Workshop

Frontiers in Soil System Science

09–11 February 2026 | LEUCOREA Wittenberg

Motivation for the Workshop

Over the last decade, soils have increasingly become a focal point in environmental research. They play a central role in local and global water and nutrient cycles, thereby providing essential ecosystem functions and services. These include biomass production, water retention, pollutant degradation, carbon storage, nutrient cycling, and serving as a habitat for an immense diversity of organisms.

Understanding soil functions requires a systemic approach because soil is a complex dynamic system influenced by multiple interacting biological, chemical, and physical processes. A systemic perspective is crucial for addressing challenges like soil degradation, carbon sequestration, and sustainable agriculture, as it enables us to understand feedback loops, emergent properties, and long-term changes in soil systems.

It is a formidable scientific challenge to unravel the interacting processes and translate our understanding into quantitative models that can describe and predict the changes in soils and their properties in response to external forcings. The main drivers today are climate change and the management of soils across a wide range of land use intensities.

Over the last 20 years, soil research provided ample evidence that an interdisciplinary approach is essential - one that integrates the various subdisciplines of soil science, including plant and rhizosphere research, contributing to the systemic perspective required for the transformation of agricultural and food systems. In this workshop, scientists from diverse disciplines are being brought together to discuss future perspectives for a systemic study of soil functions and the development of models having predictive power for future scenarios where empirical data are scarce.

Various experts will cover key topics of soil functionality: water & matter fluxes, carbon storage, nutrient cycling and soil-plant interactions. The presentations are geared towards the following guiding questions:

- What are the critical obstacles or difficulties for an improved understanding of soil functions with regard to their development under changing conditions?
- What are success stories in soil system science and are there new promising techniques and methodological approaches to provide deeper insights?
- Where is the optimal balance between data-driven approaches and process-based modelling?

We are looking forward to inspiring presentations and discussions!

Sara König, Steffen Schlüter, Doris Vetterlein, Hans-Jörg Vogel und Ute Wollschläger

Day 1 – Monday, 9 February 2026

LEUCOREA

Address: Collegienstraße 62, 06886 Lutherstadt Wittenberg

Venue: Auditorium maximum

Lunch: Seminar room 3 and 4 – 2nd floor

12:30 - 13:00	**Arrival and Registration** Coffee will be served
13:00 – 13:30	Introduction and core ideas by Hans-Jörg Vogel
Session topic: Characterization of soil functioning via indicators – how to address „soil health“? Chair: Ute Wollschläger (UFZ)	
13:30 – 14:00	**Keynote:** Developing indicators to protect Soil Quality and Health: a French perspective *Cousin, I. (INRAE)*
14:00 – 14:30	Underpinning our knowledge on the selection of soil indicators to monitor soil functions *Vazquez, C., Bünemann, E. K., Soinne, H., Cheval, P., Basile, A., Bacq-labreuil, A., Mulder, T., Chavez Rodriguez, L., Nordén, J., David, F., Cunha, L., Imbert, C., Boix-Fayos, C., Di Lonardo, D.P, Garsia, A., Creamer, R. E. (WUR)*
14:30 – 15:00	What is a healthy soil? A search for biological indicators for soil functioning and carbon storage *Febbi, C., Fiore-Donno, A. M., Bonkowski, M. (U Cologne)*
15:00 – 15:30	Session discussion
15:30 – 16:00	**Coffee break**
Session topic: Feedbacks between plants, water and soil structure Chair: Mathieu Javaux (U Louvain)	
16:00 – 16:30	**Keynote:** Explaining plant water relations from soil physical principles: evolutionary convergence and uncertainties *Carminati, A. (ETHZ), Javaux, M., Wankmüller, F. and Brodribb, T.*
16:30 – 17:00	Legacy of rhizosphere processes *Vetterlein, D. (UFZ)*
17:00 – 17:30	The effect of soil structure dynamics on soil hydraulic properties and soil water dynamics *Diamantopoulos, E. (U Bayreuth), Nielsen, M., Vdovenko, D., Leuther, F.*
17:30 – 18:00	Session discussion
18:00 – 19:00	**Poster session & socialize**
19:00	**Dinner** at Best Western Soibelmanns Hotel, followed by a get-together in the same room (open end)

Day 2 – Tuesday, 10 February 2026

Session topic: The biological control of soil functioning Chair: Lukas Wick (UFZ)	
08:30 – 09:00	**Keynote:** Successional foundations of soil ecosystem services: ecological and biogeochemical frontiers for sustainable farming systems *Bodner, G. (BOKU)*
09:00 – 09:30	**Keynote:** Earthworms as the soils' movers and shakers *van Groeningen, J. W. (WUR)*
09:30 – 10:00	The habitable pore surface determines microbial cell density and interaction potential in soil *Schmidt, H. (U Vienna), Schlüter, S., Felde, V. J. M. N. L., Raynaud, X., Pollak, S., Pjevac, P., Schuster, R., Halisch, M., Braunmiller, H. M., Koebernick, N., Handschuh, S., Zeller-Plumhoff, B., Guseva, K., Richter, A., Nunan, N.*
10:00 – 10:30	Session discussion
10:30 – 11:00	**Coffee break**
Session topic: Conceptualizing carbon cycling Chair: Anke Herrmann (SLU)	
11:00 – 11:30	**Keynote:** Soil type // texture // organic matter *Kögel-Knabner, I. (TU Munich)*
11:30 – 12:00	Disentagling the factors driving the formation of persistent mineral-associated soil organic matter *Kaiser, K. (U Halle), De Shorn Bramble, Brandt, L., Ulrich, S., Yuan, Y., Mikutta, R., Poll, C., Schöning, I., Kandeler, E., Schrumpf, M.*
12:00 – 12:30	Effect of water content, temperature and N availability on microbial carbon use efficiency and potential contribution of microbial residues to SOM formation *Miltner, A. (UFZ), Yang, S., Rupp, A., Maskow, T., Kästner, M.*
12:30 – 13:00	Session discussion
13:00 – 14:00	**Lunch** – Seminar room 3 and 4
14:00 – 16:00	**City walk through Wittenberg** - Coffee to follow
Session topic: The intricate paths of the nitrogen cycle Chair: Reinhard Well (Thünen Institute)	
16:00 – 16:30	**Keynote:** Deep roots of crops and its interactions with nitrogen as a mobile nutrient in the soil *Thorup-Kristensen, K. (U Aarhus)*
16:30 – 17:00	Converting mineral nitrogen into soil organic matter *Brüggemann, N. (FZJ), Wissel, H., Zhao, K., Reichel, R.*
17:00 – 17:30	Impacts of climate and management on grassland N cycling and losses *Kiese, R. (KIT), Dannenmann, M. et al.*
17:30 – 18:00	Session discussion
18:00 – 19:00	**Poster session & socialize**
19:00	**Dinner** - at Best Western Soibelmanns Hotel

Day 3 – Wednesday, 11 February 2026

Session topic: Systemic soil modelling to support sustainable soil management Chair: Katarina Meurer (SLU)	
08:30 – 09:00	**Keynote:** Systems Modelling Approach to Sustainable Soil Management *Wang, E. (CSIRO)*
09:00 – 09:30	Mechanistic Modelling of soil functions in agroecosystems *König, S. (UFZ), Weller, U., Ansorge, J., Franke, L., Gasser, A., Heller, O., Kanagarajah, L., Rüschhoff, J., Wollschläger, U., Vogel, H.-J.*
09:30 – 10:00	In silico analysis of carbon stabilisation by plant and soil microbes for different weather scenarios *Giraud, M., Kürsad Sırcan, A., Streck, T., Leitner D., Lobet, G., Pagel, H., Schnepf, A. (FZJ)*
10:00 – 10:30	Session discussion
10:30 – 11:00	**Coffee break**
Final discussion Chair: Steffen Schlüter (UFZ)	
11:00 – 13:00	Synthesis on challenges, success stories and the road ahead for soil system research and modelling
13:00	**Closing** Lunch packs will be provided

Instructions for Authors

Oral presentations

Each oral presentation lasts 30 minutes, including discussion. Please prepare a 20-minute presentation followed by 10 minutes for discussion. All presentations must be provided as MS PowerPoint files or PDFs. Please arrive in your session room at least 10 minutes before the session starts and check that your presentation runs correctly. Mac users are advised to test the compatibility of their presentations on Windows in advance.

Please upload your presentation to the cloud drive at: https://nc.ufz.de/s/4E8P69dwX6ANt6m using the following password: **m+0TMn0QWy**.

Please use your name as the file name, e.g. *familyname.givenname_2026*. For backup reasons, please also keep the file available on a USB stick.

Poster presentations

All posters will be displayed throughout the entire conference. Posters are organized by number (see the program and the list displayed in the poster area). Presenters are requested to mount their posters on the assigned boards by **Monday, 9 February, 1:00 pm** at the latest. Materials (pins) for attaching posters to the boards will be available at the poster boards or can be collected at the registration desk. The poster format is **A0, portrait**. Please remember to remove your poster at the end of the conference.

Poster

Session topic: Characterization of soil functioning via indicators – how to address „soil health“?

1. Predicting soil microbial activity and pesticide fate at field scale using digital sensing technologies
   Uksa, M., Zhang, Y., Werban, U., Fu, Q., Miltner, A., Reemstma, T., Harms, H. and Wick, L. Y. (UFZ)

2. Quantitative evaluation of soil functions: potential and state. Application to the data of the German Agricultural Soil Inventory
   Wollschläger, U. (UFZ), Don, A., Poeplau, C., Weller, U., Wiesmeier, M., Vogel, H.-J.

3. Addressing bias in soil health assessments
   Vazquez, C. (WUR), Creamer, R. E.

Session topic: Feedbacks between plants, water and soil structure

4. Changes in soil structure and soil hydraulic properties
   Leuther, F. (U Bayreuth), Nielsen, M., Diamantopoulos, E.

5. Soils as CO2 sinks? - The importance of dynamic disequilibria in soil systems
   Sommer, M. (ZALF) & Gerriets, M. R.

6. Long-term perennial management leads to the formation of a functionally distinct pore architecture that regulates both carbon storage and water transport
   Geers-Lucas, M. (TU Berlin)

7. Efficient calculation of the gas diffusion coefficient and heat conductivity from soil structure
   Böhm, K., Ippisch, O. (TU Clausthal)

8. Soil structure evolution in a Swedish garden soil over a six year period
   Fu, Y., Dessiex, G., Vorkauf, M., Koestel, J. (Agroscope)

9. Capturing the complex interactions of maize roots with soil at different experimental scales
   Tarkka, M. (UFZ), Phalempin, M., Lippold, E., Bouffaud, M. L., Reitz, R., Vetterlein, D., Würsig, H.

Session topic: The biological control of soil functioning

10. Leveraging expert knowledge and genomic information for projecting carbon cycling and crop dynamics
    Pagel, H. (FZJ)

Session topic: Conceptualizing carbon cycling

11. Describing surface residue decomposition for water, carbon and nitrogen balances in Daisy
    Grønning, C. R. (U Kopenhagen), Leed Madsen, A., Abrahamsen, P.

12. Structural effects on microbial respiration on the aggregate-scale
    Heinze, W. M. (SLU), Pihlap, E., Herrmann, A. M., Nunan, N., Simonsson, M., Larsbo, M.

Session topic: The intricate paths of the nitrogen cycle

13. Mitigation measures of crop cultivation to reduce climate impacting emissions from denitrification
    Well, R. (Thünen Institut), Stenfert Kroese, J., Buchen-Tschiskale, C., Cordes, J., Dechow, R., Dittert, K., Dix, B., Fuchs, K., Gattinger, A., Grosz, B., Hauschild, M., Jarrah, M., Kühne, J., Mielenz, H., Potthoff, T., Scheer, C., Schulz, F., Simpson, C. and Wolf, B.

14. Testing DAYCENT's former and current denitrification functions within the agroecological model Daisy
    Klöffel, T. (U Kopenhagen), Svane, S. F., Grønning, C. R., Jensen, L. S.

15. Identification of N-efficient agricultural management using fertilizer ^{15}N recovery and field N balance in arable soils
    Simpson, C. (KIT), Dix, B., Hauschild, M., Stenfert Kroese, J., Cordes, J., Potthoff, T., Kühne, J., Dittert, K., Buchen-Tschiskale, C., Well, R., Gattinger, A., Scheer, C., Wolf, B.

Session topic: Systemic soil modelling to support sustainable soil management

16. What is the impact of land cover on subsoil hydraulic and physical properties? (6)
    Lengrand, A. (UC Louvain), Javaux, M.

17. Constraining Soil Nitrogen Turnover in Biogeochemical Models with ^{15}N Tracing Data
    Fuchs, K. (KIT)

18. Harnessing Machine Learning for Multi-Scale Soil Health Insights: From National Mapping to Continental Trend
    Sakhaee, A. (Thünen Institut), Schneider, F.

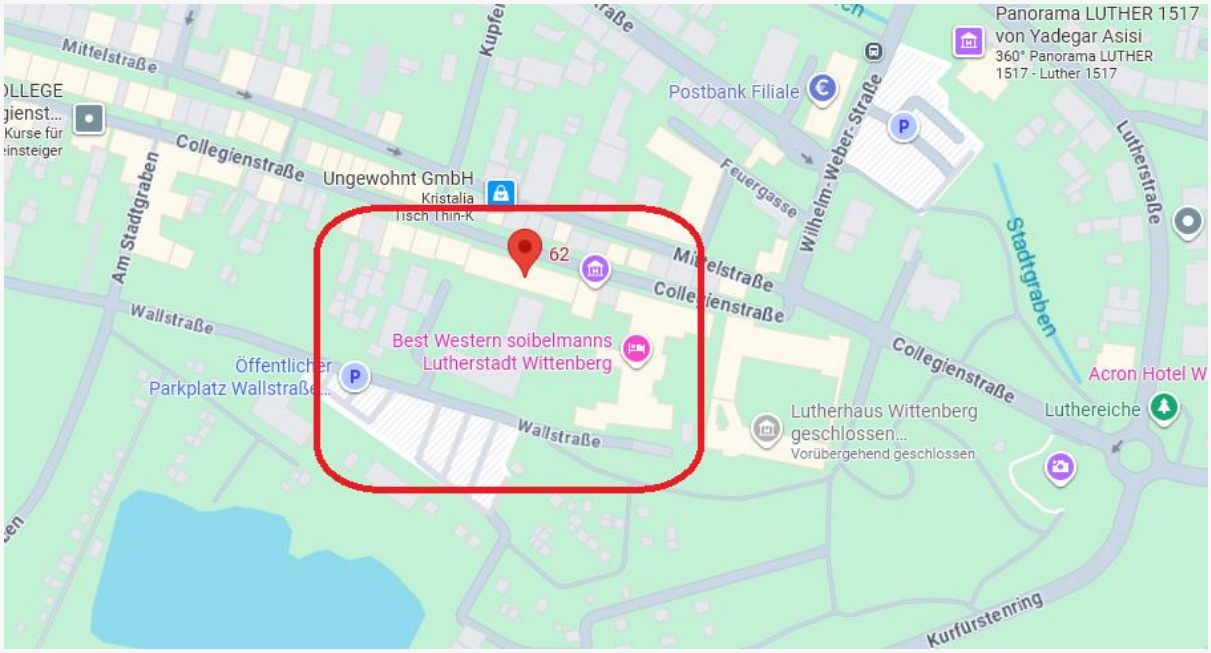
19. Breaking soil - An energy-based approach to predict tillage effects on soil structure
    Heller, O. (Agroscope), Carminati, A., König, S., Koestel, J., Vogel, H. J., Weller, U. and Keller, T.

20. Coupling of dynamic root architecture models with axisymmetric rhizosphere models
    Leitner, D. (FZJ), Schnepf, A., Vanderborght, J., Vereecken, H.

21. The power mean as a powerful tool upscaling processes and properties in Soil System Science
    Stange, F. (BGR)

Directions - to Best Western Soibelmanns Lutherstadt Wittenberg and the LEUCOREA Foundation

The LEUCOREA is located in the south-eastern part of Wittenberg's town center, between Collegienstraße and Wallstraße, directly adjacent to the Best Western Hotel.



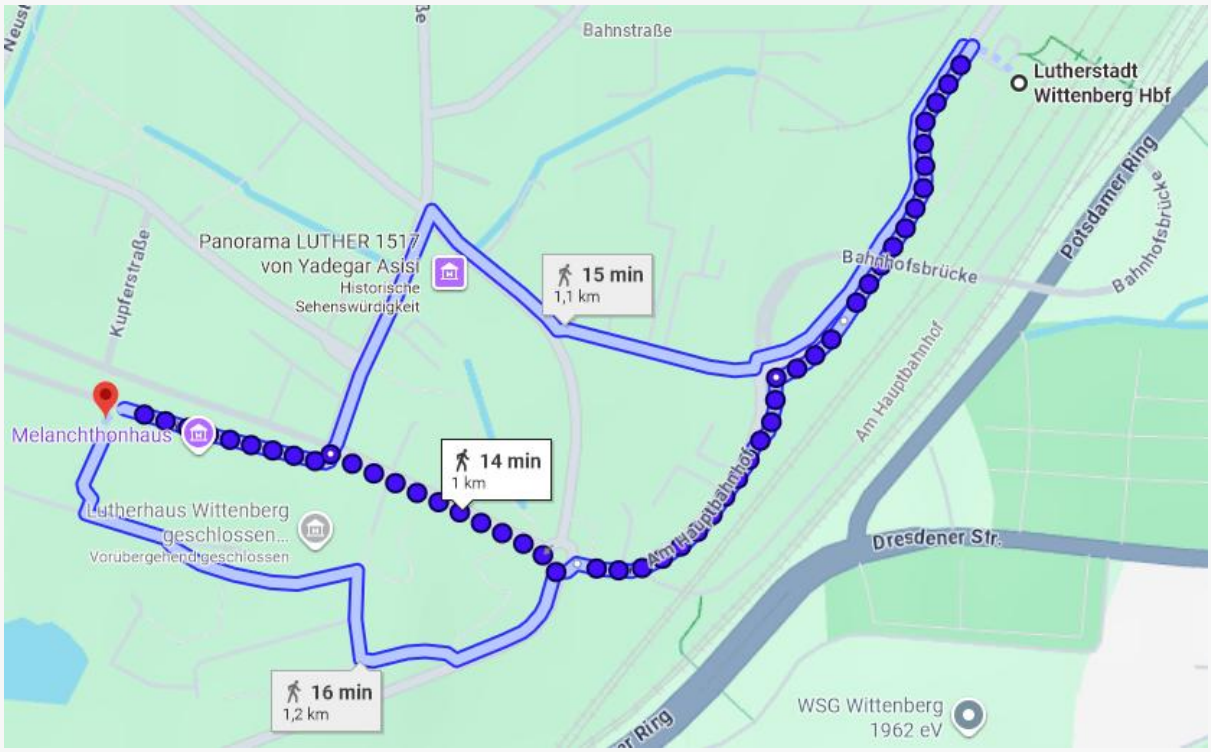
By Train

Lutherstadt Wittenberg is situated on the train line between Berlin and Halle/Leipzig and is also served by Inter-City Express (ICE) trains. The ICE travels to Wittenberg in 45 minutes from the central station in Berlin; travel time from Leipzig with the ICE is about 40 minutes; from Halle with train about 60 minutes; from the Halle/Leipzig (LEJ) Airport 55 minutes; from the Airport Berlin Brandenburg (BER) about 80 minutes, with a transfer at the Berlin central station. All connections operate more or less on the hour, additional connections are possible using regional transportation. From the train station in Wittenberg, the LEUCOREA Foundation and the hotel can be reached by foot in about 15 minutes.

Directions from Wittenberg Central Station to Leucorea

Upon leaving Wittenberg Central Station, turn left onto Am Hauptbahnhof. Continue straight ahead until you reach the roundabout, then proceed along Collegienstraße.

After approximately 10–15 minutes on foot, you will pass the Best Western Hotel. Continue further until you reach a passageway at Collegienstraße 62, located on the left-hand side.



By Car

If you arrive via motorway, take the A9 and exit at Coswig, then continue on the B187 toward Wittenberg. Once in Wittenberg, follow the signs for the city center (“Zentrum”). After crossing the bridge over the B187, turn right twice. After approximately 600 meters, turn left into Elbstraße, then immediately right into Wallstraße. Follow Wallstraße until you reach the hotel.

The hotel provides an underground parking garage; please note the maximum clearance height of 2.0 m. The parking fee is €16.00 per night.

The LEUCOREA can also be reached by car via Wallstraße. Collegienstraße is a pedestrian zone. A limited number of parking spaces for LEUCOREA visitors is available on the western side of the courtyard. Additional public parking can be found along Wallstraße.

LEUCOREA

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