

Curriculum Vitae

Personal Information

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Address	GEOMAR Helmholtz Centre for Ocean Research RD4 Dynamics of the Ocean Floor Wischhofstraße 1-3 D-24148 Kiel, Germany

Education

2006 - 2007	Study of Physics at Friedrich-Schiller-University Jena
2007 - 2011	Study of Geophysics at Friedrich-Schiller-University Jena, Diplom (B.Sc. & M.Sc.) in Geophysics "with distinction" Thesis title: "Stress- and strain distribution at curved subduction zones"
2011 - 2015	Ph.D. at the GFZ German Research Centre for Geosciences, Section 2.5 Geodynamic Modeling Degree: Dr.rer.nat. (Ph.D.) in Geophysics Thesis title: "The interaction of subducted slabs and plume generation zones in geodynamic models"

Professional Appointments

2015 - 2016	Postdoctoral Research Associate at German Research Centre for Geosciences (GFZ)
2015 - 2017	Postdoctoral Research Associate at Dept. of Mathematics, Texas A&M University
2017 - 2018	Postdoctoral Fellow at Dept. of Mathematics, Colorado State University
2018 - 2020	Assistant Project Scientist at the Dept. of Earth and Planetary Sciences (Computational Infrastructure for Geodynamics), University of California, Davis
2019 - 2020	Courtesy Appointment as Assistant Professor, Dept. of Geological Sciences, University of Florida
2020 - 2022	Visiting Assistant Professor, Dept. of Geological Sciences, University of Florida
2022 - 2024	Research Scientist, Dept. of Geological Sciences, University of Florida
since 2024	Staff Scientist, Helmholtz Centre for Ocean Research Kiel

Peer Reviewed Publications (33, Google Scholar h-index: 19, total citations: 2526)

2011	van Hinsbergen, D. J., Steinberger, B., Doubrovine, P. V., & Gassmüller, R. (2011). Acceleration and deceleration of India-Asia convergence since the Cretaceous: Roles of mantle plumes and continental collision. <i>Journal of Geophysical Research: Solid Earth</i> , 116(B6).
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- 2014 Zeumann, S., Sharma, R., Gassmöller, R., Jahr, T., & Jentzsch, G. (2014). New Finite-Element modelling of subduction processes in the Andes using realistic geometries. In *Earth on the Edge: Science for a Sustainable Planet* (pp. 105-111). Springer, Berlin, Heidelberg.
- 2016 Gassmöller, R., Dannberg, J., Bredow, E., Steinberger, B., & Torsvik, T. H. (2016). Major influence of plume-ridge interaction, lithosphere thickness variations, and global mantle flow on hotspot volcanism - The example of Tristan. *Geochemistry, Geophysics, Geosystems*, 17(4), 1454-1479.
- 2017 Dannberg, J., Eilon, Z., Faul, U., Gassmöller, R., Moulik, P., & Myhill, R. (2017). The importance of grain size to mantle dynamics and seismological observations. *Geochemistry, Geophysics, Geosystems*, 18(8), 3034-3061.
- Bredow, E., Steinberger, B., Gassmöller, R., & Dannberg, J. (2017). How plume-ridge interaction shapes the crustal thickness pattern of the Réunion hotspot track. *Geochemistry, Geophysics, Geosystems*, 18(8), 2930-2948.
- Heister, T., Dannberg, J., Gassmöller, R., & Bangerth, W. (2017). High accuracy mantle convection simulation through modern numerical methods—II: realistic models and problems. *Geophysical Journal International*, 210(2), 833-851.
- 2018 Alzetta, G., Arndt, D., Bangerth, W., Boddu, V., Brands, B., Davydov, D., Gassmöller, R., Heister, T., Heltai, L., Kormann, K., Kronbichler, M., Maier, M., Pelteret, J., Turcksin, B. & Wells, D. (2018). The deal.II library, Version 9.0. *Journal of Numerical Mathematics*, 26(4), 173-183.
- Dannberg, J., & Gassmöller, R. (2018). Chemical trends in ocean islands explained by plume–slab interaction. *Proceedings of the National Academy of Sciences*, 115(17), 4351-4356.
- Gassmöller, R., Lokavarapu, H., Heien, E., Puckett, E. G., & Bangerth, W. (2018). Flexible and scalable particle-in-cell methods with adaptive mesh refinement for geodynamic computations. *Geochemistry, Geophysics, Geosystems*, 19(9), 3596-3604.
- 2019 Kellogg, L. H., Hwang, L. J., Gassmöller, R., Bangerth, W., & Heister, T. (2018). The role of scientific communities in creating reusable software: Lessons from geophysics. *Computing in Science & Engineering*, 21(2), 25-35.
- Dannberg, J., Gassmöller, R., Grove, R., & Heister, T. (2019). A new formulation for coupled magma/mantle dynamics. *Geophysical Journal International*, 219(1), 94-107.
- Gassmöller, R., Lokavarapu, H., Bangerth, W., & Puckett, E. G. (2019). Evaluating the accuracy of hybrid finite element/particle-in-cell methods for modelling incompressible Stokes flow. *Geophysical Journal International*, 219(3), 1915-1938.
- 2020 Gassmöller, R., Dannberg, J., Bangerth, W., Heister, T., & Myhill, R. (2020). On formulations of compressible mantle convection. *Geophysical Journal International*, 221(2), 1264-1280.
- 2021 Bredow, E., Steinberger, B., Gassmöller, R., & Dannberg, J. (2021). Mantle convection and possible mantle plumes beneath Antarctica insights from geodynamic models and implications for topography. *Geological Society, London, Memoirs*, 56. doi:10.1144/M56-2020-2
- Dannberg, J., Myhill, R., Gassmöller, R., & Cottaar, S. (2021). The morphology, evolution and seismic visibility of partial melt at the core–mantle boundary: Implications for ULVZs. *Geophysical Journal International*, 227(2), 1028-1059.

- Arndt, D., Bangerth, W., Blais, B., Fehling, M., Gassmüller, R., Heister, T., Heltai, L., Köcher, U., Kronbichler, M., Maier, M., Munch, P., Pelteret, J., Proell, S., Simon, K., Turcksin, B., Wells, D. & Zhang, J. (2021). The deal.II library, Version 9.3. *Journal of Numerical Mathematics*, 29(3), 171-186. <https://doi.org/10.1515/jnma-2021-0081>
- 2022 Golshan, S., Munch, P., Gassmoller, R., Kronbichler, M., & Blais, B. (2022). Lethe-DEM: An open-source parallel discrete element solver with load balancing. *Computational Particle Mechanics*. 2022. 1-20.
- Arndt, D., Bangerth, W., Feder, M., Fehling, M., Gassmüller, R., Heister, T., Heltai, L., Kronbichler, M., Maier, M., Munch, P., Pelteret, J., Sticko, S., Turcksin, B., Wells, D. (2022). The deal.II library, Version 9.4. accepted in *Journal of Numerical Mathematics*.
- Dannberg, J., Gassmüller, R., Li, R., Lithgow-Bertelloni, C., Stixrude, L. An entropy method for geodynamic modeling of phase transitions: Capturing sharp and broad transitions in a multi-phase assemblage. *Geophysical Journal International*, 231(3), 1833-1849.
- 2023 Monaco, M., Dannberg, J., Gassmüller, R. Pugh, S. Linking geodynamic models of basalt segregation in mantle plumes to the X-Discontinuity observed beneath hotspots. *Journal of Geophysical Research: Solid Earth*, e2022JB025036.
- Euen, G. T., Liu, S., Gassmüller, R., Heister, T., & King, S. D. (2023). A comparison of 3-D spherical shell thermal convection results at low to moderate Rayleigh number using ASPECT (version 2.2. 0) and CitcomS (version 3.3. 1). *Geoscientific Model Development*, 16(11), 3221-3239.
- Saxena, A., Dannberg, J., Gassmüller R., Fraters, M., Heister, T., Styron, R. High-resolution mantle flow models reveal importance of plate boundary geometry and slab pull forces on generating tectonic plate motions. *Journal of Geophysical Research: Solid Earth*, 128, e2022JB025877.
- Heron, P., Gün. E., Shephard, G., Dannberg, J., Gassmüller, R., Martin, E., Sharif, A., Pysklywec, R., Nance, R.D., Murphy, J.B. "The role of subduction in the formation of Pangean oceanic large igneous provinces". *Geological Society, London, Special Publications* 542 (1), SP542-2023-12
- Myhill, R., Cottaar, S., Heister, T., Rose, I., Unterborn., C., Dannberg, J., Gassmüller, R. BurnMan -- a Python toolkit for planetary geophysics, geochemistry and thermodynamics. *Journal of Open Source Software* 8 (87), 5389.
- Dannberg, J., Chotalia, K., & Gassmüller, R. (2023). How lowermost mantle viscosity controls the chemical structure of Earth's deep interior. *Communications Earth & Environment*, 4(1), 493.
- 2024 Hull, S. D., Nakajima, M., Hosono, N., Canup, R. M., & Gassmüller, R. (2024). Effect of Equation of State and Cutoff Density in Smoothed Particle Hydrodynamics Simulations of the Moon-forming Giant Impact. *The Planetary Science Journal*, 5(1), 9.
- Dannberg, J., Gassmoeller, R., Thallner, D., LaCombe, F., & Sprain, C. (2023). Changes in core-mantle boundary heat flux patterns throughout the supercontinent cycle. *Geophysical Journal International*, 237(3), 1251-1274.
- Gassmüller, R., Dannberg, J., Bangerth, W., Puckett, E. G., and Thieulot, C.: Benchmarking the accuracy of higher order particle methods in geodynamic models of transient flow, *Geoscientific Model Development*, 17(10), 4115-4134.

Fraters, M. R., Billen, M. I., Gassmüller, R., Saxena, A., Heister, T., Li, H., Douglas, D., Dannberg, J., Bangerth, W. & Wang, Y. (2024). The Geodynamic World Builder: A planetary structure creator for the geosciences. *Journal of Open Source Software*, 9(101), 6671.

Africa, P., Arndt, D., Bangerth, W., Blais, B., Fehling, M., Gassmüller, R., Heister, T., Heltai, L., Kinnewig, S., Kronbichler, M., Maier, M., Munch, P., Schreter-Fleischhacker, M., Thiele, J., Turcksin, B., Wells, D. & Yushutin, V. (2024). The deal.II library, Version 9.6. *Journal of Numerical Mathematics*, 32(4), 369-380.

Heron, P. J., Gün, E., Shephard, G. E., Dannberg, J., Gassmüller, R., Martin, E., Sharif, A., Pysklywec, R.N., Nance, R.D. & Murphy, J. B. (2024). The role of subduction in the formation of Pangaeen oceanic large igneous provinces. *Geological Society, London, Special Publications*, 542(1), 105-128.

2025 Heron, P. J., Dannberg, J., Gassmüller, R., Shephard, G. E., van Hunen, J., & Pysklywec, R. N. (2025). The impact of Pangean subducted oceans on mantle dynamics: Passive piles and the positioning of deep mantle plumes. *Gondwana Research*, 138, 168-185.

Li, R., Dannberg, J., Gassmüller, R., Lithgow-Bertelloni, C., & Stixrude, L. (2025). How phase transitions impact changes in mantle convection style throughout Earth's history: From stalled plumes to surface dynamics. *Geochemistry, Geophysics, Geosystems*, 26, e2024GC011600.

Other Publications

2014 Steinberger et al. Manteldynamik und das Aufbrechen von Gondwana, *System Erde* (4), 14-19.

2016 Bangerth et al. Computational Modeling of Convection in the Earth's Mantle, *SIAM News*.

2018 Gassmüller, R. It's just coding ... - Scientific software development in geodynamics. *EGU Geodynamics Blog*.
<https://blogs.egu.eu/divisions/gd/2018/10/09/its-just-coding-scientific-software-development-in-geodynamics/>

2018 Member of the CTSP Writing Committee. Whitepaper Reporting Outcomes from NSF-Sponsored Workshop: 'CTSP: Coupling of Tectonic and Surface Processes'.
https://csdms.colorado.edu/csdms_wiki/images/CTSP_WhitePaper_Final.pdf

2020 Gassmüller, R. Scientific Software Projects and Their Communities. Better Scientific Software Blog of the Department of Energy Exascale Computing Project.
https://bssw.io/blog_posts/scientific-software-projects-and-their-communities

2017 - 2024 The ASPECT authors. ASPECT - Advanced Solver for Problems in Earth's Convection (Version 1.5.0, 2.0.0, 2.0.1, 2.1.0, 2.2.0, 2.3.0, 2.4.0, 2.5.0, 3.0.0), Zenodo, <https://doi.org/10.5281/zenodo.592692>

2021 - 2024 The Rayleigh authors. Rayleigh (Version 1.0.0, 1.0.1, 1.1.0,1.2.0), Zenodo, <https://doi.org/10.5281/zenodo.1158289>

2018 - 2024 The deal.II authors. deal.II. Zenodo. [10.5281/zenodo.595974](https://doi.org/10.5281/zenodo.595974) (Version 9.0, 9.3, 9.4, 9.6)

Invited Presentations

- 2012 4th Colloquium of DFG priority programme SAMPLE. *Modelling the interaction between subducted slabs and thermo-chemical piles*
- 2013 Gordon Research Seminar: *Past plate motions and recent hotspot volcanism - Validating plate reconstructions by geodynamic modelling*
AGU Fall Meeting: *Sensitivity of spatial distribution and dynamics of plume generation*
- 2014 6th Colloquium of DFG priority programme SAMPLE. *Geodynamic models and seismic observations of the South Atlantic lower mantle*
GeoFrankfurt: *Geodynamic models and seismic observations of the South Atlantic lower mantle*
- 2016 8th Colloquium of the DFG priority programme SAMPLE. *Major influence of lithosphere thickness variations and global mantle flow on Tristan hotspot volcanism*
CIG webinar series. *Intricacies of particle-in-cell methods in convection models with adaptive meshes: Using ASPECT's particle implementation*
- 2017 CU Boulder, Computational Science seminar: *Methods and Applications of the Finite-Element Software ASPECT in Geodynamics*
UT Austin, Seminar: *The Geodynamic Modeling Code ASPECT: Structure, Methods and Plume-Ridge Interaction*
Colorado State University, Inverse problems seminar: *Forward and inverse problems in geodynamic modeling: Part I Evolution of island chains in the South Atlantic and Indian Ocean*
- 2018 Earth-Life Science Institute (ELSI), Tokyo, *ASPECT tutorial*
University College London, *Global Geophysics Seminar: Geodynamic modeling with ASPECT: Applications for magma/mantle dynamics, grain size evolution and chemical zonation in mantle plumes*
SIAM Parallel Processing, Tokyo, *Advances in Mantle Convection Modeling: Nonlinear Solvers, Multiphysics, Linking scales*
CIDER Summer School, UC Santa Barbara: *Scientific Software Development 101: Fundamentals*
AGU panel member: *Community Forum: The Role of an Open-Source Software Initiative Within AGU*
- 2019 SIAM Geosciences, Houston: *Accurately utilizing particle-in-cell methods for adaptively refined finite-element models*
University of Florida, Geological Sciences Seminar: *Computational geoscience between research application and software project: Lessons from studying grain-size effects on mantle flow and seismic velocities*
HPC Best Practices Webinar of the IDEAS-Exascale Computing Project: *Discovering and Addressing Social Challenges in the Evolution of Scientific Software Projects*
- 2020 Exascale Computing Project Annual Meeting, Houston: *Discovering and Addressing Social Challenges in the Evolution of Scientific Software Projects*
- 2021 deal.II Developer and User Workshop: *Particle Methods in deal.II*
PALSEA workshop: *The role of community software and community benchmarks for reliable numerical modeling - Lessons learned by the Computational Infrastructure for Geodynamics*

- 2023 Department of Geology Colloquium at University of Georgia: *Understanding the Connections between Plate Tectonics and the Deep Earth: Models, Observations, and Modern Research Software.*
- Beyond Boussinesq for Astrophysical and Geophysical fluids: Numerical tools and experiments of the future, Workshop, Lyon: *Non-adiabatic boundary layers and complex phase transitions: The problem with reference states in Earth's convection*
- 2024 deal.II Developer and User Workshop: *Using deal.II's particle infrastructure to improve models of transient geodynamic processes*
- Regular conference presentations (e.g. AGU, EGU, not invited) are not listed above

Funded Research

- 2014 North-German Supercomputing Alliance: Plume-Plate interaction in 3D mantle flow – Revealing the role of internal plume dynamics on global hot spot volcanism (4.8 million CPU hours, 103,000 Euro)
- NSF CIDER: Investigating mantle dynamics using a composite rheology with grain-size evolution, tested using seismology (\$3,000)
- 2015 North-German Supercomputing Alliance: Follow-up on Plume-Plate interaction in 3D mantle flow (3.2 million CPU hours, 70,460 Euro)
- 2016 North-German Supercomputing Alliance: Follow-up on Plume-Plate interaction in 3D mantle flow (3.7 million CPU hours, 79,300 Euro)
- 2019 co-PI on NSF Frontier Research in Earth Sciences (FRES): Development and Application of a Framework for Integrated Geodynamic Earth Models (\$972,862)
- Responsible delegate for NSF XSEDE XRAC compute time allocation (3.5 million CPU hours, \$19,121)
- Responsible delegate for a community early access allocation: Frontera, Texas Advanced Computing Center (15.12 million CPU hours)
- 2020 PI on NSF Geoinformatics Subaward via the Computational Infrastructure for Geodynamics (CIG) (\$14,762)
- 2021 PI on NSF Geoinformatics Subaward via the Computational Infrastructure for Geodynamics (CIG) (\$40,624)
- co-PI on NSF CSEDI award: Understanding the Influence of Mantle Dynamics on the Generation of Earth's Magnetic Field throughout the Plate Tectonic Cycle (\$428,655)
- Responsible delegate for NSF XSEDE XRAC compute time allocation (3.8 million CPU hours, \$29,096)
- 2022 PI on NSF Geoinformatics Subaward via the Computational Infrastructure for Geodynamics (CIG) (\$94,907)
- 2023 PI on Subaward of NSF Geoinformatics: Computational Infrastructure for Geodynamics Phase IV (2023-2028) (subaward: \$740,095)

Awards

- 2019 Better Scientific Software (BSSw) fellow of the DoE IDEAS-ECP project: Social challenges in the evolution of scientific software projects. (\$34,750)
- 2025 SIAM/ACM Prize in Computational Science and Engineering: Together with all principal developers of the deal.II library.

Teaching

2008 - 2011	Teaching assistant in geodynamics courses at Friedrich-Schiller-University Jena
2011	Teaching assistant „Mathematics for Geoscientists“, University Potsdam
2012 - 2014	ASPECT student courses in module „Computational Geodynamics“
2014	ASPECT tutorial at GeoMod 2014 conference
2016	ASPECT tutorial at CIG Meeting, UC Davis
2018	ASPECT tutorial at ELSI EON Winter School Tokyo ASPECT tutorial at CGU/CIG annual meeting, Niagara Falls ASPECT tutorial at CIDER summer school, UC Santa Barbara “Version Control with Git” tutorial at CIDER summer school, UC Santa Barbara
2018, 2021 - 2024	Organization and teaching at the Rayleigh developer meeting (5 day developer meeting including scientific software development and open-source community management, ~15 participants)
2015 - 2024	Annual organization and teaching at the ASPECT hackathon (10 day summer school on scientific software development and developer workshop, 20-25 participants)
2019	Certification as a Software Carpentry Instructor Lead convener of the AGU scientific workshop: Best Practices for Developing and Sustaining Your Open-Source Research Software
2020	Organizer and Instructor of the CIG Tectonic Modeling Tutorial (5 day virtual summer school with >50 participants) Lead convener of the AGU scientific workshop: Best Practices for Developing and Sustaining Your Open-Source Research Software
2021, 2022	Instructor for Undergraduate/Graduate Course: Scientific Data and Software Skills (GLY 4930/6932), University of Florida
2023	Organizer and Instructor of the 2-day CIG workshop: Crafting Quality Research Software and Navigating Publication in Software Journals

Graduate Student Committee Membership

2017	Giovanni Alzetta, Master's in High Performance Computing, Core Building Blocks for Massively Parallel Multi-Physics Applications, SISSA (International School for Advanced Studies) Trieste, Italy
2021 -	Haoyuan Li, candidate for PhD in Geophysics, UC Davis
2022 - 2024	Ranpeng Li, masters student, Geophysics, University of Florida
2023 -	Samuel Kwafo, graduate student, Geophysics, University of Florida
2024 -	Ranpeng Li, Ph.D. candidate, Christian-Albrecht-University Kiel

Postdoctoral Associate Mentorship

2020 - 2023	Dr. Arushi Saxena, University of Florida
2021 - 2024	Dr. Daniele Thallner, University of Florida
2023 - 2024	Dr. Menno Fraters, University of Florida

Professional Service

2008 - 2009	Elected spokesperson of the student council
2009 - 2010	Elected member student council and student representative to the faculty

2011	Member of the organizing team of the 12 th International Workshop on Modeling of Mantle Convection and Lithosphere Dynamics.
2017	AGU Session Chair: DI14A: Deep Mantle Dynamics and Its Surface Expressions III
2019	AGU Session Convener: DI24A Thermochemical Nature and Structure of the Transition Zone and Lower Mantle, TH25I Update and Future Directions of the Open-Source Software Initiative, NS21AA Tour of Open-Source Software Packages for the Geosciences
2020	AGU Session Convener: IN037 Open-Source Packages and FAIR Software: Challenges with Identifying the Best Tools, Communicating Data Quality, and Making Analytical Code FAIR
2020 - 2025	Lead organizer of the annual virtual ASPECT user meeting (2 day workshop with 30 - 80 participants)
2021 - 2024	Technical lead of the Computational Infrastructure for Geodynamics (CIG)
2022	Organizer of the CIG developer workshop (3 day developer workshop)
Manuscript reviews	Journal of Open Source Software (7), Geophysical Journal International (2), Geochemistry, Geophysics, Geosystems (3), Geoscientific Model Development (2), Scientific Reports, ACM - Transactions on Mathematical Software, Solid Earth, SoftwareX, Communications Earth & Environment
Proposal reviews	NSF external reviewer (Petrology, CSEDI), Chilean National Commission for Scientific and Technological Research (CONICYT)
Proposal panels	Department of Energy - Better Scientific Software Fellows (2019 & 2020) Department of Energy - Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs. Sub-topic: <i>Technologies for Extreme-Scale Computing (2019 & 2020)</i>

Relevant Professional Experience

Project maintainer	ASPECT (https://aspect.geodynamics.org), since 2014 BurnMan (https://github.com/geodynamics/burnman), since 2017 Rayleigh (https://github.com/geodynamics/Rayleigh/), since 2021 Avni (http://avni.globalseismology.org/), since 2021 deal.II (https://dealii.org), since 2023
Software contributions	CitcomS (https://geodynamics.org/cig/software/citcoms/) FDPS_SPH (https://github.com/NatsukiHosono/FDPS_SPH) GeodynamicWorldBuilder (https://github.com/GeodynamicWorldBuilder/WorldBuilder) and others, see https://github.com/gassmoeller