

# **DEMMIN**

## **German Calibration and Validation Site for Remote Sensing**

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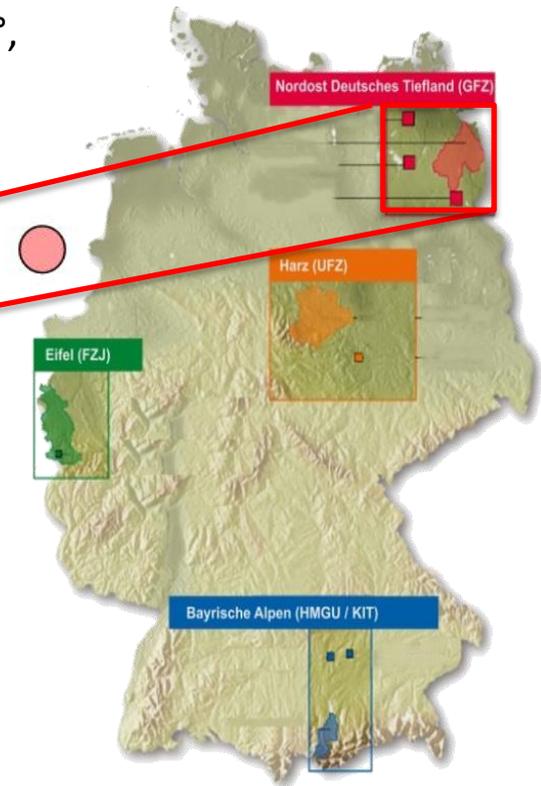
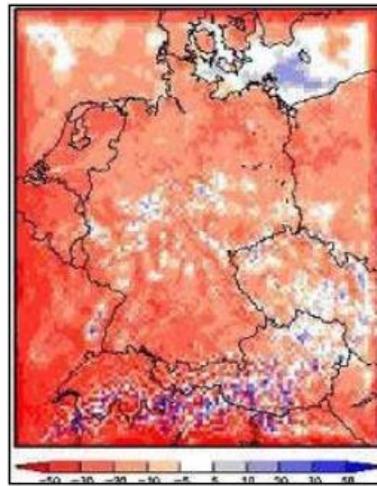
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<sup>3</sup> *German Aerospace Center (DLR)*

<sup>4</sup> *green spin GmbH*

Climatological models forecast a significant climate change (Period: 100 years)

- increase of annual mean temperature between 2.5 to 3.5 C°,
- decrease of annual mean precipitation of up to 30 %



Spatial distribution of climate change on  
regional scale

***DEMMIN is part of TERENO – German North-Eastern Lowlands Observatory***

***Free data access via TERENO data portal: <http://teodoor.icg.kfa-juelich.de>***



- CAL/VAL site for remote sensing missions and methods at agricultural areas (since 1999)
- Cooperation with Farmers managing approx. 30,000 ha
- Test-site region has an dimension of 50 to 50 km<sup>2</sup>
- Mean Size of fields is 80 ha and in maximum 300 ha

## DEMMIN Objectives

Combination of in-situ data and remote sensing data analysis for:

- Crop parameter estimation (crop type, crop status, crop pattern)
- Soil parameter retrieval (soil moisture, organic matter)
- Evapotranspiration modelling

→ High resolution data analysis (automatic data processing and analysis of multi sensor data (e.g. TSX, Sentinel-1 & 2, Landsat-8 + in-situ + modelling)

## Data infrastructure

### Agrarian meteorological network:

40 weather stations (GFZ: 20, DLR: 20)

### Soil moisture measuring network:

62 gauging stations (agricultural fields)

### 15min data interval / Web-based data access

### Soil documentation & soil analysis at each soil moisture station:

~110 soil profiles, ~1 m depth;

Parameter: texture, pH, CaCO<sub>3</sub>, OM

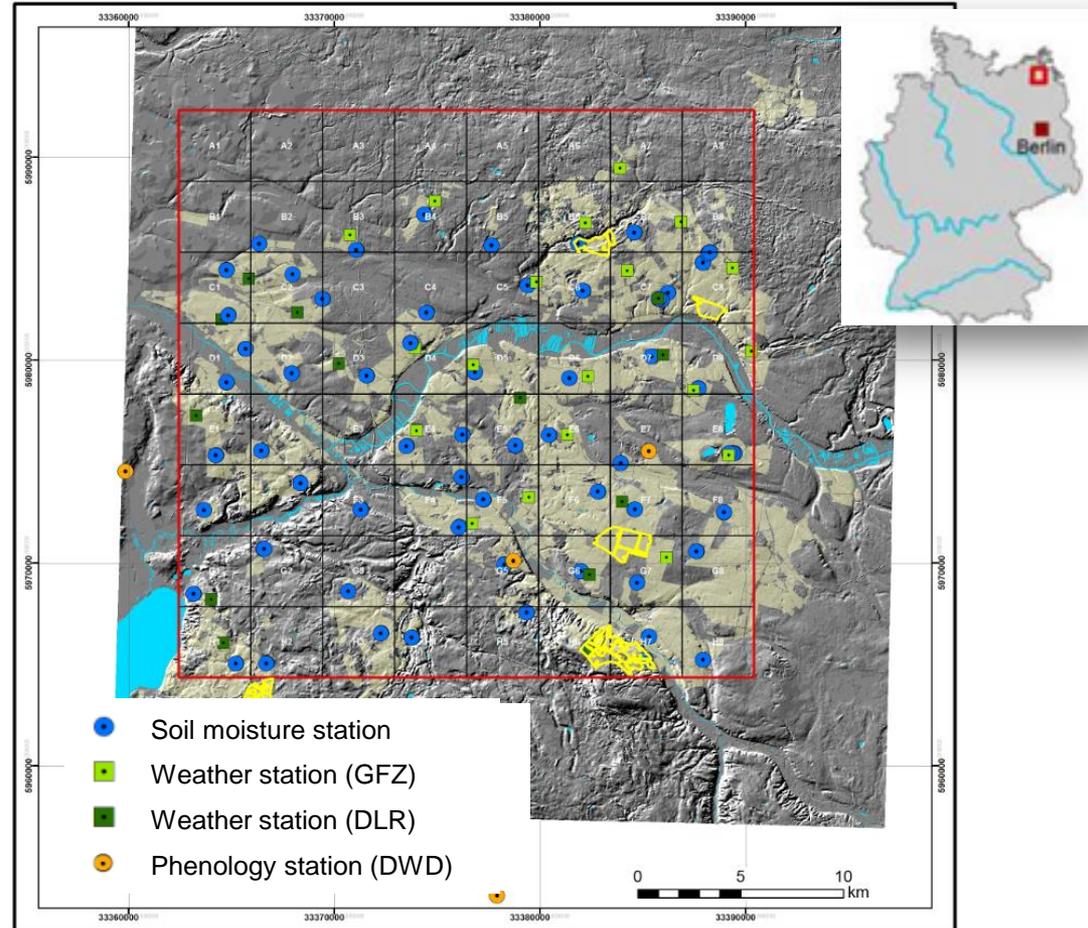
### Crop data from association of local agricultural companies, Yield Mapping

### Phenology data:

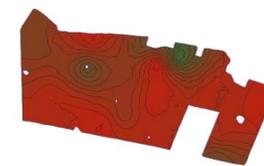
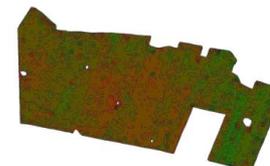
5 observation stations (German Meteorological Service - DWD)

### Soil maps, DEM 10, etc.

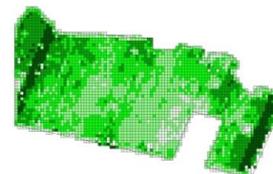
### Large RS Database (> 50 Datasets / year)



Yield mapping



Soil investigations



N-Sensor / Biomass

## SAR

(Sentinel-1, TerraSAR-X)

- Backscatter, coherence
- Dual-pol decomposition

## Optical

Sent.-2, Lands.-8, RapidEye)

- Vegetation indices
- Spectral feature analysis

Multitemporal / Multisensoral time series analysis



Comprehensive data mining algorithms

- Permutation approach
- SVM, Random Forest

Biophysical parameters  
(e.g. LAI, Biomass, plant water content)

Soil parameters  
(e.g. Surface Soil Moisture, organic matter)

Crop yield modelling

Agricultural Information Service

*GLAM.DE is supporting the effort of the DLR, started to become DEMMIN an official member of JECAM initiative - Process is still ongoing*

Thank you for your attention!

Дякую

Looking forward to welcome  
you at our poster

Julius-Maximilians-  
**UNIVERSITÄT  
WÜRZBURG**

**GFZ**  
Helmholtz-Zentrum  
POTSDAM

**DLR**  
greenSpin

**DLR**  
Federal Ministry  
of Education  
and Research

**GLAM.DE**  
Global Agricultural Monitoring – The German Contribution

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**JECAM**  
Joint European Centre for Agricultural Monitoring

**EOGLAM**  
Global Agricultural Monitoring

**Introduction**

Agricultural monitoring is essential for global food security. A key element to the successful development of remote sensing and geospatial services are well equipped European and international test sites. Data and information sensitive to early detection of seasonal negative developments such as droughts or long-term monitoring of agricultural production. The project partner are working and cooperating for many years with the DEMMIN® test site and thus are involved in many regional research activities and projects.

**Objectives**

Scientific core objective is the development of innovative methods in agricultural monitoring, based on high-resolution **optical and microwave** satellite data. Technical focus is on the retrieval of **soil and vegetation parameters** and growth conditions and thus aligned to the theme of food security.

- Optimized derivation of vegetation parameters (biomass) for cereals and maize (Uni Würzburg)
- Using optical and SAR data for determination of soil parameters on agricultural fields with various fractional cover (GFZ)
- Development and demonstration of local services for agricultural management
  - Yield service prototype based on model improvements gained during the project (requested from Green Spin GmbH)
  - Web-based interface to provide project results on soil parameters) e.g. via the existing TELEKO data portal (TUOZOO)

**DEMIN® test site**

DLR Neustrelitz established the DEMMIN® test site with 20 environmental measurement stations in 1998. The test site is an intensively used agricultural ecosystem. Within the TERENO initiative the GFZ extended the 20 gauging stations and a soil moisture network with 15 min data logging interval. The stations are hosted by DLR for data transfer. The data access for scientists and cooperating farmers is web based.

**DEMIN® test site characteristics:**

- Flat topography in the north (0-4.5m a.s.l.) and high spatial variability in the south
- Location of the gauging stations is linked to this different conditions and its according land use

**Soil moisture network:**

- 62 soil moisture gauging stations (TERENO) at each station 6 SPAC3 sensors (depths 50cm & 10cm) to analyse the impact of different land use on soil water condition.

**In-situ measurements of biophysical parameters:**

- Leaf area index (LAI 2000 and SunScan)
- Plant density and height
- Global radiation and PAR

**Cooperation with farmers:**

- Close cooperation with many regional farmers which are providing crop management information, like yield and seeding, sowing, fertilizer etc.

**Services and International Cooperation**

Evaluation of possibilities to utilize project results for agricultural service development as local services. GLAM.DE is supporting the efforts of DEMMIN® (DLR Neustrelitz) in cooperating with the JECAM initiative as the first German observation site at JECAM.

- Identification of requirements and interfaces at a potential contribution of data and services in JECAM.
- Cooperation with appropriate JECAM sites (algorithm robustness and transferability)
- Perform comparative experiments with data from a similar situated Cal/Val sites at JECAM to contribute to the JECAM goal of harmonization of approaches.

**Data and methods**

DEMMIN® is currently observed by diverse remote sensing sensors:

- Multispectral (e.g. Sentinel-2, Landsat-8, MODIS, Sentinel-1, Sentinel-3, Sentinel-6, Sentinel-5P, Sentinel-7)
- Thermal (e.g. Sentinel-3, Sentinel-6, Sentinel-7)
- Microwave (e.g. Sentinel-1, Sentinel-2, Sentinel-3, Sentinel-6, Sentinel-7)

**SAR**

(Retrieved L<sub>1</sub> to L2A) x  
 Homodyne/Coherence  
 Interferometry  
 Multi-temporal  
 Differential Interferometry  
 Coherence/Phase/Amplitude  
 SAR Interferometry

**Optical**

(Retrieved L<sub>1</sub> to L2A) x  
 Homodyne/Coherence  
 Interferometry  
 Multi-temporal  
 Differential Interferometry  
 Coherence/Phase/Amplitude  
 SAR Interferometry

Biophysical parameters  
 (e.g. LAI, NDVI, etc.)  
 Soil parameters  
 (e.g. Soil Moisture, etc.)

On-site yield monitoring  
 Agricultural Information Service

**Acknowledgements**

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[www.gfz-potsdam.de/tereno/terenoindexing/projects/glam\\_de/](http://www.gfz-potsdam.de/tereno/terenoindexing/projects/glam_de/)  
[www.uni-wuerzburg.de/geographie/uni-wuerzburg.de/fernstudium/mau/fernstudium/projekte/landuse\\_projects/glam\\_de/](http://www.uni-wuerzburg.de/geographie/uni-wuerzburg.de/fernstudium/mau/fernstudium/projekte/landuse_projects/glam_de/)  
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