# Meret Aeppli

**0**0000-0003-3335-3673

## **Current position**

### **Tenure Track Assistant Professor**

09/2022-present

EPF Lausanne. Switzerland

Head of the Soil Biogeochemistry Laboratory

#### Career breaks

Maternity leave

11/2024-03/2025

### Education

### Stanford University, United States

09/2019-08/2022

Postdoctoral Fellow

 Topic: "Carbon Cycling in Soils: Effects of Mineral Redox Reactivity on Anaerobic Microbial Respiration"

o Advisor: Prof. S. Fendorf

### ETH Zürich, Switzerland

01/2015-12/2018

Doctor of Sciences

o Dissertation: "Assessing the Control of Reduction Thermodynamics on Electron Transfer to Iron (Oxy-hydr-)Oxides" (Diss. Nr. 25'699)

o Advisor: Prof. T.B. Hofstetter

Date of thesis defense: 07.12.2018

### ETH Zürich, Switzerland

09/2012-01/2015

M.Sc. in Environmental Sciences

Concentration: Biogeochemistry and Pollutant Dynamics

Thesis: "Interactions of Bacteriophages with Natural Organic Matter and Model Sorbent Surfaces"

Advisor: Prof. M. Sander

### ETH Zürich, Switzerland

09/2009-10/2012

B.Sc. in Environmental Sciences

o Thesis: "Soil Structure of an Alpine Fen and Its Implications on Below-Ground Methane Concentrations"

o Advisor: Prof. J. Zeyer

### **Funded Project Grants**

Total funding as Assistant Professor at EPFL: CHF 1'722'884

#### **Foundation Funding**

10/2024-09/2026

"Monitoring carbon sequestration in wetland soils", sponsored by InTent Foundation

o co-I, CHF 168'000

#### **Industrial Funding**

03/2024-02/2028

o "Field-scale assessment of organic fertilizer impact on soil health and greenhouse gas fluxes from agricultural soils"; sponsored by Nestlé

o PI, CHF 546'112

# **ENAC Transdisciplinary Cluster grant**

04/2023-03/2024

- "Quantifying soil organic matter formation under microbial consortia amendments (BioSoilStock)";
   sponsored by the School of Architecture, Civil and Environmental Engineering, EPFL
- o PI, CHF 50'000

### **European Joint Programme SOIL Project Funding**

05/2023-04/2026

- "The effects of tillage practice on soil carbon sequestration mechanisms (TilSoilC)"; sponsored by the Swiss National Science Foundation
- o PI for Switzerland, CHF 432'844

## **SNSF Project Funding**

02/2023-01/2026

- "Soil organic carbon in Swiss mountain soils: abundance, distribution, and susceptibility to climate change"; sponsored by the Swiss National Science Foundation;
- o PI, CHF 510'928

### Research Partnership Grant with the ASEAN region

02/2023-01/2024

- "Web viewer development for public flood risk communications"; sponsored by the ETH Zürich, Leading House Asia
- o PI, CHF 15'000

### **SNSF Early Postdoc Mobility Fellowship**

09/2019-02/2021

- "The role of particulate terminal electron acceptors in controlling organic matter mineralization in freshwater sediments and soils"; fellowship for postdoctoral research at Stanford University sponsored by the Swiss National Science Foundation
- o PI, CHF 120'000

### **Honors**

### Jin Jingfu Memorial Lecture Award

03/2024

- o Awarded for "contributions in the field of redox reactivity and role of soil in the global carbon cycle".
- The International Association of Geochemistry bestows the award to early-career scientists that have made measurable impact on their discipline of geochemistry.

# **Rising Environmental Leaders Program**

01/2020-06/2020

- o Run by the Stanford Woods Institute for the Environment.
- Aimed at honing participant's leadership and communication skills to maximize their research impact and connect research to policy and people.
- One of 20 participants selected from a field of applicants from all seven schools at Stanford.

# **ETH Medal for Outstanding Doctoral Thesis**

09/2019

- Awarded for "solving important knowledge gaps in the redox reactivity of iron using an interdisciplinary approach".
- ETH Zürich awards the medal and CHF 2'000 to the top 8% of doctoral candidates.

### **Chemistry Travel Award**

05/2017

- o Travel award for the attendance of Goldschmidt Conference 2017.
- Sponsored by the Swiss Chemical Society and Platform Chemistry of the Swiss Academy of Sciences.

#### **Peer-Reviewed Publications**

7 publications as first author, 2 publications as last author, 2 reviews.

- 19. Bright, K; Dienes, B; Keiluweit, M; Rixen, C; **Aeppli, M**. Climate change impacts on organic carbon cycling in European alpine soils. *Soil Biology & Biochemistry*, **2025**, 210, 109891, doi:10.1016/j.soilbio.2025.109891.
- 18. Shu, Z; Liu, Q; Dai, Z; Pan, Z; **Aeppli, M**; Wang, Z. Heterogeneous Photochemical Generation of Hydroxyl Radical in Mineral-Organics Systems: Dual Roles of Iron Oxides. *Environmental Science & Technology*, **2025**, 59 (27), 13820-13831, doi:10.1021/acs.est.5c04440.
- 17. Lacroix, EM; Gomes, A; Honeyman, AS; Huy, KR; Fendorf, S; Noël, V; **Aeppli, M**. Soil Carbon Concentration Drives Anoxic Microsites Across Horizons, Textures, and Aggregate Position in a California Grassland. *Geoderma*, **2025**, 454, 117165, doi:10.1016/j.geoderma.2025.117165.
- Noël, V; Boye, K; Naughton, HR; Lacroix, EM; Aeppli, M; Kumar, N; Fendorf, S; Webb, SM. X-ray chemical imaging for assessing redox microsites within soils and sediments. Frontiers in Environmental Chemistry, 2024, 5, doi:10.3389/fenvc.2024.1329887.
- 15. Lim, J; Wehmeyer, H; Heffner, T; **Aeppli, M**; Gu, W; Kim, PJ; Horn, M; Ho, A. Resilience of aerobic methanotrophs in soils; spotlight on the methane sink under agriculture. *FEMS Microbiology Ecology*, **2024**, 100 (3), fiae008, doi:10.1093/femsec/fiae008.
- Obradović, N; Joshi, P; Arn, S; Aeppli, M; Schroth, MH; Sander, M. Reoxidation of Reduced Peat Organic Matter by Dissolved Oxygen: Combined Laboratory Column-Breakthrough Experiments and In-Field Push-Pull Tests. *Journal of Geophysical Research: Biogeosciences*, 2023, 128 (11), e2023JG007640, doi:10.1029/2023JG007640.
- Lacroix, EM, Aeppli, M, Boye, K; Brodie, E; Fendorf, S; Keiluweit, M; Naughton, HR, Noel Vincent Noël, V; Sihi, D. Consider the Anoxic Microsite: Acknowledging and Appreciating Spatiotemporal Redox Heterogeneity in Soils and Sediments. ACS Earth Space Chemistry, 2023, 7 (9), 1592–1609, doi:10.1021/acsearthspacechem.3c00032.
- 12. **Aeppli, M**; Schladow, G; Lezama Pacheco, J S; Fendorf, S. Iron Reduction in Profundal Sediments of Ultraoligotrophic Lake Tahoe under Oxygen-Limited Conditions. *Environmental Science & Technology*, **2023**, 57 (3), 1529-1537, doi:10.1021/acs.est.2c05714.
- 11. **Aeppli, M**; Thompson, A; Dewey, C; Fendorf, S. Redox Properties of Solid Phase Electron Acceptors Affect Anaerobic Microbial Respiration under Oxygen-Limited Conditions in Floodplain Soils. *Environmental Science & Technology*, **2022**, 56 (23), 17462-17470, doi:10.1021/acs.est.2c05797.
- Lopez, AM; Nicolini, CM; Aeppli, M; Luby, SP; Fendorf, S; Forsyth, JE. Assessing Analytical Methods for the Rapid Detection of Lead Adulteration in the Global Spice Market. *Environmental Science & Technology*, 2022, 56 (23), 16996-17006, doi:10.1021/acs.est.2c03241.
- Aeppli, M; Babey, T; Engel, M; Fendorf, S, Bargar, JR; Boye, K. Export of Organic Carbon From Reduced Fine-Grained Zones Governs Biogeochemical Reactivity in Simulated Aquifer. *Environmental Science & Technology*, 2022, 56 (4), 2738-2746, doi:10.1021/acs.est.1c04664.
- 8. **Aeppli, M**; Giroud, S; Vranic, S; Voegelin, A; Hofstetter, TB; Sander, M. Thermodynamic Controls on Rates of Iron Oxide Reduction by Extracellular Electron Shuttles. *Proceedings of the National Academy of Sciences of the United States of America*, **2022**, 119 (3), e2115629119, doi:10.1073/pnas.2115629119.
- Biswakarma, J; Rushworth, D; Srivastava, G; Singh, G; Kang, K; Das, S; Anantharaman, SB; Aeppli, M; Popp, AL; Bhuyan, DJ. Organizational Level Responses to the COVID-19 Outbreak: Challenges, Strategies and Framework for Academic Institutions. Frontiers in Communication, 2021, 6:573585, doi:10.3389/fcomm.2021.573585.

- Aeppli, M; Vranic, S; Kaegi, R; Kretzschmar, R; Brown, AR; Voegelin, A; Hofstetter, TB; Sander, M. Decreases in Iron Oxide Reducibility during Microbial Reductive Dissolution and Transformation of Ferrihydrite. *Environmental Science & Technology*, 2019, 53 (15), 8736–8746, doi:10.1021/acs.est.9b01299.
- Aeppli, M; Kaegi, R; Kretzschmar, R; Voegelin, A; Hofstetter, TB; Sander, M. Electrochemical Analysis of Changes in Iron Oxide Reducibility during Abiotic Ferrihydrite Transformation into Goethite and Magnetite. *Environmental Science & Technology*, 2019, 53 (7), 3568-3578, doi:10.1021/acs.est.8b07190.
- 4. **Aeppli, M**; Voegelin, A; Gorski, CA; Hofstetter, TB; Sander, M. Mediated Electrochemical Reduction of Iron (Oxyhydr-)Oxides under Defined Thermodynamic Boundary Conditions. *Environmental Science & Technology*, **2018**, 52 (2), 560-570, doi:10.1021/acs.est.7b04411.
- 3. Armanious, A; **Aeppli, M**; Jacak, R; Refardt, D; Sigstam, T; Kohn, T; Sander, M. Viruses at Solid-Water Interfaces: A Systematic Assessment of Interactions Driving Adsorption. *Environmental Science & Technology*, **2016**, 50 (2), 732-743, doi:10.1021/acs.est.5b04644.
- Franchini, AG; Henneberger, R; Aeppli, M; Zeyer, J. Methane Dynamics in an Alpine Fen: A Field-Based Study on Methanogenic and Methanotrophic Microbial Communities. FEMS Microbiology Ecology, 2015, 91 (3), doi:10.1093/femsec/fiu032.
- Armanious, A; Aeppli, M; Sander, M. Dissolved Organic Matter Adsorption to Model Surfaces: Adlayer Formation, Properties and Dynamics at the Nanoscale. *Environmental Science & Technology*, 2014, 48 (16), 9420-9429, doi:10.1021/es5026917.

### **Preprints**

1. Liu, X: Pothanamkandathil, V; Schwab, L; Mao, S; **Aeppli, M**. Predicting rates of manganese oxide reduction from thermodynamic driving forces and structural properties. *ChemRxiv*, **2025**, 10.26434/ chem-rxiv-2025-5w8sg

### Supervision

Total 3 current and 2 alumni postdoctoral researchers, 4 current and 2 alumni visiting doctoral candidates, 13 MSc students (4 MSc projects at 30 ECTS, 9 semester projects at 10 ECTS), and 4 BSc students, interns, and civil servants as assistant professor at EPFL.

#### **Postdoctoral Researchers**

Dr. Vineeth Pothanamkandathil 03/2025–present

o Topic: Redox reactivity of soil minerals at the mineral-water interface

Dr. Filippo Miele 10/2024-present

o Topic: Carbon removal in wetland restoration

Shared appointment (50:50) with CHANGE (EPFL)

Dr. Orly Mendoza 07/2023-present

Topic: Effects of tillage practices on soil carbon sequestration mechanisms

Shared appointment (50:50) with the University of Lausanne

Dr. Daniel Wasner 01/2025 – 08/2025

Topic: Macroscale drivers of soil organic carbon cycling

Dr. Lorenz Schwab 04/2023—12/2024

Topic: Redox properties and reactivities of manganese oxides

### **Doctoral Candidates**

Camila Morales 04/2024-present

Topic: Organic fertilizer impact on soil health and greenhouse gas fluxes from agricultural soil

Emma DeFrang 08/2023-present

Topic: Bioenergetic controls on microbial activity

02/2023-present Kristina Bright

o Topic: Mechanisms of soil organic carbon stabilization in mountain soils

Bence Dienes 02/2023-present

o Topic: Mechanisms of soil organic carbon stabilization in mountain soils

03/2024-02/2025 Zhipeng Shu

Topic: Redox reactions of iron oxides with extracellular electron shuttles

Visiting from Fudan University (China).

Xinru Liu 01/2024-02/2025

Topic: Redox properties and reactivities of manganese oxides

Visiting from Tongji University (China)

# Teaching Experience and Training

**Course Instructor** since 02/2024

EPF Lausanne, Switzerland

Fate and behavior of environmental contaminants (ENV-507)

- Environmental Sciences and Engineering Program
- o Elective MSc-level course, 4 ECTS

Course co-Instructor since 09/2023

EPF Lausanne, Switzerland

- Environmental chemistry (ENV-200)
- Environmental Sciences and Engineering Program
- o Mandatory BSc-level course, 5 ECTS, shared 50:50 with another instructor

**Teaching Assistant** 03/2022-06/2022

Stanford University, United States

o Science of Soils (ESS-155), weekly classes in the field and laboratory.

# **Postdoc Teaching Certificate**

10/2020

Stanford University, United States

 Comprises teaching training, elective courses and workshops, teaching practice, and teaching portfolio (minimum in-class time: 100 h).

**Teaching Assistant** 01/2015-12/2018

ETH Zürich, Switzerland

- Laboratory Course: Elementary Chemical Techniques (529-0030-00L)
- Yearly three week intensive course.

**Teaching Assistant** 09/2011-09/2012

ETH Zürich, Switzerland

- Exercises in Mathematics III: Systems Analysis (701-0071-00L)
- Weekly exercises.

#### **Presentations**

#### **Invited Presentations at International Conferences**

- 5. Structural Iron in Smectite Clay Minerals: a New Approach to Interpret Redox Properties. *Fe Biogeochemistry Workshop*, Lech, Austria, **2025**.
- 4. Redox Processes in Alpine Soils: Implications for Biogeochemical Carbon Cycling. *Goldschmidt Conference*, Prague, Czech Republic, **2025**.
- 3. Electron transfer reactions and their role in soil carbon cycling. *European Geosciences Union General Assembly*, Vienna, Austria, **2024**.
- 2. Buy one, get one free: how reaction thermodynamics controls iron reduction by extracellular electron shuttles. *Fe Biogeochemistry Workshop*, Lech, Austria, **2023**.
- 1. Variations in mineral structure and redox properties of iron-bearing clay minerals during redox cycling. *Goldschmidt Conference*, Lyon, France, **2023**.

#### **Invited National and International Seminars**

- 18. From Electrons to Ecosystems: Redox Controls on Soil Carbon Cycling. *ETH Zürich*, Zürich, IBP Seminar, **2025**.
- 17. Assessing Soil Redox Processes and Their Role in Element Cycling. *University of Bristol*, Bristol, Seminar School of Earth Sciences, **2024**.
- 16. Redox Processes and Their Role in Element Cycling. *University of Manchester*, Manchester, Seminar Department Earth and Environmental Sciences, **2024**.
- 15. Redox Processes and Their Role in Element Cycling. *Swiss Federal Institute for Forest, Snow and Landscape Research WSL*, Birmensdorf, Seminar, **2024**.
- 14. Shedding Light on the Dark Side of Terrestrial Ecosystems: Assessing Biogeochemical Processes in Soils. *University of Vienna*, Vienna, CMESS Seminar, **2023**.
- 13. Shedding Light on the Dark Side of Terrestrial Ecosystems: Assessing Biogeochemical Drivers of Element Cycling in Soils. *EPFL*, Inaugural Lecture, **2023**.
- 12. Assessing Soil Redox Processes and Their Role in Element Cycling. *WSL-Institut für Schnee- und Lawinenforschung SLF*, Davos, Colloquium, **2023**.
- 11. Redox Processes in Soils: Elucidating the Role of Iron Minerals. *University of Bern*, Bern, Soil Science Colloquium, **2023**.
- 10. Assessing Soil Redox Processes and Their Role in Element Cycling. *University of Lausanne*, Lausanne, IDYST Seminar, **2023**.
- 9. Can Soil Science Contribute to Improving Food and Nutrition? *Industrial Board Meeting of the Integrative Food and Nutrition Center at EPFL*, Lausanne, Seminar, **2023**.
- 8. Electron Transfer Reactions in Soils: Implications for Biogeochemical Element Cycling. *CLIMACT Seminar Series*, Virtual Seminar, **2022**.
- 7. Follow the Electrons: Redox-Active Minerals in Biogeochemical Processes. *Swiss Geoscience Meeting*, Lausanne, Keynote, **2022**.
- 6. Follow the Electrons: Insights Into Soil Carbon Cycling. EPFL, Lausanne, IIE Seminar Series, 2022.
- 5. Redox Properties of Iron Minerals: Insights From Electrochemical Analyses and Thermodynamic Considerations. *German Research Centre for Geosciences*, Virtual Seminar, **2022**.

- 4. Exploring Mechanisms of Soil Organic Carbon Stabilization by Tracking Electron Flows in Soils. *Technical University of Munich*, Virtual Public Lecture, **2021**.
- 3. Tracking Electrons in Soils: How Electro-Active Minerals Affect Soil Carbon Turnover. *EPFL*, Virtual Public Lecture, **2020**.
- 2. Follow the Electrons: How Redox-Active Minerals Affect Soil Carbon. *University of California, Davis*, Virtual Seminar. **2020**.
- 1. Redox Reactions In the Environment: What Can We Learn From Mediated Electrochemical Analyses? *Indiana University-Purdue University Indianapolis*, Virtual Seminar, **2020**.

#### **Oral Presentations at National and International Conferences**

Excluding invited presentations (see above).

- 14. Iron Reduction In Profundal Sediments Of Ultra-oligotrophic Lake Tahoe Under Oxygen-limited Conditions. Oral presentation. *Goldschmidt Conference*, Honolulu, Hawaii, United States, **2022**.
- 13. Redox Properties of Particulate Electron Acceptors Affect Anaerobic Respiration in Floodplain Soils. Poster presentation. *Gordon Research Conferences on Environmental Science: Water*, Plymouth, New Hampshire, United States, **2022**.
- 12. Redox properties of particulate electron acceptors affect anaerobic microbial respiration under oxygen-limited conditions in floodplain soils. Oral presentation, virtually delivered. *European Geosciences Union General Assembly*, **2022**.
- 11. Thermodynamic Limitations on Microbial Respiration Using Ferric Iron as Terminal Electron Acceptor. Poster presentation. *American Geophysical Union Fall Virtual Meeting*, **2021**.
- Organic Matter Mineralization in Redox-Dynamic Environments: How Does the Redox Reactivity
  of Particulate Electron Acceptors Affect Microbial Respiration Rates? Oral presentation, virtually
  delivered. Virtual Goldschmidt Conference, 2021.
- 9. Soil Organic Matter Stabilization in Floodplain Soils: Role of Particulate Terminal Electron Acceptors. Poster presentation. *American Geophysical Union Fall Virtual Meeting*, **2020**.
- 8. Is Carbon Mineralization In Floodplains Controlled by the Redox Reactivity of Iron Minerals? Oral presentation, virtually delivered. *American Chemical Society Fall 2020 Virtual Meeting*, **2020**.
- 7. How Does the Redox Reactivity of Iron Minerals Affect Carbon Mineralization in Floodplains? Oral presentation, virtually delivered. *Virtual Goldschmidt Conference*, **2020**.
- 6. Mediated Electrochemical Reduction of Iron (Oxyhydr-)Oxides under Defined Thermodynamic Boundary Conditions. Poster presentation. *Gordon Research Conferences on Environmental Science: Water*, Plymouth, New Hampshire, United States, **2018**.
- Ferrous Iron-Induced Transformation of Ferrihydrite: Linking Changes in Oxide Mineralogy and Reducibility. Oral presentation. *Interfaces Against Pollution Conference*, La Grande-Motte, France, 2018.
- 4. Investigating Iron Oxide Reduction Using Mediated Electrochemical Analysis. Oral presentation. *Goldschmidt Conference*, Paris, France, **2017**.
- 3. Investigating Iron Oxide Reduction Using Mediated Electrochemical Analysis. Oral presentation. *International Conference on the Biogeochemistry of Trace Elements*, Zürich, Switzerland, **2017**.
- 2. Thermodynamics of Electron Transfer to Iron Oxides Assessed by Mediated Electrochemical Reduction. Oral presentation. *Swiss Geoscience Meeting*, Geneva, Switzerland, **2016**.
- 1. Mediated Electrochemical Reduction of Iron Oxides: Effects of pH and Potential on Electron Transfer to the Oxides. Oral presentation. *European Mineralogical Conference*, Rimini, Italy, **2016**.

## **Academic Engagement**

### **Session convening**

- Goldschmidt Conference, Session 10d: Redox driven contaminant dynamics in terrestrial systems,
   2025.
- Goldschmidt Conference, Session 10I: Redox processes in terrestrial and aquatic systems and their impact on contaminant and nutrient cycling, 2024.
- Goldschmidt Conference, Session 11b: Iron and manganese minerals and their role in nutrient and contaminant cycling across scales, 2023.
- o Goldschmidt Conference, Session 12g: Environmental redox reactions and their impact on metal and nutrient dynamics, **2022**.
- Goldschmidt Conference, Session 11g: Redox-Driven Transformation and Mobility of Contaminants and Nutrients, 2021.
- AGU Fall Meeting, Symposium 103775: Soils of the Anthropocene: Ecosystem Scale Implications of Pore-Scale Redox Heterogeneities in Soils, 2020.
- o Goldschmidt Conference, Session 12b: Coupled Redox Cycling of S, Mn, and Fe: Impacts on Nutrient and Contaminant Dynamics, **2020**.

### Institutional responsibilities

- o Board member for the Food Center at EPFL (since 04/2023).
- Member of the Central Environmental Laboratory steering committee at EPFL (since 01/2023).
- Member of the teaching commission for the Environmental Sciences and Engineering section at EPFL (since 10/2022).
- Member of the commission for Master admissions and excellence scholarships of the Environmental Sciences and Engineering section at EPFL (since 04/2022).
- Member of ALPOLE management committee since 09/2021.
- o Search committee member for three faculty searches from 2022 to 2024.
- President for PhD exams (2) and PhD candidacy exams (11) at EPFL.

### **Peer-Review**

- Scientific journals: Applied and Environmental Microbiology, Applied Geochemistry, Biogeochemistry, Biogeosciences, Environmental Science: Nano, Environmental Science & Technology, Environmental Science: Processes & Impacts, Geochimica et Cosmochimica Acta, Journal of Geophysical Research: Biogeosciences, Nature Reviews Earth & Environment. Complete list available on Publons (total 40 reviews since 2019).
- Funding agencies: Israel Science Foundation, National Science Center Poland, National Science Foundation: Stanford Synchrotron Radiation Lightsource (total 3 reviews since 2020).

### Memberships

American Chemical Society, American Geophysical Union, Association for Women in Science, ETH Women Professors Forum, European Association of Geochemistry.

#### Other responsibilities

External expert on PhD evaluation committees (2) and PhD candidacy exams (1).

#### Outreach

### **Guest on Scientific Sense Podcast**

05/2025

- Appeared on podcast to discuss the importance of soil redox reactions for global climate and food security.
- o Prof. Meret Aeppli of EPFL on the complexity of soil as a system.

### **Booth at EPFL Scientastic**

04/2023

o Organized and led exhibition booth for the SOIL group.

### Radio Reportage at Radio Télévision Suisse (RTS)

10/2023

- o Radio reportage about field work of the SOIL group in the Swiss Alps.
- À la découverte de l'Institut de recherche sur l'environnement alpin et polaire ALPOLE à Sion, CQFD series, 2023.

## **Interview in EPFL Dimensions Magazine**

09/2023

- o Gave an interview on the role of soils in food production.
- o What's good for our soil is good for the climate, number 10, 2023.

# **Booth at EPFL Open Doors**

04/2023

- Organized and led exhibition booth for the SOIL group.
- Participated in Human Library.

### **Popular Science Article**

04/2023

- Wrote an article for the website of the Center for Climate Impact and Action (CLIMACT).
- o Aeppli, M. Why are soils important for carbon cycling and climate? CLIMACT Website, 2023.