Kilian Eichenseer

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Positioned at the intersection of data science and Earth science, I develop quantitative methods and Bayesian models for reconstructing the evolution of life and environments.

Education and career

Postdoctoral researcher, Durham University, UK (January 2022 –). Developing a Bayesian age model to correlate and date stratigraphic sections from the Cambrian.

Postdoctoral researcher, Friedrich-Alexander University Erlangen-Nürnberg (FAU), Germany, (July – December 2021). Preparing a large SFB grant application on temporal and spatial scales in palaeontology and their relevance to climate change.

PhD **University of Plymouth, UK (January 2017 – July 2021).** *Environmental controls on the skeletal mineralogy of marine calcifiers.* Supervisor: Dr Uwe Balthasar.

MSc **Palaeobiology and Sedimentology, FAU, Germany (2014 – 2016).** *Taphonomical and Ecological Controls on the Pleistocene Rise of Acropora.* Grade: 1.4 (1 = best, 5 = worst)

BSc **Earth sciences, FAU, Germany (2011 – 2015).** Thesis on Quaternary, tropical coral faunas on Sulawesi, Indonesia. Grade: 1.7 (1 = best, 5 = worst)

Key skills

R programming. Proficiency in the programming language R for data analysis and visualisation. Experience using tidyverse and with creating and publishing R packages.

Statistical analysis. Proficiency in hypothesis testing, time series and spatial analysis, linear models, hierarchical models, and non-parametric techniques (Splines, GAM).

Machine learning. Extensive experience in designing and implementing Bayesian models, using JAGS or Stan, or directly programming Markov chain Monte Carlo simulations in R. Blog posts on Bayesian modelling: https://keichenseer.netlify.app/post/

Version control: Git and GitHub

Other software. Markdown, Latex, Microsoft Office, Adobe Photoshop & Illustrator, ImageJ (image processing), Shotcut (video editing), blogdown (creating websites using R)

Laboratory work. Experience in planning, executing and analysing chemical laboratory experiments.

Software

Jones, L.A., Gearty, W., Allen, B., Eichenseer, K., et al. (2022). palaeoverse: a community-driven R package to support palaeobiological analysis. R package version 1.0.0.

Key publications

Jones, L.A. & Eichenseer, K. (2022). Uneven spatial sampling distorts reconstructions of Phanerozoic seawater temperature. *Geology* 50 (2), 238-242.

> *Impact:* We demonstrated that reconstructions of global palaeotemperatures need to consider the spatial structure of the proxy record. Existing studies of global temperature change in deep-time based on proxy data are very likely biased.

Eichenseer, K., Balthasar, U., Smart, C. W., Stander, J., Haaga, K. A. & Kiessling, W. (2019). Jurassic shift from abiotic to biotic control on marine ecological success. *Nature Geoscience*, *12*(8), 638-642.

> *Impact:* The proliferation of calcifying plankton in the Mesozoic has profoundly affected marine life by buffering CO_2 excursions and stabilising Earth's biochemical cycle. We demonstrated that this mechanism has forever changed evolution in the marine realm, lifting environmental controls on ecological success.

Kemp, D. B., Eichenseer, K. & Kiessling, W. (2015). Maximum rates of climate change are systematically underestimated in the geological record. *Nature communications* 6, 8890.

> *Impact:* Modern rates of climate change appear vastly greater than rates measured in the geological record, because rates of change scale with the measurement period. Recognising this scaling law opens possibilities for more informative comparisons of ancient and modern climate change.

Awards and grants (ca. £267,000)

Research fellowship of €217,400 from the German Research Foundation (DFG, 2021): *Tracking the role of biotic and abiotic controls of macroevolution across the Phanerozoic*, hosted at the FAU, Germany. I declined the fellowship in favour of a Postdoc on Bayesian age modelling at Durham University.

Scholarship of €15,000 from the Emerging Talent Initiative, Friedrich-Alexander Universität Erlangen-Nürnberg (2021)

Young Scientist Award (€300) at *90th annual meeting of the Paläontologische Gesellschaft*, Munich, Germany (2019)

Travel grant of £300 from PALASS for *the 5th International Palaeontological Congress* in Paris, France (2018)

Travel grant of £100 for the *Progressive Palaeontology conference* in Manchester, UK (2018)

Travel reimbursement of £320 from PALASS at the *EGU conference* in Vienna, Austria (2018)

Roland Schlich travel grant of €425 towards the *EGU conference* in Vienna, Austria (2018)

Award for the best presentation in the category "lightening talks" at the *Progressive Palaeontology conference* in Leicester, UK (2017)

PhD scholarship (£65,000) from the School of Geography, Earth and Environmental Sciences, University of Plymouth, UK (2017)

PROMOS scholarship (€1,000) from the German Academic Exchange Service (DAAD, 2015)

Teaching experience

Teaching assistant for undergraduate practicals at Durham University (2022, Palaeobiology) and at the University of Plymouth (2017 – 2020, Palaeontology, Stratigraphy, Earth History)

Teaching assistant at undergraduate field trips at the University of Plymouth (coral reefs and tectonics of the Devonian in Devon, UK, 2017 – 2020)

Science communication

Quantamagazine (2019): How Jurassic Plankton Stole Control of the Ocean's Chemistry

University of Plymouth research communication (2019): Evolution of life in the ocean changed 170 million years ago

Science Slam: Tempolimit für den Klimawandel, Nürnberg, Germany (2016)

Science Slam - Klima Special: Tempolimit für den Klimawandel, Erlangen, Germany (2015)

Other peer-reviewed publications

Balthasar, U., Kershaw, S., Da Silva, A.-C., Seuss, B., Cusack, M., Eichenseer, K., Chung, P. (2021). Palaeozoic stromatoporoids and chaetetids analysed using electron backscatter diffraction (EBSD); implications for original mineralogy and microstructure. *Facies* 67:1-18.

In review:

Jones, L.A., Gearty, W., Allen, B., Eichenseer, K., Dean, C., Galván, S., Kouvari, M., Godoy, P., Nicholl, C., Buffan, L., Dillon, E., Flannery Sutherland, J. & Chiarenza, A. palaeoverse: a community-driven R package to support palaeobiological analysis. In review in *Methods in Ecology and Evolution*.

Conference contributions (selected)

Eichenseer, K., Sinnesael, M., Smith, M.R. & Millard, A.R. (2022). Increasing temporal resolution with Bayesian chemostratigraphy. *6th International Palaeontological Congress* in Khon Kaen, Thailand.

Eichenseer, K. & Jones, L.A. (2022). Improving palaeoclimatic reconstructions with ecological data: How hot was the early Eocene? *6th International Palaeontological Congress*.

Eichenseer, K. (2021). The Pleistocene rise of staghorn corals. **Invited speaker** at the *Early Career Researcher Symposium of the International Fossil Coral and Reef Society*.

Eichenseer, K., Balthasar, U., Smart, C., Stander, Haaga, K. A., J. & Kiessling, K. (2019). Aragonite calcite sea effects on calcifying organisms and reefs. *Annual Meeting of the Palaeontological Association* in Valencia, Spain.

Eichenseer, K., Balthasar, U., Smart, C. W., Stander, J., Haaga, K. A., Kiessling, W. Jurassic decline in abiotic controls on marine ecological success (2019). *90th annual meeting of the Paläontologische Gesellschaft* in Munich, Germany. **Young Scientist Award.**

Professional development

Workshop (3 days) on machine learning approaches to automated geologic correlation at the University of Bremen (2022)

Multiple short courses (up to 1 day) on R (advanced), ggplot2, Python (beginners) and parallel programming with supercomputers (2017 – 2022)

Summer school (2 weeks) on environmental crises in the geological record at the FAU in Germany (2016)

Workshop (2 weeks) on Conservation Paleobiology and Historical Ecology at the University of Vienna, Austria (2016)

International course on carbonate microfacies (1 week) at the FAU in Germany (2016)

Field course (5 weeks) on taphonomic and ecological processes in tropical environments on San Salvador Island, Bahamas (2015)

Peer-review experience

Nature Communications

Earth and Planetary Science Letters

Field work experience:

Quantitative survey and sampling of Pleistocene and recent reef ecosystems on San Salvador island, The Bahamas (2015) and on Sulawesi, Indonesia (2014)