



Antonios Apostolakis

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Research interests

- Soil biogeochemistry
- Carbon and nitrogen cycles in terrestrial ecosystems
- Global and climate change effects on biodiversity and ecosystem functioning

Non-academic interests

- Literature, mostly fiction
- Indoors bouldering
- Hiking

Profile

I am a soil biogeochemist with a background on environmental engineering. Through an interdisciplinary approach combining fieldwork, laboratory analyses, and modeling, I try to understand the mechanisms driving biogeochemical cycles and their responses to environmental change across diverse biomes and climatic regions.

Education

PhD in Soil Biogeochemistry, 08/2017-04/2022

[Department of Processes, Max-Planck-Institute for Biogeochemistry](#)

[Department of Soil Science, Friedrich-Schiller-University of Jena](#)

Thesis: Land use effects on carbon and nutrient fluxes in soils.

Advisors: Dr. Schrumpf, Prof. Trumbore and Prof. Michalzik

MSc in Water Resources and Climate Change, 10/2015-06/2017

[School of Environmental Engineering, Technical University of Crete](#)

Thesis: Modeling glasshouse tomato cultivation with SALTMED: scenarios of irrigation quality and climate change.

Advisors: Prof. Daliakopoulos and Prof. Tsanis

BSc in Environmental Engineering, 09/2010-09/2015

[School of Environmental Engineering, Technical University of Crete](#)

Thesis: Mass distribution, chemical and biochemical properties of soil aggregates in a chronosequence of set-aside fields.

Advisors: Prof. Paranychanakis and Prof. Nikolaidis

Work Experience

TRUESOIL project, 11/2022- today

[Division of Crop Science, University of Göttingen](#)

Reducing tillage intensity in arable croplands is often considered as a conservation practice that promotes C sequestration in soils, but its true climate change mitigation potential also depends on non-CO₂ greenhouse gas emissions. I studied a long-term tillage experiment in central Germany and found that reducing tillage intensity does not lead to crop yield or soil C benefits in medium-textured soils while it might promote N₂O emissions (one manuscript under review).

Biodiversity Exploratories project, 08/2017-08/2022

[Max-Planck-Institute for Biogeochemistry](#)

Management intensification is the main driver of biodiversity loss with adverse effects on ecosystem functioning. I studied 150 forests and 150 grasslands in Germany and found that extensively managed ecosystems have a tighter C and N cycling leading to lower soil CO₂ emissions and N and P losses through leaching (three papers published and one manuscript soon to be submitted).

RECARE project, 10/2015-07/2017

School of Environmental Engineering, Technical University of Crete

Soil salinization is a major land degradation threat in semi-arid and coastal regions. I designed a greenhouse experiment in Crete, Greece, and modelled soil water and salt dynamics. I estimated that climate change will increase irrigation water demand by 5-15%. This can be covered by current irrigation practices but with a detrimental effect on soil salinity (two papers published).

SoilTrEC project, 06/2014-09/2015

School of Environmental Engineering, Technical University of Crete

Intensive soil cultivation deteriorates soil structure and depletes soil organic matter. I studied adjacent agricultural fields differing in the time elapsed since set-aside in Crete, Greece. I modelled soil structure and C dynamics to explore the long-term potential of set-aside on C sequestration. I found that soil structure is restored within seven simulation years after tillage cessation, while soil C will not reach expected thresholds even after 100 years due to productivity limitation in semi-arid agroecosystems (one paper published).

Publications in peer-review journals

13. **Apostolakis**, Daka, Englert, Siebert, Meijide, **2026**. Long-term reduced tillage does not enhance crop yield, soil organic carbon stocks or greenhouse gas mitigation under ambient rainfall and rainfall exclusion in a temperate Luvisol. **Soil and Tillage Research**. <https://doi.org/10.1016/j.still.2025.106985>
12. He, Wang, Baer, Schaaf, **Apostolakis**, Meijide, Chen, Hochholdingner, Yu, **2025**. Rhizosheath inhabiting Massilia are linked to heterosis in roots of maize. **Nature Communication**. <https://doi.org/10.1038/s41467-025-65829-2>
11. Feng, Ai, Sánchez-Rodríguez, Li, Zhang, Yang, **Apostolakis**, Muentner, Li, Dippold, Zhou, Dittert, Wang, **2025**. Depth-dependent patterns in soil organic C, enzymatic stoichiometric ratio, and soil quality under conventional tillage and reduced tillage after 55-years. **Agriculture, Ecosystems and Environment**. <https://doi.org/10.1016/j.agee.2025.109584>
10. Neyret, Le Provost, Boesing, Schneider, Baulechner, Bergmann, de Vries, Fiore-Donno, Geisen, Goldmann, Merges, Saifutdinov, Simons, Tobias, Zaitsev, Gossner, Jung, Kandeler, Krauss, Penone, Schloter, Schulz, Staab, Wolters, **Apostolakis**, Birkhofer, Boch, Boeddinghaus, Bolliger, Bonkowski, Buscot, Dumack, Fischer, Gan, Heinze, Hoelzel, John, Klaus, Kleinebecker, Marhan, Müller, Renner, Rillig, Schenk, Schoening, Schruppf, Seibold, Socher, Solly, Teuscher, van Kleunen, Wubet, Manning, **2024**. A slow-fast trait continuum at the whole community level in relation to land-use intensification. **Nature Communications**. <https://doi.org/10.1038/s41467-024-45113-5>
9. **Apostolakis**, Schoening, Michalzik, Ammer, Schall, Haensel, Nauss, Trumbore, Schruppf, **2023**. Forest Structure and fine root biomass influence soil CO₂ efflux in temperate forests under drought. **MPDI-Forests**. <https://doi.org/10.3390/f14020411>
8. **Apostolakis**, Schoening, Michalzik, Klaus, Boeddinghaus, Kandeler, Marhan, Bolliger, Fischer, Prati, Haensel, Nauss, Hoelzel, Kleinebecker, Schruppf, **2022**. Drivers of soil respiration across a management intensity gradient in temperate grasslands under drought. **Nutrient Cycling in Agroecosystems**. <https://doi.org/10.1007/s10705-022-10224-2>
7. **Apostolakis**, Schoening, Klaus, Michalzik, Bischoff, Boeddinghaus, Bolliger, Fischer, Hölzel, Kandeler, Kleinebecker, Manning, Marhan, Neyret, Oelmann, Prati, van Kleunen, Schwarz, Schurig, Schruppf, **2022**. Direct and plant community mediated effects of management intensity on annual nutrient leaching risk in temperate grasslands. **Nutrient Cycling in Agroecosystems**. <https://doi.org/10.1007/s10705-022-10209-1>
6. Panagea, **Apostolakis**, Berti, Čermak, Diels, Else, Kusa, Piccoli, Poesen, Stoate, Tits, Toth, Wyseure, **2022**. Impact of agricultural management on soil aggregates and associated organic carbon fractions: Analysis of long-term experiments in Europe. **EGU-SOIL**. <https://doi.org/10.5194/soil-8-621-2022>
5. Daliakopoulos, **Apostolakis**, Wagner, Deligianni, Koutsikoudis, Stamatakis, Tsanis, **2019**. Effectiveness of Trichoderma harzianum in soil and yield conservation of tomato crops under saline irrigation. **CATENA**. <https://doi.org/10.1016/j.catena.2018.12.009>

4. Tzanakakis, **Apostolakis**, Nikolaidis, Paranychianakis, **2018**. Ammonia oxidizing Archaea do not respond to ammonium or urea supply in an alkaline soil. **Applied Soil Ecology**. <https://doi.org/10.1016/j.apsoil.2018.08.002>
3. Varouchakis, **Apostolakis**, Siaka, Vasilopoulos, Tasiopoulos, **2018**. Alternatives for domestic water tariff policy in the municipality of Chania, Greece towards water saving using game theory. **Water Policy**. <https://doi.org/10.2166/wp.2017.182>
2. **Apostolakis**, Panakoulia, Nikolaidis, Paranychianakis, **2017**. Shifts in soil structure and soil OM in a chronosequence of set-aside fields. **Soil and Tillage Research**. <https://doi.org/10.1016/j.still.2017.07.004>
1. **Apostolakis**, Wagner, Daliakopoulos, Kourgialas, Tsanis, **2016**. Greenhouse soil moisture deficit under saline irrigation and climate change. **Procedia Engineering**. <https://doi.org/10.1016/j.proeng.2016.11.098>

In review or in preparation manuscripts

4. **Apostolakis**, Schoening, Klaus, Michalzik, Schruppf. Management intensification promotes base cation leaching through plant diversity and anion leaching in temperate grasslands. **Soon to be submitted in Agriculture, Ecosystems and Environment**.
3. **Apostolakis**, Schoening, Michalzik, Ammer, Schall, Schruppf. Drivers of nutrient availability in temperate forests. **In preparation** (writing stage).
2. Walther, Michalzik, **Apostolakis** and Römermann. Functionally rare species do not affect ecosystem processes on the short-term, but temporal changes in abiotic conditions do. **Soon to be submitted in Applied Vegetation Science**.
1. Francis, Wuddivira, Gouveia, De Caires, **Apostolakis**, Bramble. From ground zero: comparative impacts of corn residue and animal manure on macro-aggregate recovery in humid tropical soils. **Soon to be submitted in European Journal of Soil Science**.

Presentations in international conferences (*Award winning contributions)

19. Leventis, Tsiknia, **Apostolakis**, Stathopoulou, Garezu, Petrakis, and Ehaliotis, **2025**. Recovery of soil functions and fertility in a post-quarry rehabilitation chronosequence in Milos Island (Greece). Mikrobiocosmos, Greece, poster.
 - 18.* Long, Li, **Apostolakis**, Siebert, Dittert, Wang, **2025**. Effects of long-term conservation tillage on N₂O emissions and gross N mineralization in a Haplic Luvisol. Deutsche Gesellschaft fuer Pflanzenernaerung, Germany, poster.
 17. **Apostolakis**, Englert, Daka, Siebert, and Meijide, **2024**. Crop yield, soil carbon storage and nitrous oxide emissions under long-term reduced tillage and controlled drought conditions. **Soil Health: Current status and future needs**, Greece, oral.
 16. **Apostolakis**, Nikolaidis, Paranychianakis, **2024**. Gradual recovery of soil structure and organic carbon stocks in semi-arid fine-textured soils after setting aside arable land. **Soil Health: Current status and future needs**, Greece, poster.
 15. Nikolaou, Tsiknia, **Apostolakis**, Gasparatos, Ehaliotis, **2024**. Linkages between the Acemannan concentration and the Composition of Plant-Associated Microbial Communities in Aloe vera (Aloe Barbadensis Miller) under increased soil salinity. **Soil Health: Current status and future needs**, Greece, oral.
 14. **Apostolakis**, Englert, Daka, Siebert, and Meijide, **2024**. Soil CO₂ and N₂O fluxes under winter wheat and winter barley cultivation in a long-term conventional vs. reduced tillage field trial in central Germany. **N-workshop**, Denmark, poster.
 13. Englert, **Apostolakis**, Markwitz, Knohl, Dittert, Siebert, Meijide, **2024**. Spatial and temporal variability of nitrous oxide fluxes. **N-workshop**, Denmark, poster.
- in a German crop rotation
12. **Apostolakis**, Englert, Daka, Siebert, and Meijide, **2024**. Soil organic carbon sequestration and greenhouse gas emissions in a long-term conventional vs. reduced tillage field-trial in central Germany. **EJP-SOIL Annual Science Day**, Lithuania, poster.
 11. **Apostolakis**, Englert, Siebert, and Meijide, **2023**. Trade-offs between yield, soil organic matter and greenhouse gases in a paired reduced-tillage and reduced-rain field trial. **64th assembly of the Gesellschaft für Pflanzenbauwissenschaften**, Germany, poster.

- 10.* Englert, **Apostolakis**, Schröer, Markwitz, Knohl, Dittert, Siebert, and Meijide, **2023**. Spatial and temporal variability of nitrous oxide fluxes in a German crop rotation. **64th assembly of the Gesellschaft für Pflanzenbauwissenschaften**, poster. *This contribution won conference's poster award.
9. **Apostolakis**, Englert, and Meijide, **2023**. TRUESOIL Project: reduced tillage effects on soil organic matter and greenhouse gas emissions under ambient and reduced rain conditions. **EJP-SOIL Annual Science Day**, Latvia, poster.
8. **Apostolakis**, Englert, Doersch, Jumadi, Khalil, Klumpp, Morales, Okolo, Osborne, Perez-Quezada, Philatie, Posse, Frasier, Restovich, Serrano-Ortiz, Kjær, Turunen, van Wesemael, Verheijen, and Meijide, **2023**. TRUESOIL Project: Understanding Trade-offs and Dynamic Interactions between SOC Stocks and GHG Emissions for Climate Smart Agrisoil Management. **EGU**, EGU23-7372, poster.
7. **Apostolakis**, Schoening, Haensel, Michalzik, Nauss, Schall, Trumbore, Schruppf, **2021**. Forest properties effects on temperate forest soil respiration under drought. **EUROSOIL**, oral.
6. **Apostolakis**, Klaus, Schoening, Michalzik, Schruppf, **2021**. Management effects on nitrate and ammonium leaching in temperate grasslands. **EGU**, EGU21-5979, oral.
5. **Apostolakis**, Daliakopoulos, Tsanis, **2017**. Effectiveness of *Trichoderma harzianum* and humate amendment in soil salinity restoration. **EGU**, EGU2017-15797, poster.
4. **Apostolakis**, Koutskoudis, Deligianni, Nevras, Wagner, Daliakopoulos, Stamatakis, Tsanis, **2016**. Effect of saline water drip irrigation on tomato yield and quality characteristics under Mediterranean greenhouse conditions. **EAAE**, poster.
3. Daliakopoulos, Wagner, Grillakis, **Apostolakis**, Tsanis, **2016**. An open-source low-cost portable apparatus for soil fauna sampling. **EGU**, EGU2016-16745-2, poster.
2. Wagner, **Apostolakis**, Daliakopoulos, Tsanis, **2016**. Can tomato inoculation with *Trichoderma* compensate yield and soil health deficiency due to soil salinity? **EGU**, EGU2016-1007, poster.
1. Vasilopoulos, **Apostolakis**, Siaka, Tasiopoulos, Varouchakis, Karatzas, **2015**. Domestic water charging policy in the Municipality of Chania using game theory. **IWA**, oral.

Skills

Field work

Field campaign planning, leading and implementing, including large-scale soil sampling.

Soil CO₂ fluxes, experience with LI6400 and PP-EGM-5 for short-term measurements, with LI8100 paired with multiplexers for long-term campaigns, and with the sorption methods for high spatial sampling.

Nitrous oxide and methane fluxes, experience with gas samples for gas chromatography analyses and with LI7820 combined with smart-chamber or self-developed static chambers.

Nutrient (like nitrate, ammonium, phosphate and base cations) availability and leaching with resins.

Lab work

Soil physicochemical and biochemical properties, e.g. texture, structure, C and N analysis, C fractionation, pH, enzymatic activities for C and N cycling, DNA extraction

Modeling

Deterministic: Carbon, Aggregation and Structure Turnover; RothC; Denitrification-Decomposition.

Statistical (in R): uni- and multivariate analysis (e.g. analysis of variance and covariances, principal component analysis); mixed effects with *lme4*; path analysis and structural equations with *lavaan*.

Other software

R language: data processing (*tidyverse*); visualization (*ggplot*); statistics; bibliometrics (*bibliometrix*).

Inkscape: to create conceptual graphs and to adjust vectorized data-plots created in R.

Soft skills

In the *Biodiversity Exploratories* project, my work involved large-scale field work through which I developed my organization and management skills and enhanced my pro-activity. Leading groups of technicians and student helpers offered me an understanding of effective leadership and the importance of collegiality.

In the *RECARE* project, I was in close contact with key-stakeholders, from farmers to local administration. I learnt the importance of involving stakeholders already in the initial steps of a project and of keeping up information channels via newsletters and in-person meetings.

I have officially co-supervised one under- and two graduate students. I helped them with brainstorming, experimental set-up, data analysis and thesis preparation. Supervising students taught me how to motivate others and honed my creativity in finding simple ways to explain complex concepts.

Languages

English C2 level (fluent)

German B1 level, I can hold a simple conversation. Currently undertaking B2 classes.

Greek native

Funds and awards

Biodiversity Exploratories project (mobility fund after proposal writing, 3,500€), 2020.

Limmat Stiftung, MSc graduation scholarship (3,000€), 2017.

Limmat Stiftung, BSc graduation scholarship (5,000€), 2015.

Academic and administrative services

Diversity, Equity & Inclusion officer of MPI for Biogeochemistry (elected position), 2020-2022

I organized seminar series, served as a point of contact for Diversity issues, led a volunteer working group and liaised with administration and directorship to improve inclusivity in our work environment.

Reviewer in the Journals

Biogeosciences; European Journal of Soil Science; Forest Ecology and Management; Nutrient cycling in Agroecosystems; Agriculture, Ecosystems and Environment

Thesis supervision

- Oliver Lindunda Daka, 2024 (completed), MSc thesis: Effects of long-term reduced tillage and reduced rainfall on soil organic matter dynamics and greenhouse gas emissions.
- Anne Catharina Albrecht, 2025 (completed), BSc thesis: Influence of reduced tillage on nitrate leaching – an overview including examples from the TRUESOIL project.
- Johanna Hanczaryk, 2024 to date, MSc thesis: Soil Respiration and Temperature Sensitivity in Agricultural Soils under long term conventional and reduced tillage.

Research visits

Ecophysiology of Plant Nutrition lab, University of Bonn, Oct. 2023

Topic: Development of a method for nitrous oxide flux measurements for a pot experiment.

Hosts: Prof. Schaaf and Prof. Yu

Grassland science lab, ETH-Zürich, Oct. to Nov. 2020

Topic: Drivers of inorganic N leaching in temperate grasslands.

Hosts: Prof. Buchmann and Prof. Klaus

References of former mentors

1. **Prof. Dr. Stefan Siebert**, University of Goettingen, Germany
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2. **Prof. Dr. Ana Meijide**, University of Bonn, Germany
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3. **Prof. Dr. Nikolaos Paranychianakis**, Technical University of Crete, Greece
+ 30 28210 37823, nparanychianakis@tuc.gr
4. **Dr. Ingo Schöning**, Max-Planck-Institute for Biogeochemistry, Germany
+49 364 15 76191, ischoen@bgc-jena.mpg.de

References of former mentees

1. **Paulina Englert**, PhD student, Uni-Bonn, Germany (penglert@uni-bonn.de)
2. **Oliver L. Daka**, PhD student, Uni-Aarhus, Denmark (oliverldaka@agro.au.dk)
3. **Johanna Hanczaryk**, MSc student, Uni-Bonn, Germany (s7johanc@uni-bonn.de)