

SEBASTIAN STEINIG

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EDUCATION AND EMPLOYMENT

Senior Research Associate (0.5 FTE)

since Apr 2023

School of Geographical Sciences, University of Bristol, Bristol, UK

- Research Co-Investigator on NERC project: "PaleoGradPhan – Paleoclimate meridional and zonal Gradients in the Phanerozoic" - PI: Prof. Dan Lunt
- I will use Gaussian process regression to combine temperature reconstructions with new paleoclimate modelling to constrain and better understand large-scale temperature gradients over the last 500 million years

Lecturer in Physical Geography (0.5 FTE)

since Sep 2022

School of Geographical Sciences, University of Bristol, Bristol, UK

- co-developed and co-delivered new MSc unit "Introduction to Scientific Computing" for the new Environmental Modelling and Data Analysis and Geographic Data Science and Spatial Analytics MSc programmes
- designed and delivered six 3-hour long computer-based lectures and practicals to introduce students with a wide range of previous coding experience to Python for scientific computing and data analysis

Research Associate

Sep 2019 - Mar 2023

School of Geographical Sciences, University of Bristol, Bristol, UK

- part of the NERC-funded SWEET project ("Super-Warm Early Eocene Temperatures and climate: understanding the response of the Earth to high CO₂ through integrated modelling and data"; www.deepmip.org/sweet) - PI: Prof. Dan Lunt
- role involved configuring, running and analysing UK climate models of different complexities (HadCM3/UKESM) to better understand early Eocene warmth
- I coordinated the development of the international DeepMIP model database and developed the climatearchive.org platform for visualising, analysing and sharing climate model data online and across disciplines

PhD in Geosciences

Dec 2015 - Aug 2019

Christian-Albrechts-University, Kiel, Germany

and GEOMAR Helmholtz Centre for Ocean Research, Kiel, Germany

- IODP-funded project on the simulation of Early Cretaceous greenhouse climate and gateway control on carbon burial in the evolving South Atlantic Ocean
supervisors: Prof. Martin Frank and Dr. Sascha Flögel
- I applied a suite of models of different complexity - a global climate model (NEMO/ECHAM), intermediate complexity (UVic) and biogeochemical box modelling constrained by geochemical proxy data
- *Thesis: Evolving ocean basins in the Early Cretaceous greenhouse climate: A model-proxy synthesis of circulation, surface temperatures and carbon burial*
Honors: with the highest distinction (*summa cum laude*)

MSc in Climate Physics

Oct 2012 - Nov 2015

Christian-Albrechts-University, Kiel, Germany

Final Grade: 1.1 (scale 1-5), ~UK First Class Honours

BSc in Physics of the Earth System

Oct 2008 - Sep 2012

Christian-Albrechts-University, Kiel, Germany

Final Grade: 1.5 (scale 1-5), ~UK First Class Honours

Journal Articles (published)

- [1] B. Goudsmit-Harzevoort, A. Lansu, M. L. J. Baatsen, A. S. von der Heydt, N. J. de Winter, Y. Zhang, A. Abe-Ouchi, A. de Boer, W.-L. Chan, Y. Donnadieu, D. K. Hutchinson, G. Knorr, J.-B. Ladant, P. Morozova, I. Niezgodzki, **S. Steinig**, A. Tripathi, Z. Zhang, J. Zhu, and M. Ziegler. “The Relationship Between the Global Mean Deep-Sea and Surface Temperature During the Early Eocene”. In: *Paleoceanography and Paleoclimatology* 38.3 (2023). DOI: 10.1029/2022PA004532.
- [2] A. J. McGlannan, A. Bonar, L. Pfeifer, **S. Steinig**, P. Valdes, S. Adams, D. Duarte, B. Milad, A. Cullen, and G. S. Soreghan. “An eolian dust origin for clastic fines of Devonian-Mississippian mudrocks of the greater North American midcontinent”. In: *Journal of Sedimentary Research* 92.12 (2022), pp. 1186–1206. DOI: 10.2110/jsr.2022.013.
- [3] Z. Zhang, Z. Zhang, Z. He, N. Tan, Z. Guo, J. Zhu, **S. Steinig**, Y. Donnadieu, J.-B. Ladant, W.-L. Chan, A. Abe-Ouchi, I. Niezgodzki, G. Knorr, D. K. Hutchinson, and A. M. de Boer. “Impact of Mountains in Southern China on the Eocene Climates of East Asia”. In: *Journal of Geophysical Research: Atmospheres* 127.17 (2022). DOI: <https://doi.org/10.1029/2022JD036510>.
- [4] T. Reichgelt, D. R. Greenwood, **S. Steinig**, J. G. Conran, D. K. Hutchinson, D. J. Lunt, L. J. Scriven, and J. Zhu. “Plant Proxy Evidence for High Rainfall and Productivity in the Eocene of Australia”. In: *Paleoceanography and Paleoclimatology* 37 (2022). DOI: 10.1029/2022PA004418.
- [5] I. Niezgodzki, G. Knorr, G. Lohmann, D. J. Lunt, C. J. Poulsen, **S. Steinig**, J. Zhu, A. de Boer, W.-L. Chan, Y. Donnadieu, D. K. Hutchinson, J.-B. Ladant, and P. Morozova. “Simulation of Arctic sea ice within the DeepMIP Eocene ensemble: Thresholds, seasonality and factors controlling sea ice development”. In: *Global and Planetary Change* 214 (2022), p. 103848. DOI: 10.1016/j.gloplacha.2022.103848.
- [6] C. J. R. Williams, D. J. Lunt, U. Salzmann, T. Reichgelt, G. N. Inglis, D. R. Greenwood, W.-L. Chan, A. Abe-Ouchi, Y. Donnadieu, D. K. Hutchinson, A. M. Boer, J.-B. Ladant, P. A. Morozova, I. Niezgodzki, G. Knorr, **S. Steinig**, Z. Zhang, J. Zhu, M. Huber, and B. L. Otto-Bliesner. “African Hydroclimate During the Early Eocene From the DeepMIP Simulations”. In: *Paleoceanography and Paleoclimatology* 37 (2022). DOI: 10.1029/2022PA004419.
- [7] Y. Zhang, A. M. de Boer, D. J. Lunt, D. K. Hutchinson, P. Ross, T. van de Flierdt, P. Sexton, H. K. Coxall, **S. Steinig**, J.-B. Ladant, J. Zhu, Y. Donnadieu, Z. Zhang, W.-L. Chan, I. Abe-Ouchi, Ayako and Niezgodzki, G. Lohmann, G. Knorr, C. J. Poulsen, and M. Huber. “Early Eocene Ocean Meridional Overturning Circulation: The Roles of Atmospheric Forcing and Strait Geometry”. In: *Paleoceanography and Paleoclimatology* 37 (2022). DOI: <https://doi.org/10.1029/2021PA004329>.
- [8] L. Cavalheiro, T. Wagner, **S. Steinig**, C. Bottini, W. Dummann, O. Esegbe, G. Gambacorta, V. Giraldo-Gómez, A. Farnsworth, S. Flögel, P. Hofmann, D. J. Lunt, J. Rethemeyer, S. Torricelli, and E. Erba. “Impact of global cooling on Early Cretaceous high pCO₂ world during the Weissert Event”. In: *Nature Communications* 12.1 (2021), p. 5411. DOI: 10.1038/s41467-021-25706-0.
- [9] W. Dummann, **S. Steinig**, P. Hofmann, M. Lenz, S. Kusch, S. Flögel, J. O. Herrle, C. Hallmann, J. Rethemeyer, H. U. Kasper, and T. Wagner. “Driving mechanisms of organic carbon burial in the Early Cretaceous South Atlantic Cape Basin (DSDP Site 361)”. In: *Climate of the Past* 17.1 (2021), pp. 469–490. DOI: 10.5194/cp-17-469-2021.
- [10] D. J. Lunt, F. Bragg, W.-L. Chan, D. K. Hutchinson, J.-B. Ladant, P. Morozova, I. Niezgodzki, **S. Steinig**, Z. Zhang, J. Zhu, A. Abe-Ouchi, E. Anagnostou, A. M. de Boer, H. K. Coxall, Y. Donnadieu, G. Foster, G. N. Inglis, G. Knorr, P. M. Langebroek, C. H. Lear, G. Lohmann, C. J. Poulsen, P. Sepulchre, J. E. Tierney, P. J. Valdes, E. M. Volodin, T. Dunkley Jones, C. J. Hollis, M. Huber, and B. L. Otto-Bliesner. “DeepMIP: model intercomparison of early Eocene climatic optimum (EECO) large-scale climate features and comparison with proxy data”. In: *Climate of the Past* 17.1 (2021), pp. 203–227. DOI: 10.5194/cp-17-203-2021.

- [11] G. N. Inglis, F. Bragg, N. J. Burls, M. J. Cramwinckel, D. Evans, G. L. Foster, M. Huber, D. J. Lunt, N. Siler, **S. Steinig**, J. E. Tierney, R. Wilkinson, E. Anagnostou, A. M. de Boer, T. Dunkley Jones, K. M. Edgar, C. J. Hollis, D. K. Hutchinson, and R. D. Pancost. “Global mean surface temperature and climate sensitivity of the early Eocene Climatic Optimum (EECO), Paleocene–Eocene Thermal Maximum (PETM), and latest Paleocene”. In: *Climate of the Past* 16.5 (2020), pp. 1953–1968. DOI: 10.5194/cp-16-1953-2020.
- [12] **S. Steinig**, W. Dummann, W. Park, M. Latif, S. Kusch, P. Hofmann, and S. Flögel. “Evidence for a regional warm bias in the Early Cretaceous *TEX*₈₆ record”. In: *Earth and Planetary Science Letters* 539 (2020), p. 116184. DOI: 10.1016/j.epsl.2020.116184.
- [13] W. Dummann, **S. Steinig**, P. Hofmann, S. Flögel, A. Osborne, M. Frank, J. Herrle, L. Bretschneider, R. Sheward, and T. Wagner. “The impact of Early Cretaceous gateway evolution on ocean circulation and organic carbon burial in the emerging South Atlantic and Southern Ocean basins”. In: *Earth and Planetary Science Letters* 530 (2020), p. 115890. DOI: 10.1016/j.epsl.2019.115890.
- [14] K. Wallmann, S. Flögel, F. Scholz, A. W. Dale, T. P. Kemena, **S. Steinig**, and W. Kuhnt. “Periodic changes in the Cretaceous ocean and climate caused by marine redox see-saw”. In: *Nature Geoscience* 12.6 (2019), pp. 456–461. DOI: 10.1038/s41561-019-0359-x.
- [15] **S. Steinig**, J. Harlaß, W. Park, and M. Latif. “Sahel rainfall strength and onset improvements due to more realistic Atlantic cold tongue development in a climate model”. In: *Scientific Reports* 8.1 (2018), p. 2569. DOI: 10.1038/s41598-018-20904-1.

Journal Articles (submitted)

- [16] **S. Steinig**, W. Dummann, P. Hofmann, M. Frank, W. Park, J. O. Herrle, and S. Wagner Thomas Flögel. “Controls on Early Cretaceous South Atlantic Ocean circulation and carbon burial - a climate model-proxy synthesis”. In: *Climate of the Past* (submitted).
- [17] M. J. Cramwinckel, N. J. Burls, A. A. Fahad, S. Knapp, C. K. West, T. Reichgelt, D. R. Greenwood, W.-L. Chan, Y. Donnadieu, D. K. Hutchinson, A. M. de Boer, J.-B. Ladant, P. A. Morozova, I. Niezgodzki, G. Knorr, **S. Steinig**, Z. Zhang, J. Zhu, R. Feng, D. J. Lunt, A. Abe-Ouchi, and G. N. Inglis. “Global and zonal-mean hydrological response to early Eocene warmth”. In: *Paleoceanography and Paleoclimatology* (submitted).

Journal Articles (in preparation)

- [18] **S. Steinig**, W.-L. Chan, D. K. Hutchinson, J.-B. Ladant, I. Niezgodzki, Z. Zhang, J. Zhu, and D. J. Lunt. “Overview of the model database for the Deep-Time Model Intercomparison Project (DeepMIP)”. In: *Earth System Science Data* (in prep).
- [19] **S. Steinig**, J. Zhu, R. Feng, W.-L. Chan, D. K. Hutchinson, J.-B. Ladant, I. Niezgodzki, Z. Zhang, and D. J. Lunt. “Drivers of (non-)linear Eocene surface warming in the DeepMIP ensemble”. In: *Paleoceanography and Paleoclimatology* (in prep).
- [20] **S. Steinig**, C. J. R. Williams, A. A. Sellar, and D. J. Lunt. “Constraints on HadGEM3 climate sensitivity from the early Eocene”. In: *Journal of Advances in Modeling Earth Systems* (in prep).
- [21] **S. Steinig**, T. Alexander, P. J. Valdes, and D. J. Lunt. “Climatearchive.org: An interactive platform for visualising and sharing global climate data”. In: *Environmental Modelling & Software* (in prep).

FUNDING AND AWARDS

NERC Standard Grant (£785,000 as Research Co-Investigator)	2022
<i>Project:</i> PaleoGradPhan – Paleoclimate meridional and zonal Gradients in the Phanerozoic	
Winner of JGI Beauty of Data Competition (£100)	2022
Competition to find the best University of Bristol data visualisations and new ways of communicating data. Awarded for the entry 'Wheel of Time Weather Globe'.	

Jean Golding Institute Seed Corn Funding (£5,000 as PI)	2021
<i>Project:</i> Earth's climate at your fingertips: connecting multidisciplinary environmental sciences and the public through interactive data exploration (climatearchive.org)	
For collaboration with University of Bristol Research IT on consultancy basis.	
School of Geographical Sciences, University of Bristol (£2,200 as PI)	2021
& Cabot Institute for the Environment, University of Bristol (£2,200 as PI)	
For research time and travel expenses to prepare and showcase a future warming visualisation (climatearchive.org/cop26) at COP26 in Glasgow as part of the Universities Network Public Engagement Subgroup exhibition stand.	
SHUG Faculty Award (3,000 €)	2020
Best PhD dissertation in the Faculty of Mathematics and Natural Sciences (out of ~140).	
Prof. Dr. Werner Petersen Award (2,500 €)	2019
For an outstanding PhD dissertation at GEOMAR, Kiel, Germany.	

SEMINARS AND CONFERENCE TALKS

Meteorological Colloquium by the Universities of Frankfurt and Mainz, Germany (invited seminar)	Dec 2022
EGU General Assembly, Vienna, Austria (solicited talk)	May 2022
Bristol DataViz Interest Group, University of Bristol, UK (invited online talk)	Mar 2022
Institute of Geosciences, University of Frankfurt, Germany (invited seminar)	Dec 2021
Celebrating 30 years of PMIP (invited online talk)	Dec 2021
PhanTASTIC Fall Meeting (invited online talk)	Sep 2021
6th DeepMIP Meeting (invited online talk)	Sep 2020
PREFACE International Conference on Ocean, Climate and Ecosystems, Lanzarote, Spain (talk)	Apr 2018
IODP/ICDP Kolloquium, Bochum, Germany (talk)	Apr 2018
GSA Annual Meeting, Seattle, Washington, USA (talk)	Oct 2017

FIRST-AUTHOR CONFERENCE POSTER PRESENTATIONS

14th International Conference on Paleooceanography, Bergen, Norway (2022)
 EGU General Assembly, Vienna, Austria (2018, 2020, 2021)
 IODP/ICDP Germany, annual colloquium (2016, 2018, 2019)
 Fourth International Conference on Earth System Modelling, Hamburg, Germany (2017)

TEACHING AND STUDENT SUPERVISION

MSc unit "Introduction to Scientific Computing"	2022
School of Geographical Sciences, University of Bristol, Bristol, UK	
<ul style="list-style-type: none"> I designed the structure of this completely new unit, created and delivered material for six of the twelve 3-hour long combined lectures and computer practicals, and designed and marked a new assessment on geospatial data analysis in Jupyter notebooks I used Python as an example to introduce and practice basic concepts in scientific computing and geospatial data analysis a particular challenge was to account for the large spread in the students' previous coding experience and their interests across the physical and human domains 	

I am also currently training, supporting, and mentoring a PhD, an MScR and two visiting MSc students.

- Co-Supervisor of NERC PhD Phoebe Ross, "Deep Ocean Circulation during Super Warm Early Eocene Temperatures"
- Co-Supervisor of Cabot MScR Andy Lyford, "Modelling polar amplification"
- Supervisor of visiting MSc students Akina Renard and Willem Nicolas from France, 5 months research placement to trial computer science methods for the climatearchive.org platform

I further worked with groups of 2nd year BSc Computer Science students during two 6-month Software Product Engineering courses between 2021 and 2023. My role also involved introducing them to fundamentals of palaeoclimate and palaeoclimate modelling to allow them to develop academic software at the interface between computer and climate sciences.

OUTREACH ACTIVITIES

- **Horizons: Histories and Futures of Migration, Germanisches Nationalmuseum, Nuremberg, Germany:** Invited custom exhibition installation to visualise future climate change scenarios and links to human migration (tinyurl.com/Horizons-Migration). Germany's largest museum of cultural history with ~430,000 visitors each year. On display from 30th March - 10th September 2023.
- **Understanding Climate, Senckenberg Museum, Frankfurt, Germany:** Invited custom exhibition installation of my climatearchive.org platform to let visitors explore past and future climate change and science (tinyurl.com/Understanding-Climate). Second-largest natural history museum in Germany with ~400,000 visitors each year. On display from 21st October 2022 - 16th July 2023.
- **Bristol Data & AI Showcase 2022, Bristol, UK:** Invited exhibition display of my work on climate data accessibility and sharing (<https://tinyurl.com/JGI-showcase>).
- **"Festival of Tomorrow" 2022, Swindon, UK:** Two-day exhibition stall showcasing palaeoclimate research and invited panel discussion: "Global warming - Back to The Future!"
- **COP26, Glasgow, UK:** Selected exhibition stall in the public Green Zone showcasing the climatearchive.org platform as part of the Universities Network Public Engagement Subgroup.
- **Media interviews:** including online blogs (tinyurl.com/ask-a-scientist) and BBC's 'Science in Action' (www.bbc.co.uk/programmes/w3ct1l4k) about my research and outreach activities
- **Online Articles:** Multiple co-authored pieces in "The Conversation UK" using science-fiction and fantasy novels to explain climate science basics to a broader audience (theconversation.com/profiles/sebastian-steinig-1282910).

OTHER RELEVANT EXPERIENCE

- **Organisation of NextGEN@Helmholtz conference** Jul 2017
Part of the core team of PhD students organising a three-day conference for more than 140 early career scientists from across 18 different Helmholtz centres with an overall budget of 30,000 €.
- **Participation in research cruise M135** Feb 2017 – Apr 2017
Water mass and geological sampling within the oxygen minimum zone off Peru onboard German RV Meteor.
- **Palaeoceanographic internship Cardiff University, Cardiff, UK** Aug 2012 – Sep 2012
I worked for two months with Ian Hall and Margit Simon on the generation of high-resolution palaeoceanographic records from the Agulhas region in the Palaeoclimate and Climate Systems Research in the School of Earth and Ocean Sciences.