Rene Gassmoeller

Curriculum Vitae

Personal Information

Email	rene.gassmoeller@ufl.edu
Website	https://gassmoeller.github.io
Address	Department of Geological Sciences
	219 Williamson Hall
	1843 Stadium Road
	Gainesville, FL 32611, USA

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: "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: "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, Department of Geological Sciences, University of Florida
2020 - 2022	Visiting Assistant Professor, Department of Geological Sciences, University of Florida
2022 -	Scientist, Department of Geological Sciences, University of Florida

Peer Reviewed Publications (19, h-index: 13)

2011	van Hinsbergen, D. J., Steinberger, B., Doubrovine, P. V., & Gassmöller, R. (2011). Acceleration and deceleration of India-Asia convergence since the Cretaceous: Roles of mantle plumes and continental collision. *Journal of Geophysical Research: Solid Earth*, *116*(B6).
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 R éunion 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., Gassmöller, 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., Gassmöller, 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., Gassmöller, 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.
in review	Monaco, M., Dannberg, J., Gassmöller, R. Pugh, S. The segregation of recycled basaltic material within mantle plumes explains the detection of the X-Discontinuity beneath hotspots: 2D geodynamic simulations. *In Review*
	Euen, G. T., Liu, S., Gassmöller, R., Heister, T., and King, S. D.: 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)*, Geosci. Model Dev. Discuss. [preprint],* https://doi.org/10.5194/gmd-2022-252, *in review.*

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	Gassmöller, 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 Committe. 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	Gassmöller, 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 - 2022	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, 2.4.0), https://doi.org/10.5281/zenodo.592692
2021, 2022	Rayleigh (Version 1.0.0, 1.0.1, 1.1.0), https://doi.org/10.5281/zenodo.1158289

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*

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	Better Scientific Software (BSSw) fellow of the DoE IDEAS-ECP project: Social challenges in the evolution of scientific software projects. ($34,750)
	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 (2022-2027) ($705,150)

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	Organization and teaching at the Rayleigh developer meeting (5 day developer meeting including scientific software development and open-source community management, 15 participants)
2015 - 2021	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

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	Ranpeng Li, graduate student, Geophysics, University of Florida

Postdoctorial Associate Mentorship

	Arushi Saxena, University of Florida (since 2020)
	Daniele Thallner, University of Florida (since 2021)

Professional Service

2008 - 2009	Elected spokesperson of the student council at the Institute for Geosciences
2009 - 2010	Elected member of the student council and student representative to the faculty at the Institute for Geosciences
2011	Member of the organizing team of the 12th 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, NS21A A 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 - 2022	Organizer of the Virtual ASPECT user meeting (2 day user workshop with 30 - 60 participants)
2021 -	Technical Lead of the Computational Infrastructure for Geodynamics
2022	Organizer of the CIG developer workshop (3 day developer workshop)
Manuscript reviews	Journal of Open Source Software (4), Geophysical Journal International, Geochemistry, Geophysics, Geosystems (2), Geoscientific Model Development, Scientific Reports, ACM - Transactions on Mathematical Software, Solid Earth, SoftwareX
Proposal reviews	NSF external reviewer (Petrology), 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: *Technologies for Extreme-Scale Computing (2019 & 2020)*

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
Software contributions	CitcomS (https://geodynamics.org/cig/software/citcoms/) deal.II (https://dealii.org/) FDPS_SPH (https://github.com/NatsukiHosono/FDPS_SPH GeodynamicWorldBuilder (https://github.com/GeodynamicWorldBuilder/WorldBuilder) and others, see https://github.com/gassmoeller
Software	Software development: Visual Studio Code, Jupyter, git, Github, Eclipse, Sphinx, Qt, Docker, Jenkins, TravisCI, CMake, DevOps tools Relevant scientific software: GPlates, ArcGIS
Programming languages	C++, C, Python, Shell, Fortran