



TERENO Advisory Board Meeting, 16-17 Sept 2013, Klink/Lake Müritz

Welcome on behalf of GFZ German Research Centre for Geosciences

Oliver Bens, Achim Brauer, Knut Kaiser





As a member of the Helmholtz Association,
the GFZ is the

National Research Centre for Geosciences in Germany



- Foundation under public law
- Founded in 1992
- About 1110 employees



GFZ Locations

Main research centre: Potsdam

Branch offices:

- Adolf-Schmidt-Observatory for Geomagnetism, Niemegek
- KTB Deep Crustal Lab, Windischeschenbach
- Department 1, Section 1.2 Oberpfaffenhofen (Wessling)

Further research sites e.g.:

- **TERENO-NE**
- Magnetic Observatory Wingst
- Geothermal in situ Research Lab, Groß Schönebeck
- CO₂ Storage Research Lab, Ketzin
- Underground-Lab Freiberg
- Central Asian Institute for Applied Geosciences CAIAG, Kyrgyzstan


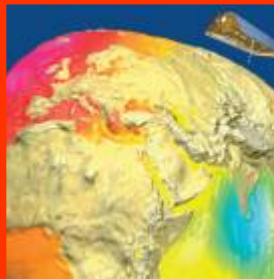







Helmholtz Research Fields

Energy	Earth and Environment	Health	Key Technologies	Structure of Matter	Transport and Space
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Programmes within research field „Earth and Environment“

 <p>Geothermal Energy</p>	 <p>Geosystem: The Changing Earth</p>	 <p>Atmosphere and Climate</p>	 <p>Polar Regions and Coasts</p>	 <p>Terrestrial Environment</p>
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Research Profile of GFZ

Earth System Analysis

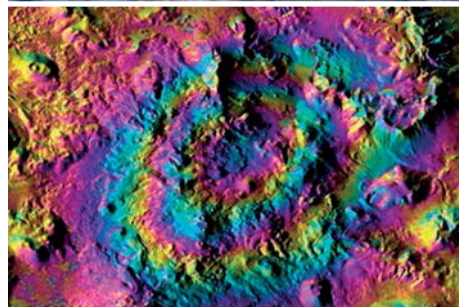
- Geodesy & Remote Sensing
- Physics of the Earth
- Geodynamics and Geomaterials
- Chemistry and Material Cycles
- Earth Surface Processes

Earth System Management

- Centre for Geological Storage
- Centre for Geothermal Research
- Centre for Early Warning
- Centre for Geoinformation Technology

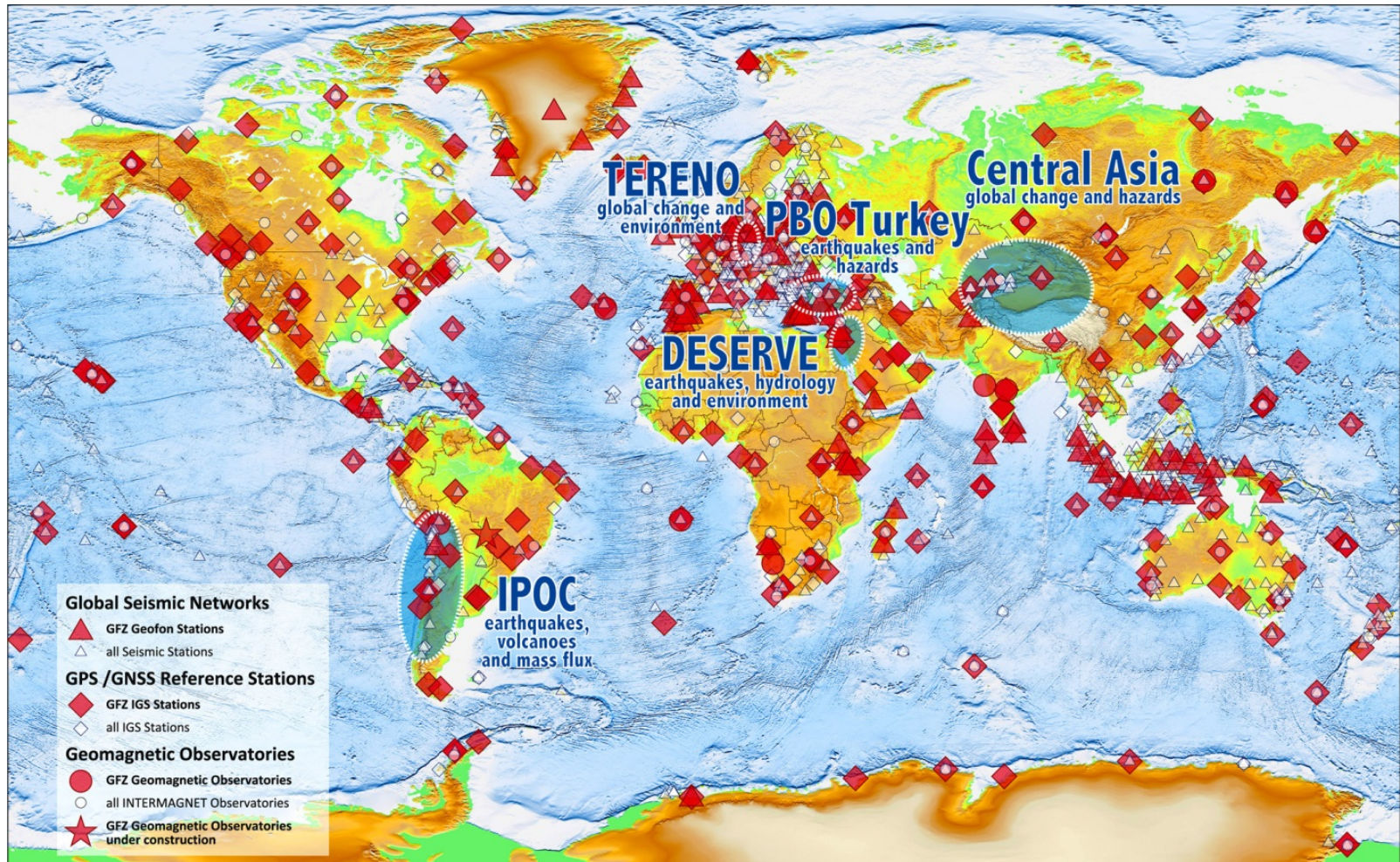
Earth System Monitoring

- MESI (Modular Earth Science Infrastructure)
- Earth System Observatories (Chile, Turkey, Central Asia, Middle East)
- Global Networks (e.g. GEOFON)
- TERENO (Terrestrial Environmental Observatories, Helmholtz, Germany)



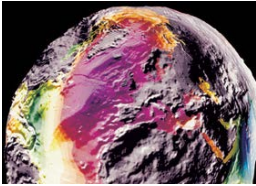


GFZ Earth System Observatories





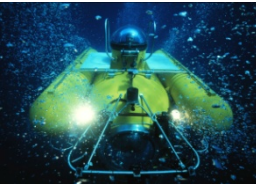
Research Programmes within the Research Field Earth and Environment



- **Geosystem: The Changing Earth**
(GFZ, GEOMAR)



- Marine, Coastal and Polar Systems



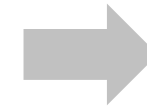
- Oceans: From the Deep Sea to the Atmosphere



- **Atmosphere and Climate**
(KIT, GFZ)



- **Terrestrial Environment**
(FZJ, UFZ, HMGU)



Cross-
-
Programme-
-
Activity



Why did we establish the Northeastern German Lowland Observatory?

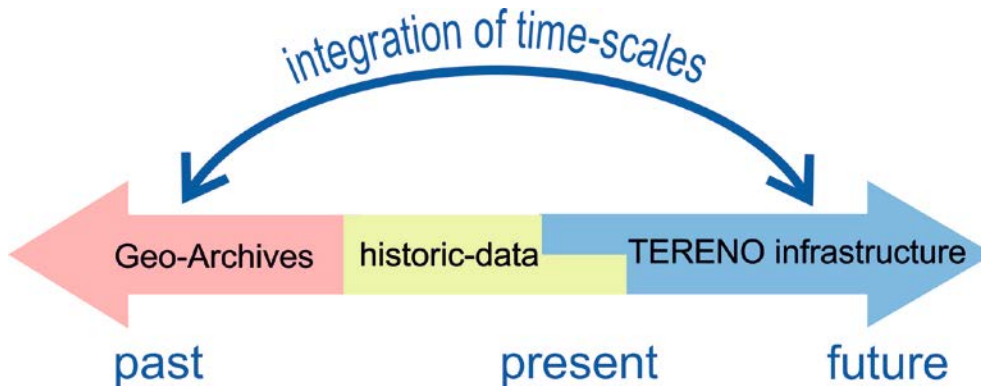


With respect on the impact of climate change, NE Germany is one of most vulnerable regions in central Europe!

Source: R. Glaser

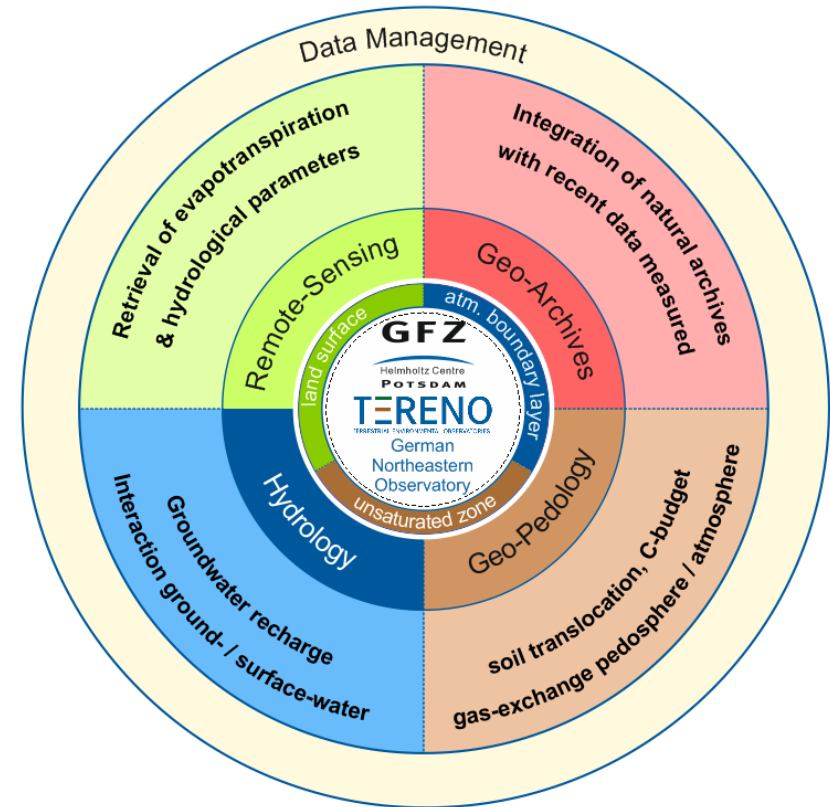


TERENO-NE: Concept (II)



Combining geoarchives (lake sediments, trees, soils) with recent observations (monitoring) enables to distinguish short-time dynamics from long-term climatic and anthropogenic trends.

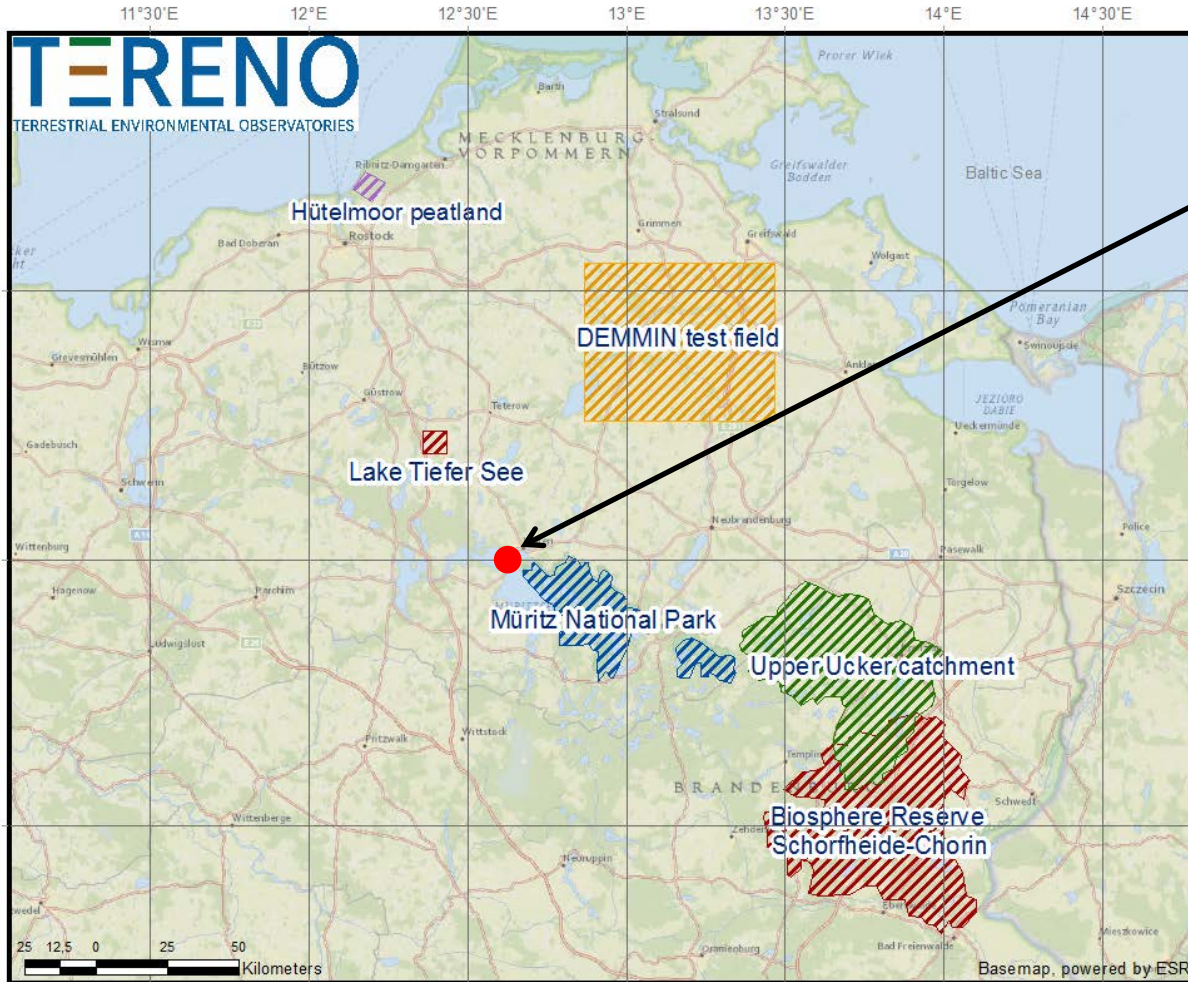
= methodical add-on (even applied by GFZ in other observatories: Eifel, Ammer)



TERENO-NE is investigating four subject groups: geoarchives, geopedology (incl. GHG exchange and microbial comm. of peatlands), hydrology and remote sensing – supported by central data management.








TERENO-NE: Research Sites



*AB Meeting 2013
 (Klink / Müritzn)*

Scaling / spatial properties:

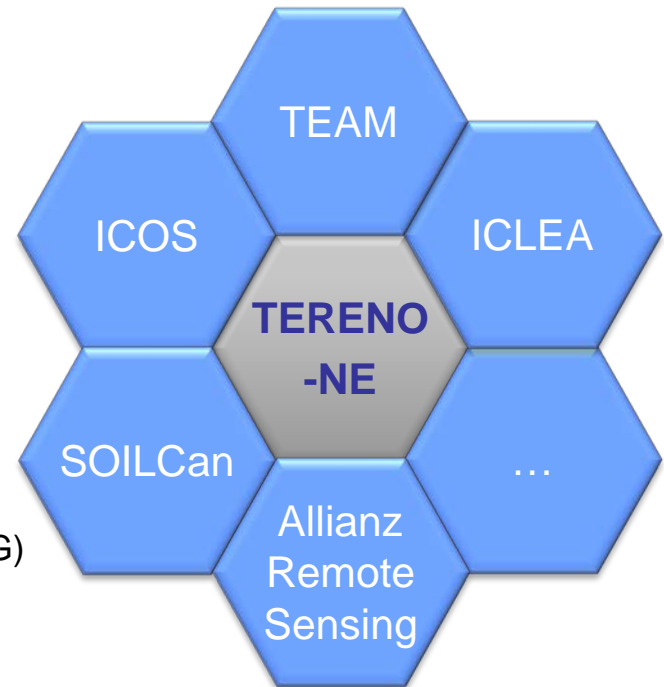
- Representing a large region (lowland of northern central Europe)
- Catchment-oriented (in parts)
- Densification by integration of single sites

 Geoarchives
  Hydrology, Geoarchives, Geopedology
  Remote Sensing, TEAM
  Geopedology
  TEAM, University of Rostock



TERENO-NE: A Research Network (I)

- **TERENO-NE**
Northeastern German Lowland Observatory
- **ICOS**
International Carbon Observing System
- **SOILCan**
Lysimeter project
- **ICLEA**
Virtual Institute of Climate and Landscape Evolution Analyses
- **TEAM**
Trace Gas Exch. in the Earth-Atmos. System on Multiple Scales (HHYIG)
- **Remote Sensing and Earth System Dynamics**
Helmholtz Alliance





TERENO-NE: A Research Network (II)



+ Universities: Berlin, Cottbus, Greifswald, Potsdam, Rostock



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Set-up of TERENO-NE: instrumentation period 2011-2013



Drilling of groundwater wells at Lake Hinnensee



Construction of a lysimeter at Dedelow



Radiometer built at WSL

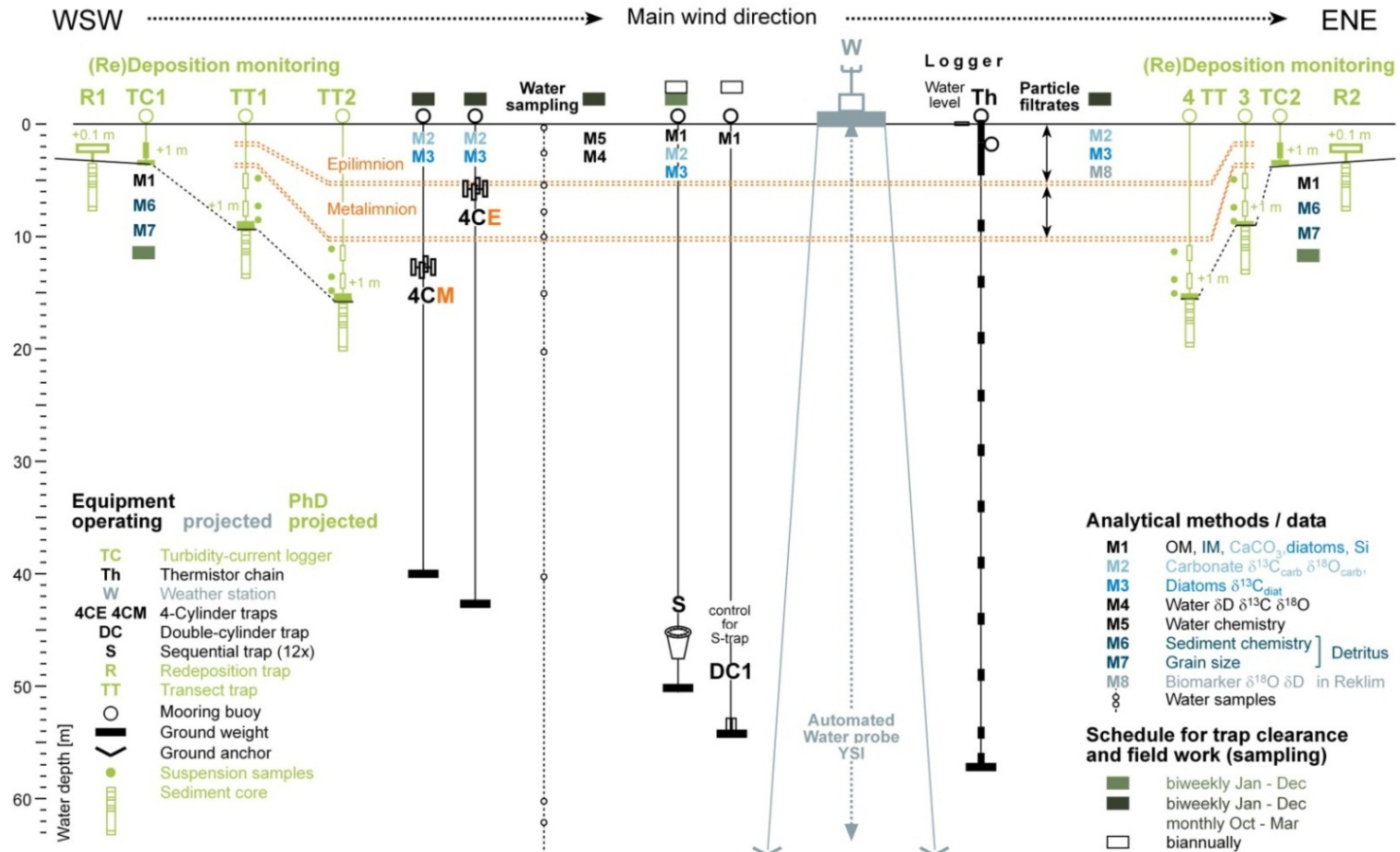


Research crane at Drönnewitz



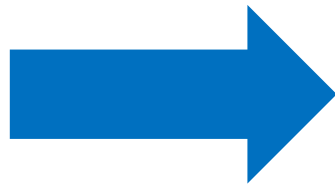
Exemplary Research Activities – Geoarchives & Landscape Development:

Lake sediment formation: Tiefer See/Klocksinn





Exemplary Research Activities – Hydrologie & Geoarchives: *Water and tree rings: catchment of Lake Fürstenseer See-Hinnensee*



See both the presentation of Theresa Blume/GFZ in session 2 this afternoon (“Hydrology of a forested groundwater-dominated lake system: structures and processes”) and the excursion tomorrow...




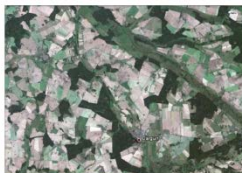






Exemplary Research Activities – Coupling Pedosphere & Atmosphere: *GHG fluxes of peatlands*

- **Multi-scale** direct **measurements** of GHG flux
- Quantification and understanding of interactions **across temporal and spatial scales**
- **Modeling and scaling** from local to regional



Method	Scale	TERENO Site
	Airborne eddy covariance regional (1000–100.000 km ²)	
	Airborne eddy covariance subregional (10 – 10.000 km ²)	
	Ground-based eddy covariance Ecosystem scale (0,01 – 10 km ²)	



Exemplary Research Activities – Soil & Land Use:

Soil erosion/sedimentation and C-budget: Ucker River catchment (start 2013)

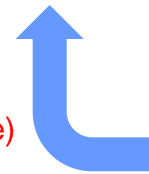


Change of soil landscapes,
soil moisture, evapo-
transpiration, vegetation
(interface to biosphere and
atmosphere)

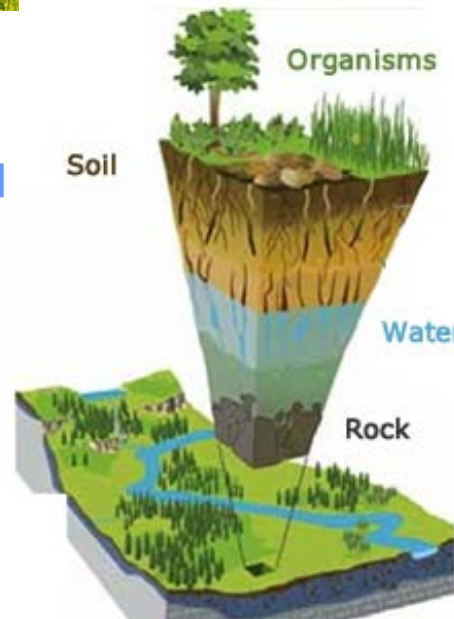
Air



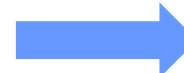
Turnover of SOM,
GHG budget
(interface to atmosphere)



Soil



Translocation of matter/erosion,
palaeosols/ fossil C/ buried land
surfaces, input of matter in
inland waters
(interface to geochronology)



Weathering
(interface to geosphere)

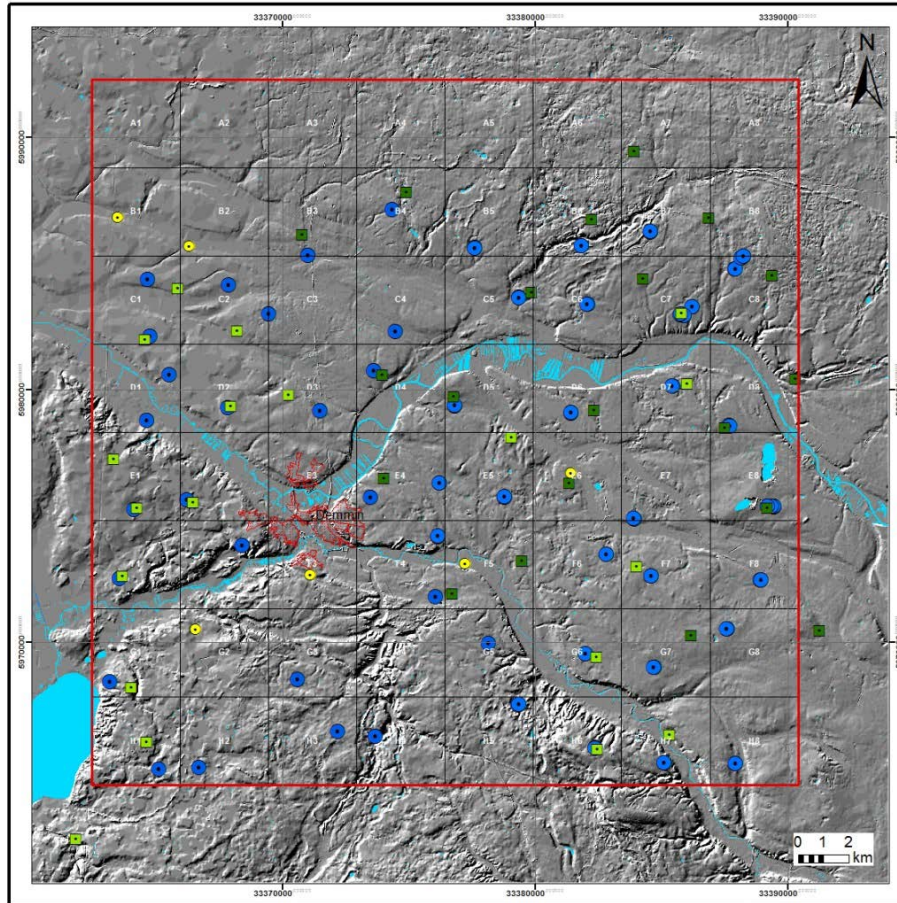


Soil water budget, matter
fluxes in unsaturated zone
(interface to hydrosphere)





Exemplary Research Activities – Remote Sensing: *DEMMIN test area*



- Focus: detection of evapo-transpiration, land cover and soil properties by remote sensing (work is performed in close cooperation with DLR and BGR)
- Instruments: met stations, soil moisture monitoring network, research crane

Monitoring network at DEMMIN test site



TERENO-NE: further information

- Report for the Advisory Board (just at hand...)
- Presentation of Harry Vereecken today (just in advance...)
- Central TERENO information and data portal „TEODOOR“
(just by clicking <http://teodoor.icg.kfa-juelich.de/overview-de>)
- A growing number of publications
- Asking the GFZ representatives being here...



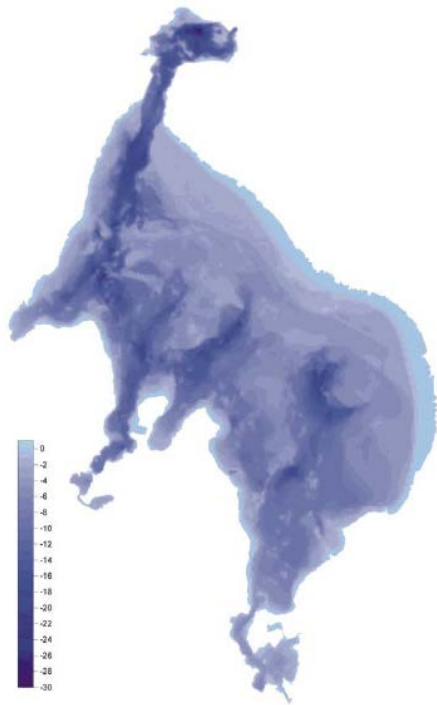
Information on the locality (region: Mecklenburg Lake District)





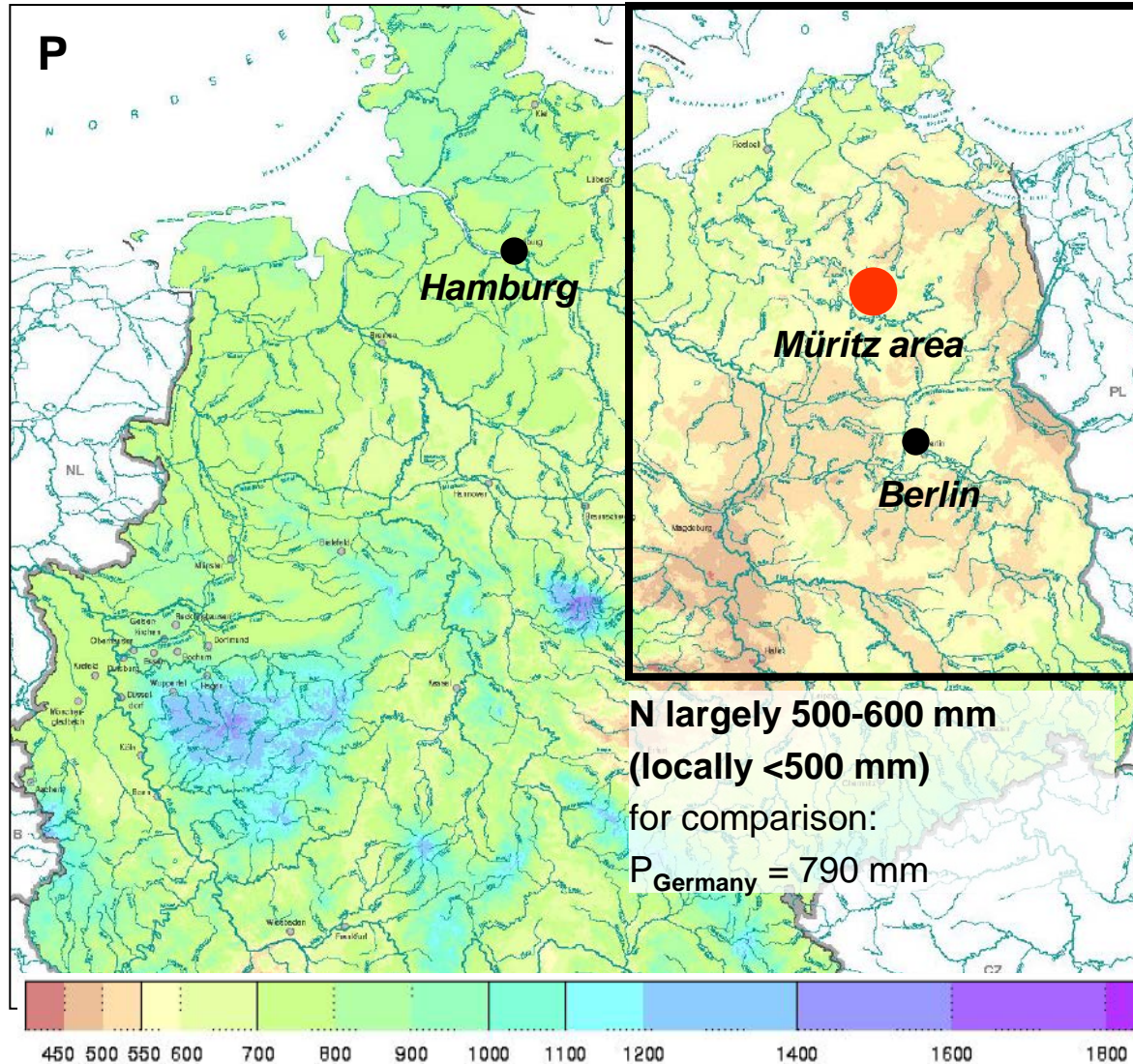
Lake Müritz

- „Müritz“ from Slavonic (Polabic) „More“ = „Meer“ (Sea)
- 117 km², 62 m HN, 25 m H_{Max}, 6 m H_{Mean}, c. 20 km N-S-distance
- Drainage via Elde and Elbe river to North Sea
- Fed dominantly by precipitation and groundwater
- polymiktic, (dominantly) mesotrophic, high biodiversity
- At least 4x „hotspot“: for nature conservation, water management, tourism, science...
- Colorful lake history...
(20th century: eutrophication -> re-mesotrophication!)





Climate

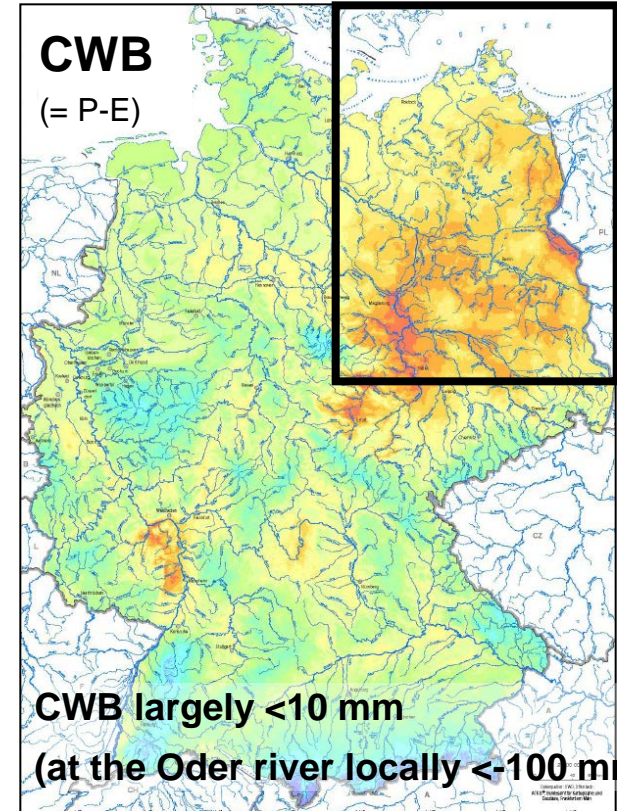


Mean annual precipitation [mm]

HAD 2003

CWB

(= P-E)



Lake Müritz area:

- oceanic-continental transition
- mean annual precipitation: 550 mm (SE) to 650 mm (NW)
- mean annual temp.: 8 °C



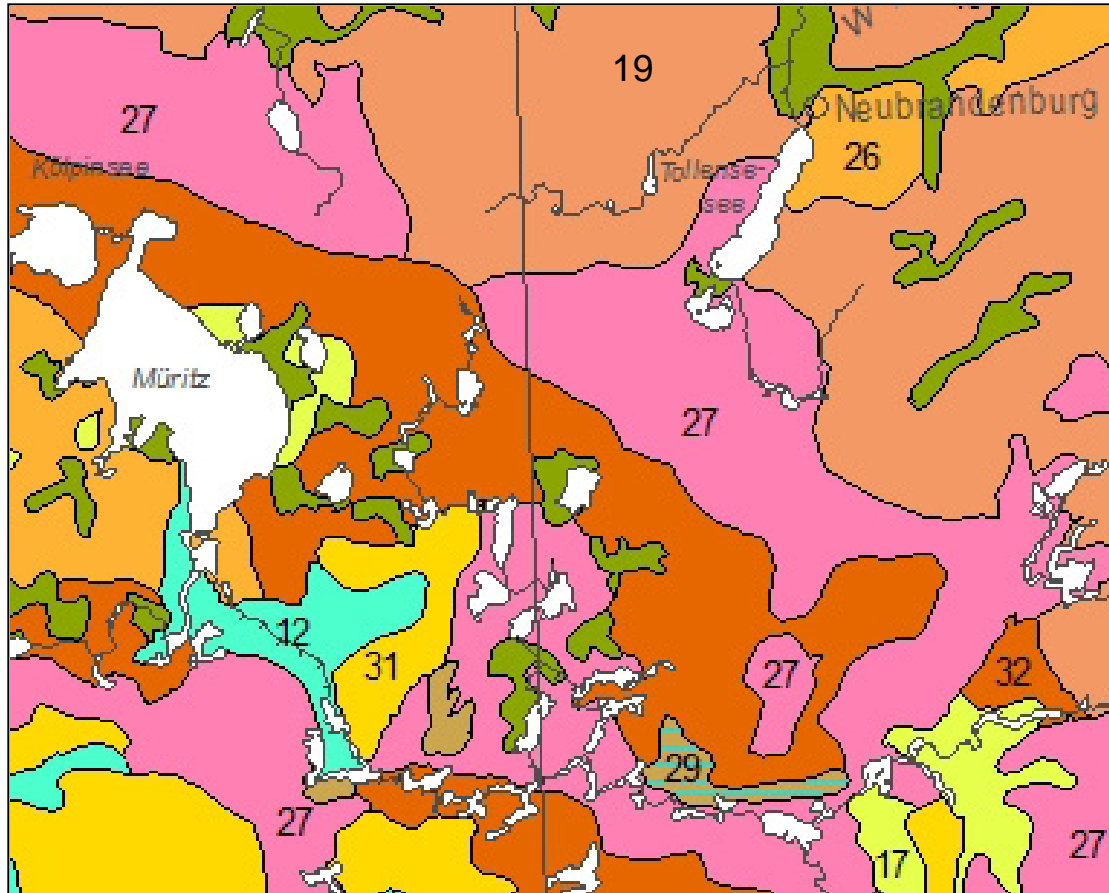
Geology



GÜK 500 MV, LUNG 2000



Soils



BÜK 1000, BGR 1998

- In general: dominantly anhydromorphic („dry“) soils (MLD: 90 %)
- „19“: Luvisol (Lessivé) pattern of the till plains
- „27“: Cambisol pattern (nutrient rich) of the terminal moraine zones
- „32“: Cambisol pattern (nutrient poor) of the outwash plains
- „17“: Podzol pattern of fluvial and aeolian deposits (river and dunes)



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Vegetation (actual)

Outwash plains: pine-dominated



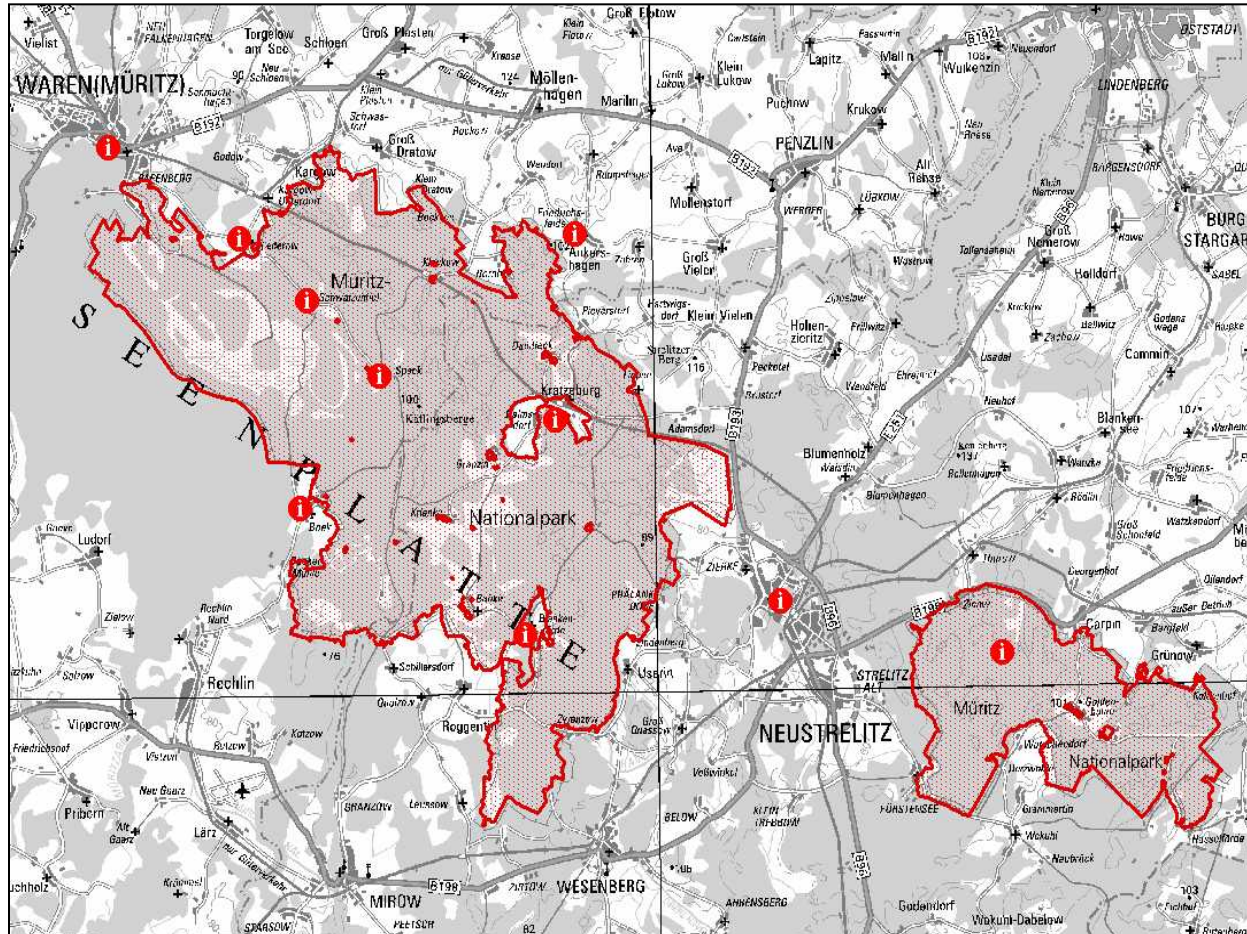
Till plains and terminal zones: beech-dominated



- due to widespread nutrient-poor (sandy) sites: large forest portion in the region
- forests were dominantly re-established in the 18th/19th centuries (after medieval clear-cutting)
- managed pine forests generally dominate
- c. 70 % pine, 10 % beech and oak, 20 % rest (e.g. wet sites with alder and ash)
- potentially natural vegetation (even at outwash plain/dune sites!) is (oak-) beech forest



Müritz National Park (I)

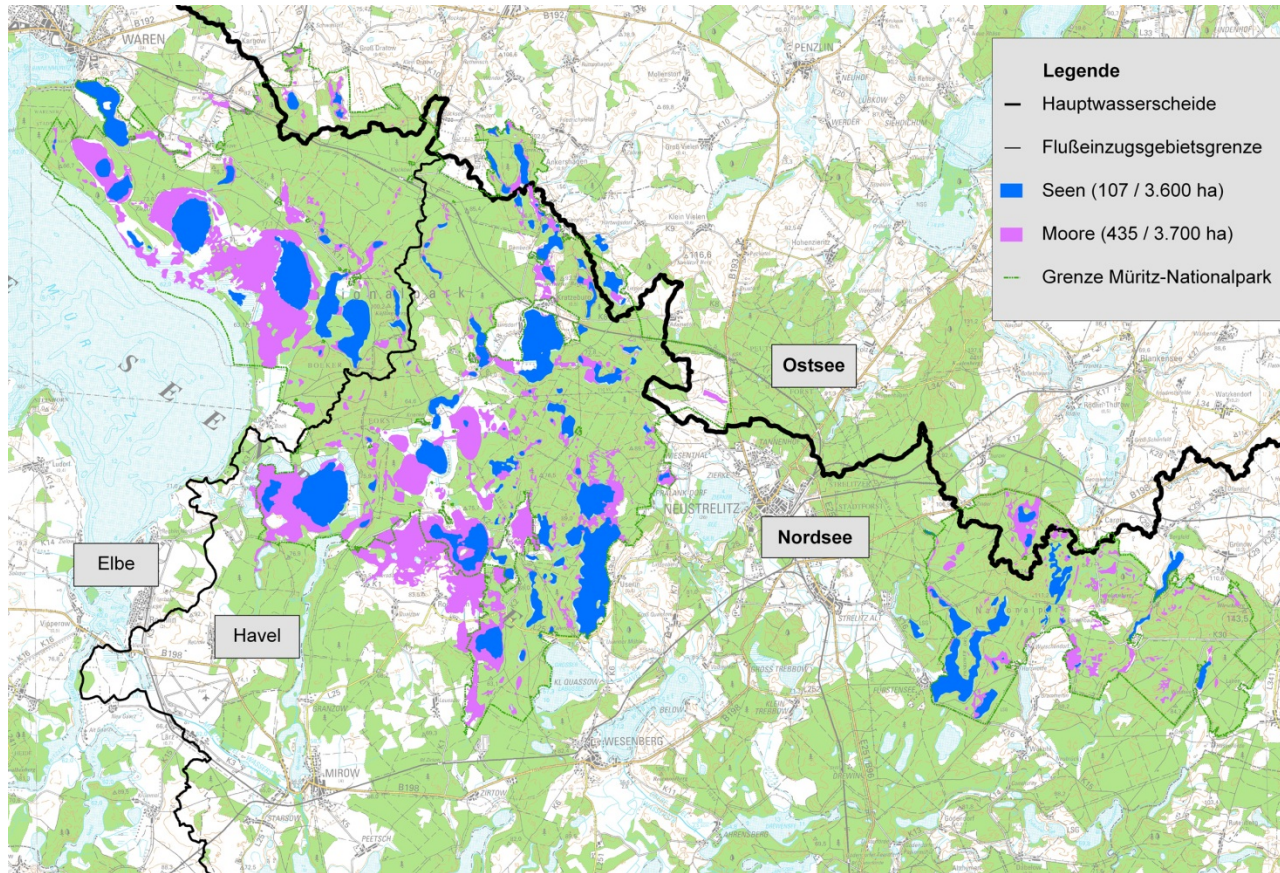


- founded in 1990
- area = 322 km²; largest German terrestrial national park
- two parts („Müritz“ = 260 km², „Serrahn“ = 62 km²)
- protective purpose: natural ecosystem dynamics
- area distribution: 72 % forest (of different closeness to nature!), 13 % lakes, 8 % peatlands, 5 % grassland, 2 % arable land

<http://www.natur-mv.de>



Müritz National Park (II)



Ecosystems particularly worthy of protection:

- lakes
- lakeshores
- peatlands
- near-natural deciduous forests (particularly beech forests at terminal moraine sites)

In general:

- Zonation -> „national park in development“

Kobel & Spicher 2010



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History, settlement, economy



- permanent settlement of the region since the Final Palaeolithic (Lateglacial/Alleroed)
- Slavonic settlement from the 7th to the 12th century AD
- German settlement since the very late 12th century AD (town foundations in the 13th century AD)
- primarily agri- and silvicultural land-use
- service and industrie in the larger towns (Waren/M., Röbel and Neustrelitz; 15.000-30.000 inhab.)
- large touristic significance of the region