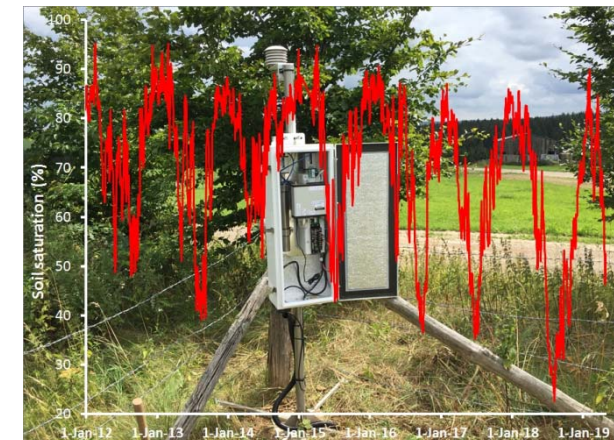
### “Innovative Methods for non-invasive Monitoring of Hydrological Processes from Field to Catchment Scale”

#### Editorial Team:

	<b>Heye Reemt Bogena</b> Julich Research Centre Jülich, Germany
	<b>Clara Christabel Chew</b> University Corporation for Atmospheric Research (UCAR) Boulder, United States
	<b>Andreas Güntner</b> German Research Centre for Geosciences, Helmholtz Centre Potsdam Potsdam, Germany
	<b>Martin Schrön</b> Helmholtz Centre for Environmental Research (UFZ) Leipzig, Germany
	<b>Virginia Strati</b> University of Ferrara Ferrara, Italy

#### Topics:

- Instrumental aspects
- Improved algorithms of signal conversion
- Data analysis
- Applications of new methods for investigating hydrological processes
- Integration of such monitoring data into models
- New data storage or transmission solutions initiatives
- Spatialized hydrological information using Internet of Things or cloud service communication protocols



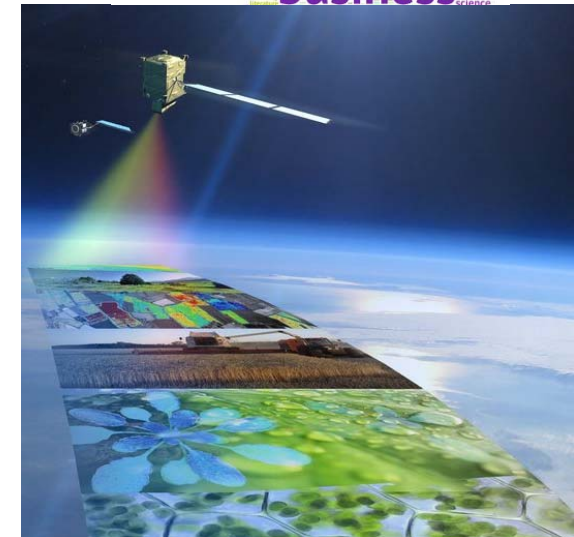
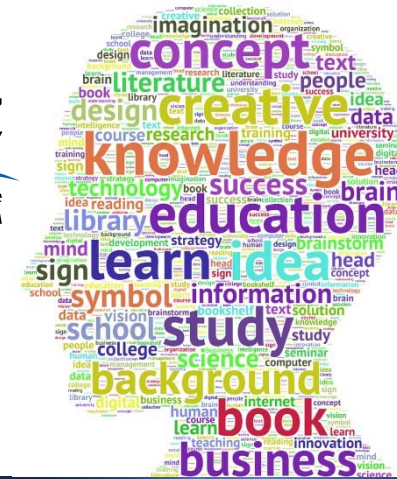
**Submission Deadline:**  
**30 January 2020**





## Knowledge transfer into the society

- TERENO based research is the basis for two initiatives for knowledge transfer
- show users of non-scientific practice what information can be obtained from remote earth observation data + in-situ data (e.g. TERENO)
- SAPIENS – provides webinar training (specialized authorities at the level of municipalities, administrative districts, government districts and federal states as well as non-governmental organizations and the media)
- KONSAB – webinars + seminars for agricultural and forestry business



source: ESA



## Planned activities

- Strengthen the analysis of cross observatory data
- Increase the number of data papers to improve accessibility of TERENO data to the research community
- Continuously make data available
- Strategic Invest funding „TERRA-LAB“



# TERRA-LAB: from sensing to future management and production

- Strategic investment > 15 Million Euro
- Automatization and digitization of the current TERENO observatories
- Expansion of the current TERENO network with 2-3 forest observatories, and 2 agricultural sites.
- Establishment of a German wide network of digital soil moisture observations and groundwater measurements based on the principle of co-location with existing measurement sites run by authorities.





# TERRA-LAB cyberinfrastructure

## TERRA-LAB cyberinfrastructure

From Sensing to Real-Time Forecasts and management

