Dr. Arne Spang

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Professional appointments

10/2022 - present	Postdoctoral Researcher at University of Bayreuth, Germany Numerical model development and execution
08/2022 - 09/2022	Postdoctoral Researcher at University of Mainz, Germany Numerical model execution
04/2018 – 09/2018	Research Assistant at University of Mainz, Germany Numerical model execution

Education

10/2018 - 07/2022	Doctoral Candidate in Computational Geodynamics at University of Mainz, Germany Final grade: magna cum laude (very good) Thesis: Thermomechanical modeling of magmatic systems
10/2015 - 04/2018	Master of Science in Geoscience at University of Mainz Final grade: 1.2 (very good) Thesis: Pressure dependence of vapor/melt partition coefficients of boron in silicate melts, 1.0 (very good)
10/2012 - 03/2016	Bachelor of Science in Geoscience at University of Mainz Final grade: 1.4 (very good) Thesis: A quantitative analysis of bubble coalescence in basaltic magmas, 1.0 (very good)

Other scientific activities

08/2026 - 09/2026	3-week stay as guest researcher at ETH Zürich, Switzerland
10/2025 - 10/2025	3-week stay as guest researcher at ETH Zürich, Switzerland

Funding acquisition

01/2026	WiN-UBT Research Stay Grant 2026. Mobility grant for early career researchers (2 000 €).

10/2025	Co-PI of “Data2Model: Building the knowledge to convert observations to models”. Proposal for a PhD student as part of the DFG SPP DEFORM. Fully funded (261 000 €).

Teaching

12/2023 - 04/2024	Seminar leader for “Introduction to Thermomechanical Modelling”
10/2020 - 03/2021	Teaching assistance for “Geophysical Modelling”
04/2019 - 09/2020	Planning and execution of practical seminars on “The Dynamics of the Lithosphere”
04/2018 - 09/2018	Student assistance in “Hydrogeology” (Preparation of practice and exam tasks)
04/2017 - 09/2018	Student assistance in “Applied Geophysics” (Preparation and automation of practice tasks)

Supervision

04/2024 - 10/2024	Muhammad Ilham Hamadi, Master thesis, “Postseismic relaxation due to thermally activated ductile deformation” (main supervisor)
12/2023 -	Tatjana Weiler, PhD thesis, “Modelling of deep earthquake generation in the Hindu Kush” (co-supervisor)
12/2023 -	Danielle Silva Souza, PhD thesis, “Experimental investigation of Antigorite dehydration reactions under deformation” (mentor)
10/2023 – 05/2026	Hao Liu, PhD thesis, “Geodynamic modelling of the Changbai magmatic system” (external advisor)
06/2022 - 05/2023	Zornitsa Kunchova, Master thesis, “Modelling of magmatic systems underneath the Klyuchevskoy group of volcanoes, Kamchatka” (co-supervisor)
10/2021 - 02/2022	Elisabeth Walter, Bachelor thesis, “Geophysical Modelling of Magma Induced Uplift at Campi Flegrei, Italy” (co-supervisor)

Skills

Languages	English (very good, written and spoken) German (native speaker)
Programming	Matlab (daily for 4 years) Julia (daily for 4 years) Python (weekly for 4 years) C/C++ and Bash (occasionally for 7 years)
Development	DEDLoc, https://github.com/ArneSpang/DEDLoc LaMEM, https://github.com/UniMainzGeo/LaMEM

	geomIO, https://bitbucket.org/geomio/geomio GephysicalModelGenerator, https://github.com/JuliaGeodynamics/GeophysicalModelGenerator.jl
Other Software	Geodynamic modeling on HPC clusters, Visual Studio Code, Git, Paraview, GMT, Inkscape, Windows, Ubuntu OS

Monographies

1. **Spang, A.** (2022). Thermomechanical Modeling of Magmatic Systems (Doctoral dissertation, Johannes Gutenberg-Universität Mainz). http://doi.org/10.25358/openscience-7509

Peer-reviewed articles

13. Liu, H., Sun, B., Kaus, B.J.P., **Spang, A.**, Riel, N., Yang, J., & Zhao, L.: Gravity-Driven Settling of a Dense Melt Core: A Plausible Mechanism for Decadal Subsidence at Changbaishan Volcano. *Journal of Geophysical Research: Solid Earth, 131, e2026JB035547.* https://doi.org/10.1029/2026JB035547
12. **Spang, A.**, Piccolo, A., Gerbault, M. I., Kaus, B. J. P., & Thielmann, M. (2026). Implications of thermal weakening and magma compressibility for volcano monitoring. *Journal of Geophysical Research: Solid Earth, 131,* e2026JB034071. https://doi.org/10.1029/2026JB034071
11. Duretz, T., de Montserrat, A., Sevilla, R., Räss, L., Utkin, I., & **Spang, A.:** Automatic tuning of iterative pseudo-transient solvers for modelling the deformation of heterogeneous media. *Geoscientific Model Development*. 19, 5343–5362. https://doi.org/10.5194/gmd-19-5343-2026
10. Piccolo, A., **Spang, A.**, Eskens, L. H. J., Andrić-Tomašević, N., Eizenhöfer, P. R., Le Breton, E., & Thielmann, M. (2026). The dynamics and surface signal of slab break-off in continental settings: Insights from 3D numerical modeling. *Journal of Geophysical Research: Solid Earth*, 131, e2025JB032004. https://doi.org/10.1029/2025JB032004
9. **Spang, A.**, Thielmann, M., Pranger, C., de Montserrat, A., & Räss, L. (2026). Overcoming the numerical challenges owing to rapid ductile localization with DEDLoc (version 1.0.0), *Geoscientific Model Development*, 19, 369–388. https://doi.org/10.5194/gmd-19-369-2026
8. **Spang, A.**, Thielmann, M., de Montserrat, A., & Duretz, T. (2025). Transient propagation of ductile ruptures by thermal runaway. *Journal of Geophysical Research: Solid Earth*, *130*(6), e2025JB031240. https://doi.org/10.1029/2025JB031240
7. Paul, J., **Spang, A.**, & Piccolo, A. (2025). Hydration weakening and destruction of the North China Craton. *Tectonophysics*, 230756. https://doi.org/10.1016/j.tecto.2025.230756
6. Kaus, B.J.P., Thielmann, M., Aellig, P., de Montserrat, A., de Siena, L., Frasukiewicz, J., Fuchs, L., Piccolo, A., Ranocha, H., Riel, N., Schuler, C., **Spang, A.**, & Weiler, T., (2024). GeophysicalModelGenerator.jl: A Julia package to visualise geoscientific data and create numerical model setups. *Journal of Open Source Software*, 9(103), 6763. https://doi.org/10.21105/joss.06763

5. **Spang, A.**, Thielmann, M., & Kiss, D. (2024). Rapid ductile strain localization due to thermal runaway. *Journal of Geophysical Research: Solid Earth, 129(10)*, e2024JB028846. https://doi.org/10.1029/2024JB028846
4. Kiss, D., Moulas, E., Kaus, B. J., & **Spang, A.** (2023). Decompression and fracturing caused by magmatically induced thermal stresses. *Journal of Geophysical Research: Solid Earth, 128*(3), e2022JB025341. https://doi.org/10.1029/2022JB025341
3. **Spang, A.**, Baumann, T. S., & Kaus, B. J. (2022). Geodynamic modeling with uncertain initial geometries. Geochemistry, *Geophysics, Geosystems, 23*(6), e2021GC010265. https://doi.org/10.1029/2021GC010265
2. **Spang, A.**, Burton, M., Kaus, B. J., & Sigmundsson, F. (2022). Quantification of volcano deformation caused by volatile accumulation and release. *Geophysical Research Letters, 49*(10), e2021GL097502. https://doi.org/10.1029/2021GL097502
1. **Spang, A.**, Baumann, T. S., & Kaus, B. J. (2021). A multiphysics approach to constrain the dynamics of the Altiplano-Puna magmatic system. *Journal of Geophysical Research: Solid Earth, 126*(7), e2021JB021725. https://doi.org/10.1029/2021JB021725

Articles under review

1. Nardoni, C., **Spang, A.**, Nespoli, M, & de Siena, L.: Differentiating the contribution of magma and gas to the current unrest at Campi Flegrei over space and time with modelling. *Journal of Geophysical Research: Solid Earth.* https://essopenarchive.org/doi/abs/10.22541/essoar.15007961/v1

Invited presentations

11/2026	LMU Munich	Implications of Thermal Weakening and Magma Compressibility for Volcano Monitoring
06/2026	Keynote at Ada Lovelace Workshop	Ductile instability, strain localization, and rupture propagation by thermal runaway
03/2026	University of Leeds	Deep-focus earthquakes driven by thermal runaway
12/2025	University of Bonn	Understanding the physics of thermal runaway and ductile rupture propagation
10/2025	ETH Zürich	Ductile strain localization and transient rupture propagation by thermal runaway
09/2025	Geomod Lisbon	Transient propagation of ductile ruptures by thermal runaway
06/2025	TSK Webinar	Ductile strain localization and transient rupture propagation by thermal runaway
04/2024	EGU General Assembly	Thermal runaway and the challenges of rapid localization
03/2022	ETH Zürich	Thermomechanical modeling of magmatic systems

02/2022	University of Bayreuth	Geodynamic inversion with uncertain initial geometries
01/2022	University of Lausanne	Multidisciplinary approach to constrain the dynamics of the Altiplano-Puna magma system
08/2021	GEOMAR Kiel	3D geodynamic modeling of the dynamics of the Altiplano-Puna magma system

Conference contributions

- 3 invited oral presentations
- 8 oral presentations
- 7 virtual oral presentations
- 10 poster presentations

	EGU General Assembly	Ada Lovelace Workshop/ GeoMod	Physics of Volcanoes	German-Swiss Geodynamics Workshop	Other
2026					
2025					
2024					
2023					
2022					
2021					VMSG, DGG
2020					Geo Utrecht
2019					AGU, Geo Münster
2018					
2016					