

# The climate and soil moisture network at TERENO Northeastern German Lowland Observatory - DEMMIN

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## Objectives

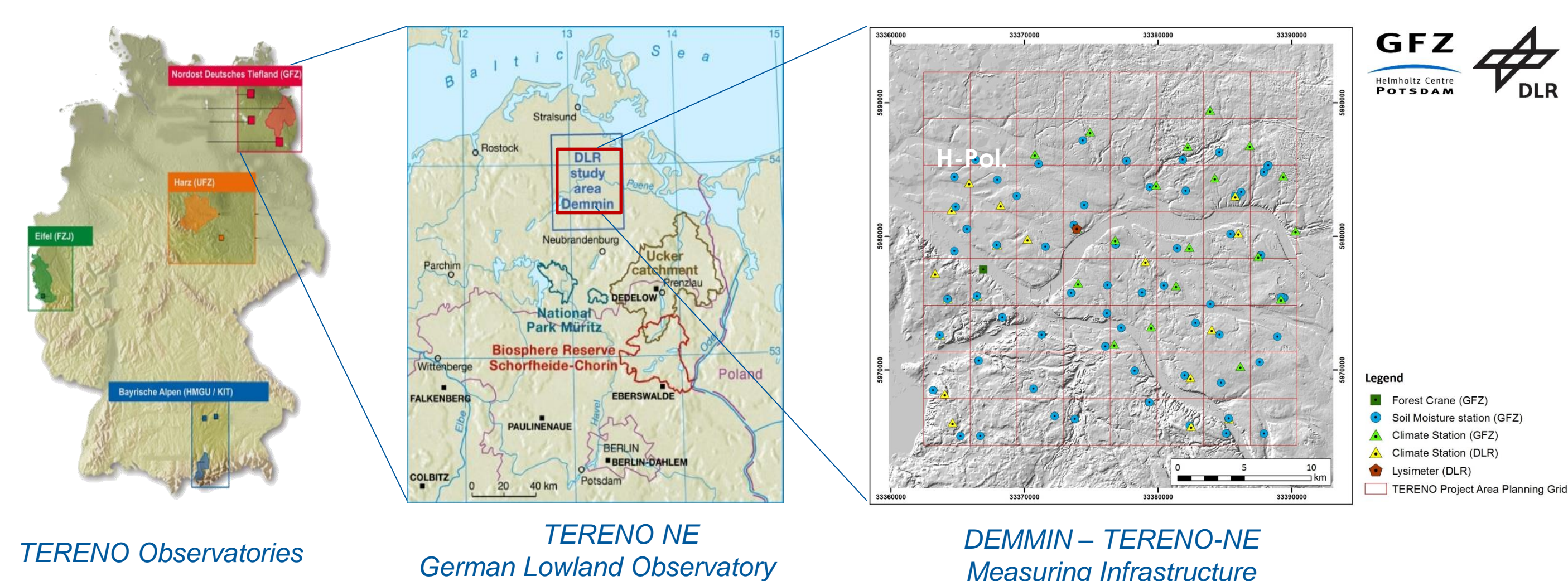
The goal of the TERENO initiative is the long-term monitoring and documentation of proposed climate change, changes in land use, social-economic developments and anthropogenic influences on terrestrial ecosystems. Therefore long-term observations of multitemporal environmental parameters at different scale are the basis for gathering information on changes of the available water resources, material flows, or further ecological changes.

The Durable Environmental Multidisciplinary Monitoring Information Network (DEMMIN®) located in the North-east of Germany was installed by German Aerospace Center in 1999 for Calibration and Validation of Remote Sensing data at agricultural areas. Due to its physiographic composition and typical agricultural management the area is a perfect test site for monitoring of relevant environmental parameters. Since 2009 the DEMMIN test field of 50 x 50 km is part of the Northeastern German Lowland Observatory (TERENO-NE), which is coordinated by Helmholtz Centre Potsdam – GFZ German Research Centre for Geosciences.

Because of the remote sensing focus of the DEMMIN test sites it is a perfect area to evaluate the potential of linking ground based in-situ data with remote sensing data analysis with view to the COPERNICUS initiative of the European Union (EU) and the European Space Agency (ESA).

## NE German Lowland Observatory - Test Site DEMMIN

The test site is an intensively used agricultural ecosystem. In the north the topography with an altitude difference 0 - 84,5 m above sea level is rather flat and in the south hilly to undulating. Cause of significant differences in parent substrate material and relief a high spatial variability of soil types are developed. The location of the gauging station is linked to this different conditions and its according landuse.

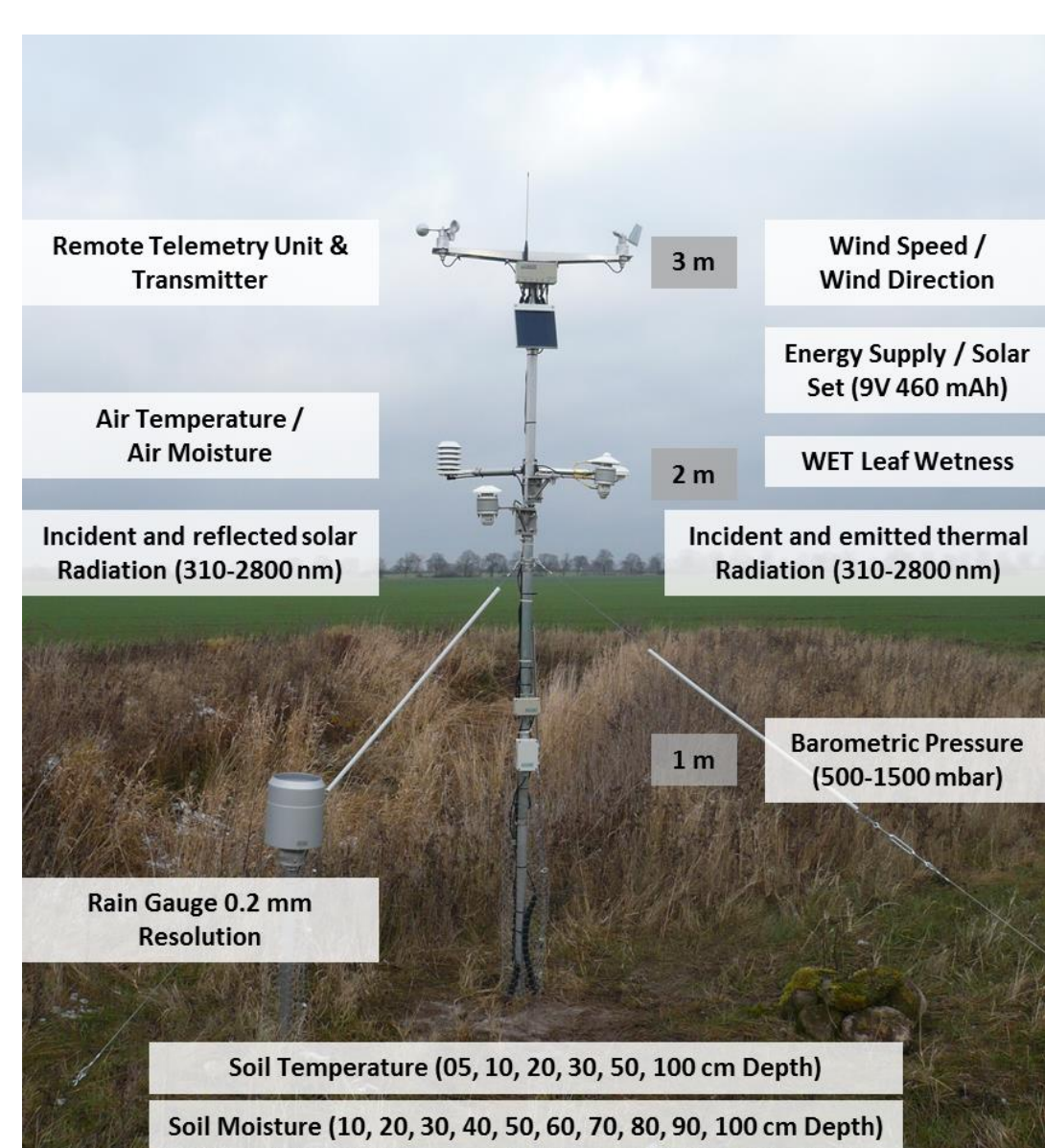


## Data

Data of climate and soil moisture network available at: **TEODOOR Online Portal**  
<http://teodoor.icg.kfa-juelich.de/tereno-online-portal-folder/data-search-portal/data-portals/germanlowlandobservatory>  
 Maps and Movies of climate and soil moisture network available at: **DLR DEMMIN-WEB Portal**  
<http://demminweb.dlr.de/node/89>

## Climate Network

DLR Neustrelitz established the DEMMIN® test field with 20 agro-meteorological gauging stations in 1999. Within the TERENO initiative the GFZ Potsdam added 20 additional gauging stations with 15 minute data logging interval. The stations are embedded in the DLR telemetry network for data transport. The data access for scientists and corporation farmers is web based.



Agro-meteorological gauging station Heydenhof (GFZ)

## Soil Moisture Network

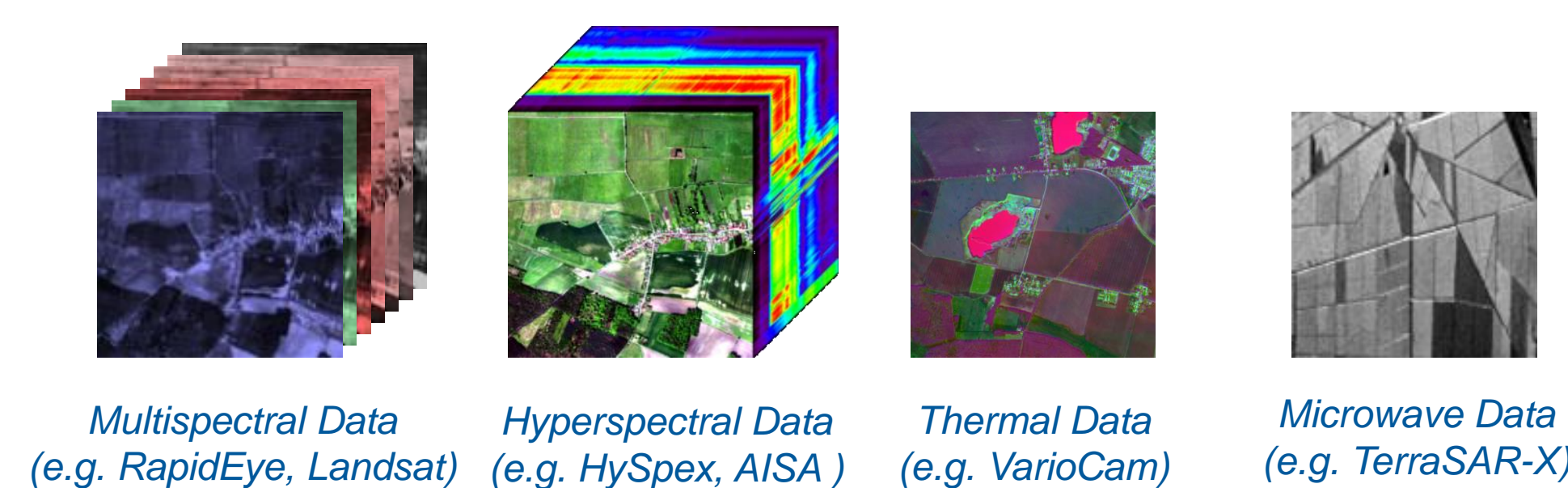
62 soil moisture gauging station are installed within the TERENO project. Each station is equipped with 6 SPADE sensors with measuring depths of 50cm (4x) and 70cm (2x). The gauging stations are located below agricultural fields to analyse the impact of different land use on soil water condition. In addition the soil characteristics are documented (~120 profiles) + laboratory analysis.



Soil moisture gauging stations Zarnekla and Nielitz

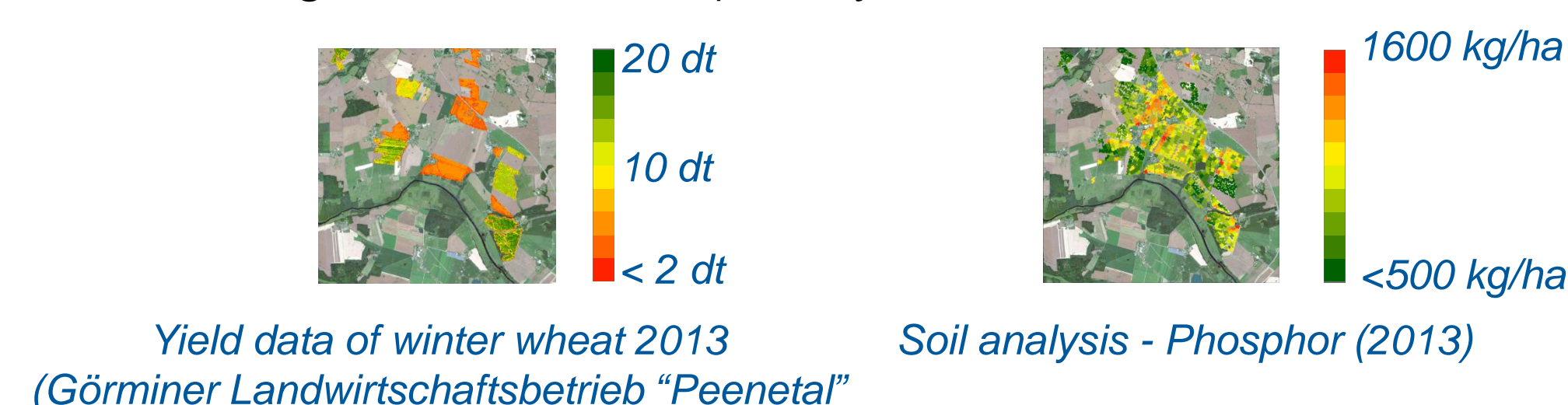
## Remote Sensing Data

The Demmin test site is excellently observed by diverse remote sensing sensors → about 50 observations / year:



## Information of Farmers

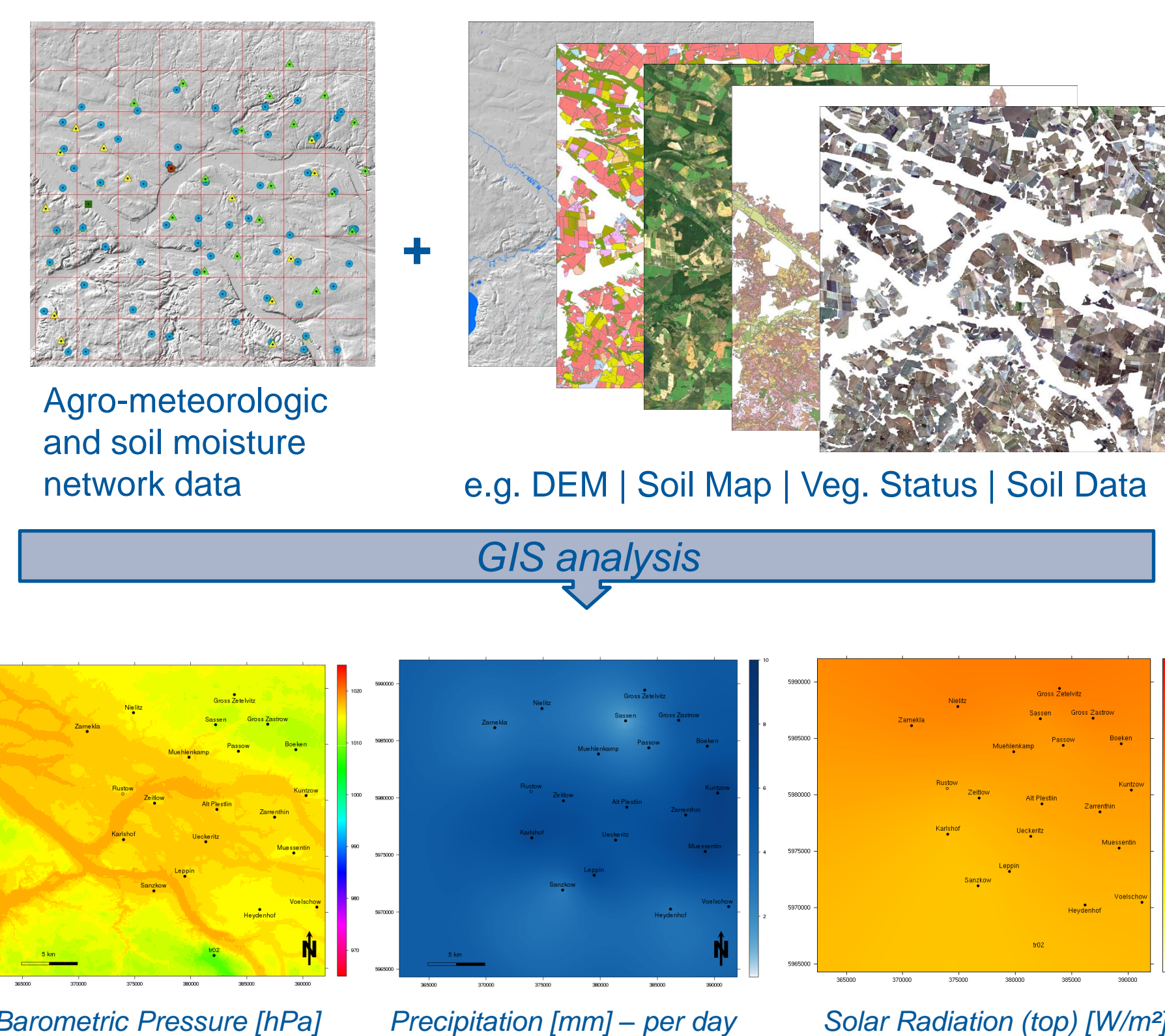
A close cooperation to many farmers has been established during the last few years. The farmers provide information about their crop management (sowing strategies, fertilizer etc.) and yield.



## Area Based Environmental Parameter Products

### Agro-meteorological Data

It is in development to produce daily maps of relevant environmental parameter based on the acquired data of the agro-meteorological network calculated by using GIS analysis. In dependence of the parameter the data of the point measurements are combined with information retrieved from DEM, vegetation information based on remote sensing data or soil information (soil maps + remote sensing data analysis).

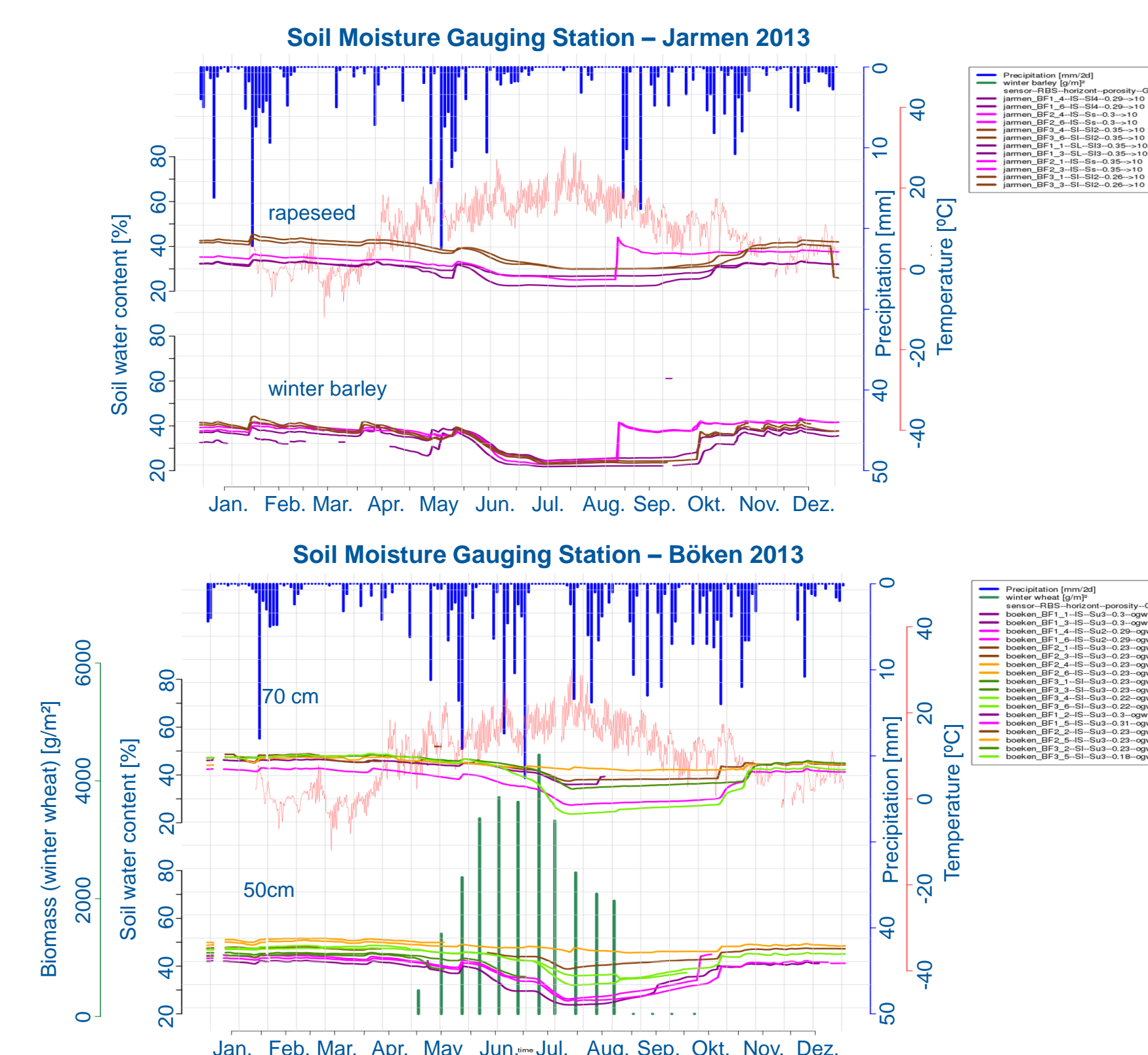


## Soil Moisture Data analysis

### Soil Moisture Data

The soil moisture data are analysed with regard to the impact of the site specific soil conditions and crop type and crop cover. The results show strong relationship between soil water content and crop type (top). The soil of winter barley (root zone up to 70cm depth) dries faster compared to the soil with rapeseed (root zone up to 150cm).

Lower picture shows data of different SPADE sensor installation depths.



## Outlook

The retrieval of area based environmental products is still under development. It is planned to combine the data of the agro-meteorological, the soil moisture network data and remote sensing data for retrieving input data for meso-scale climate modelling.

## Acknowledgements

We thank the German Federal Ministry of Education and Research (BMBF) for the financial support to the establishment and expansion of agro-meteorological and soil moisture network of TERENO-NE test area DEMMIN.