

# Dr. Christian Werner

DATA SCIENCE · ENVIRONMENTAL MODELLING · MACHINE LEARNING · TEACHING

🏠 [www.christianwerner.net](http://www.christianwerner.net) | 📧 [cwerner](mailto:cwerner) | in [christianwerner-01](https://www.linkedin.com/in/christianwerner-01)

## Profile

A geoscientist by training, I enjoy working with structured, unstructured and spatial data. I explore causalities with statistical, numerical and data-driven models to develop insights for past, present and future events. In addition to data exploration, processing and modeling, I develop numerical models that aim to simulate the dynamic interactions of soil, atmosphere and climate. These models are used to assess implications of climate and global change on the environment and society. I also teach data analytics, remote sensing and ecology.

## Skills

<b>Data Science</b>	PyData stack (Pandas, Numpy, Sklearn), PyTorch/ fastai, Tensorflow/ Keras, ETL (Luigi, DVC, custom), R, databases (SQL, Neo4j), visualizations (mpl, plot.ly, dash, ggplot2, others), Hadoop (pyspark), use of GCP and AWS
<b>Programming</b>	10+ years of Python, 5+ years of R, C/C++, HPC numerical computing, Linux, Docker, bash, git, $\text{\LaTeX}$
<b>Geoinformatics</b>	GIS (ArcGIS, QGIS, IDRISI), Remote sensing tools
<b>Management</b>	Lead and participant in national and international multi-disciplinary scientific projects
<b>Teaching</b>	Capacity building with international partners, university lecturer, mentor for BA, MSc, and PhD students
<b>Science</b>	Biogeochemical cycles and vegetation modeling, climate and global change, remote sensing, ecology, geoinformatics

## Experience

### Data and Modelling Centre, Senckenberg BiK-F

[Frankfurt, Germany](#)

RESEARCH ASSOCIATE

Jan. 2011 - PRESENT

- Development of advanced biogeochemical and dynamic global vegetation models (C++)
- Multi-class classification and segmentation products for satellite images using Deep Learning
- Uncertainty analysis and calibration of complex models using Bayesian methods
- Development of pre- and postprocessing pipelines (incl. data fusion)
- Modeling of C and N cycles and associated GHG emissions and mitigation options in agricultural systems under climate change
- Spatial data analysis, geographic information systems and remote sensing applications
- Ad-hoc data science duties (EDA, cluster analysis, random forest, GBM, PCA) within the Data and Modelling Centre, SBIK-F
- Python programming mentoring within the Data and Modelling Centre, SBIK-F

### Department of Geography, Goethe University Frankfurt

[Frankfurt, Germany](#)

GUEST LECTURER

2014 - PRESENT

- Introduction in Data Analytics and Remote Sensing using R (exercise)
- The Ecology of Global Change (seminar)

### Karlsruhe Institute of Technology (KIT)

[Garmisch-Partenkirchen, Germany](#)

PostDoc

Jul. 2007 - Dec. 2010

- Process-based modeling of the soil-atmosphere trace-gas exchange and development of emission inventories
- Field and lab measurement of trace gas emissions
- Model development and HPC computing
- Geoinformatics (GIS), development of bayesian model uncertainty estimation for complex numerical models
- Data exploration and data integration

## Education

### University of Freiburg

[Freiburg, Germany](#)

PHD (DR. RER. NAT., GRADE: SUMMA CUM LAUDE)

Jul. 2003 - Jul. 2007

Thesis: Computation of a global  $\text{N}_2\text{O}$  emission inventory for tropical rainforest soils using a detailed biogeochemical model [pdf]

### University of Würzburg

[Würzburg, Germany](#)

MSC IN GEOGRAPHY (DIPLOM, GRADE: 1.0)

Sept. 1996 - Jul. 2003

Thesis: Erstellung eines N-Spurengas-Emissionskatasters für land- und forstwirtschaftlich genutzte Böden der Bundesrepublik Deutschland

### University of Queensland

[Brisbane, Australia](#)

BA IN GEOGRAPHY

Feb. 2000 - Dec. 2000

## Grants

### GCP Research Grant

Development of a data-fusion pipeline for satellite data & process-based simulation of rice cropping systems

Google Inc.

Dec. 2018

## Honors & Awards

2007 **Best PhD Thesis**, Elsa & Walter Hermann Award, Karlsruhe Institute of Technology

Karlsruhe, Germany

2003 **Best MSc Thesis**, IMK-IFU, Research Centre Karlsruhe

Garmisch-Partenkirchen, Germany

## Certifications

### CSMM.101x: Artificial Intelligence

Columbia University (edX)

Sep. 2018

### Deep Learning Specialization

deeplearning.ai (Coursera)

Neural Networks and Deep Learning; Improving Deep Neural Networks: Hyperparameter tuning, Regulari-

Jun. 2018

zation and Optimization; Structuring Machine Learning Projects; Convolutional Neural Networks; Sequence Models

### CSMM.102x: Machine Learning

Columbia University (edX)

May 2018

### DEV288x: Natural Language Processing (NLP)

Microsoft (edX)

May 2018

### Data Manipulation at Scale: Systems and Algorithms

University of Washington (Coursera)

Apr. 2018

## Publications

- [1] Bagnara, M., Gonzalez, R. S., Reifenberg, S., Steinkamp, J., Hickler, T., **Werner, C.**, Dormann, C. F., and Hartig, F. An R package facilitating sensitivity analysis, calibration and forward simulations with the LPJ-GUESS dynamic vegetation model. *Environmental Modelling and Software*, 111:55–60, 2019.
- [2] **Werner, C.**, Schmid, M., Ehlers, T. A., Fuentes-Espoz, J. P., Steinkamp, J., Forrest, M., Liakka, J., Maldonado, A., and Hickler, T. Effect of changing vegetation on denudation (part 1): Predicted vegetation composition and cover over the last 21 thousand years along the Coastal Cordillera of Chile. *Earth Surface Dynamics*, 6:829–858, 2018.
- [3] Norby, R. J., De Kauwe, M. G., Walker, A. P., **Werner, C.**, Zaehle, S., and Zak, D. R. Comment on “Mycorrhizal association as a primary control of the CO<sub>2</sub> fertilization effect”. *Science*, 355(6323):358.2–358, 2017.
- [4] Klatt, S., Kraus, D., Rahn, K.-H., **Werner, C.**, Kiese, R., Butterbach-Bahl, K., and Haas, E. Parameter-Induced Uncertainty Quantification of Regional N<sub>2</sub>O Emissions and NO<sub>3</sub> Leaching using the Biogeochemical Model LandscapeDNDC. In Del Grosso, S. J. and Ahuja, L., Editors, *Advances in Agricultural Systems Modeling*. American Society of Agronomy, Inc., Crop Science Society of America, Inc., and Soil Science Society of America, Inc., Madison, WI, 2015.
- [5] Hickler, T., Rammig, A., and **Werner, C.** Modelling CO<sub>2</sub> Impacts on Forest Productivity. *Current Forestry Reports*, 1(2):1–12, 2015.
- [6] Haas, E., Klatt, S., Fröhlich, A., Kraft, P., **Werner, C.**, Kiese, R., Grote, R., Breuer, L., and Butterbach-Bahl, K. LandscapeDNDC: a process model for simulation of biosphere–atmosphere–hydrosphere exchange processes at site and regional scale. *Landscape Ecology*, 28:615–636, 2013.
- [7] **Werner, C.**, Haas, E., Grote, R., Gauder, M., Graeff-Hönninger, S., Claupein, W., and Butterbach-Bahl, K. Biomass production potential from *Populus* short rotation systems in Romania. *Global Change Biology Bioenergy*, 4(6):642–653, 2012.
- [8] Rahn, K.-H., **Werner, C.**, Kiese, R., Haas, E., and Butterbach-Bahl, K. Parameter-induced uncertainty quantification of soil N<sub>2</sub>O, NO and CO<sub>2</sub> emission from Högwald spruce forest (Germany) using the LandscapeDNDC model. *Biogeosciences*, 9(10):3983–3998, 2012.
- [9] van Oijen, M., Cameron, D. R., Butterbach-Bahl, K., Farahbakhshazad, N., Jansson, P.-E., Kiese, R., Rahn, K.-H., **Werner, C.**, and Yeluripati, J. B. A Bayesian framework for model calibration, comparison and analysis: Application to four models for the biogeochemistry of a Norway spruce forest. *Agricultural and Forest Meteorology*, 151:1609–1621, 2011.
- [10] Rahn, K.-H., Butterbach-Bahl, K., and **Werner, C.** Selection of likelihood parameters for complex models determines the effectiveness of Bayesian calibration. *Ecological Informatics*, 6(6):333–340, 2011.
- [11] **Werner, C.**, Butterbach-Bahl, K., Haas, E., Hickler, T., and Kiese, R. A global inventory of N<sub>2</sub>O emissions from tropical rainforest soils using a detailed biogeochemical model. *Global Biogeochemical Cycles*, 21(3):GB3010, 2007.

For the full list of scientific publications see [[8](#) 7YzW4ZUAAAAJ].

## Additional information

**Languages** German (native), English (proficient)

**Community** Co-host of TWiML&AI study groups, member of Data, Machine Learning, and Deep Learning meetups in Frankfurt & Würzburg

**Interests** Open-source and open-data proponent, Python aficionado, avid road/ cross cyclist, reluctant runner, average guitarist