

Curriculum Vitae

Personal information

Surname / First name **Thielmann, Marcel**
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Professional career

11/2021 – present **Emmy Noether Group Leader**
Bayerisches Geoinstitut (BGI), University of Bayreuth, Germany
Head of the QuakeID research group (2 PostDocs + 2 PhD) investigating deep earthquake rupture processes, teaching

08/2020 – 09/2020 **Guest professor**
Department of Geology, University of Vienna
Lecture on Finite Difference Modelling, microstructural simulation of brittle-ductile deformation in eclogite

09/2015 – 10/2021 **Postdoctoral researcher and lecturer**
Bayerisches Geoinstitut (BGI), University of Bayreuth, Germany
Numerical modeling of deformation processes in the Earth, student supervision (2 PhD + 1 master), teaching

09/2013 – 04/2015 **Postdoctoral researcher**
Computational Physics of Engineering Materials, ETH Zurich, Switzerland
Design, construction and execution of laboratory experiments to investigate deformation of and flow in granular media, student supervision (1 PhD + 1 master), teaching

10/2009 – 08/2013 **Scientific assistant (Marie Curie Fellow)**
Geophysical Fluid Dynamics Group, ETH Zurich, Switzerland
Investigation of weakening mechanisms in the lithosphere with numerical modeling, scaling analyses, development of finite element codes

02/2008 – 09/2009 **Student assistant**, Bundesanstalt für Wasserbau, Karlsruhe, Germany
Numerical modeling of triaxial tests using ABAQUS

07/2006 – 12/2007 **Student assistant**, Geophysical Institute, University of Karlsruhe
Borehole stress analysis, contribution of data to the World Stress Map

10/2005 – 01/2006 **Intern**, Servicio Sismológico, Chile
Aftershock location of the Ms 7.6 Tarapacá earthquake, improvement of the 1D velocity model in Northern Chile

10/2005 – 01/2006

Student assistant, Geophysical Institute, University of Karlsruhe
Development of a raytracing program for reflection/refraction seismics

Education

07/2022

Habilitation in Geophysics

Microstructural controls on localization processes in the Earth's mantle and lithosphere

University of Bayreuth, Germany

Advisors: Prof. H. Keppler, Prof. D.J. Frost, Prof. S.M. Schmalholz

10/2009 – 05/2014

Dr. sc. ETH

Processes and properties controlling the formation of lithospheric-scale shear zones

ETH Zurich, Switzerland

Advisor: Prof. P. Tackley

10/2003 – 07/2009

Diploma in Geophysics, Grade: 1.2 (very good)

Geodynamically consistent cross-sections through active mountain belts

University of Karlsruhe, Germany

Thesis supervisors: Prof. F. Wenzel, Prof. H. Wilhelm

Minor subjects: Physics, Hydrogeology, Rock Mechanics

09/1992 – 07/2002

Abitur (diploma from German secondary school qualifying for university admission)

Klettgau Gymnasium Tiengen, Germany

Community service

Scientific Conferences

Co-convenor at the European Geoscience Union General Assembly(2013, 2017–2023), Co-convenor at the GeoMod 2018 conference, Co-organizer of the German-Swiss Geodynamics Workshop 2016, Poster Judge at EGU general assembly 2014–2020

Reviewing

Reviewer for Physics of the Earth and Planetary Interiors, Journal of Structural Geology, Tectonophysics, Journal of Geophysical Research, Geophysical Journal International, PLOS ONE, Granular Matter, Icarus, Solid Earth, Science Advances, Nature Communications

Institutional responsibilities

2023

PhD evaluation committee of L. Czekay, University of Bayreuth, Germany

2021

PhD advisory committee of R. Fildes, UC Davis, USA

2020

PhD evaluation committee of R. Huang, University of Bayreuth, Germany

2019

PhD evaluation committee of J. Schierjott, ETH Zurich, Switzerland

2017

PhD advisory committee of E. Marzotto, University of Bayreuth, Germany

2017

PhD advisory committee of J. Schierjott, ETH Zurich, Switzerland

2016

PhD advisory committee of P. Eichheimer, University of Bayreuth, Germany

2013– 2015

Internal Seminar Organizer, Institute of Building Materials, ETH Zurich, Switzerland

Awards

04/2011, Union Outstanding Student Poster (OSP) Award for the poster "Shear heating and subduction initiation" at the EGU General Assembly, Vienna, Austria

External funding

2018

WiN-UBT Travel Grant, € 1500.-

DFG grant 321722160, Chemistry dependence of the grain boundary character distribution (GBCD) of olivine, € 250 000.- (Co-PI)

2020

DFG grant, QDis: Quantifying Detachment Induced Surface Uplift in the Alps, ~ € 320 000.- (PI)

Memberships

Deutsche Geophysikalische Gesellschaft (DGG), European Geoscience Union (EGU), American Geophysical Union (AGU)
 Research Network “YoungCEED – Subduction zone initiation (SZI) database”
 Member DFG Priority Programme “Mountain Building Processes in Four-Dimensions (4D-MB)”

Journal publications

Publication statistics

Since 2012, I have published 25 articles in international peer-reviewed scientific journals (7 as first author, 9 as co-author of a PhD student supervised by me). The continuously growing number of citations since 2012 (Google Scholar: 631 as of 26.03.2023) and an h-index of 14 reflects the scientific relevance of these publications and the quality of my research.

Rogowitz, A., **Thielmann, M.**, Kraus, K., Grasemann, B., and Renner, J. (2023). The Effect of the Garnet Content on Deformation Mechanisms and Weakening of Eclogite: Insights From Deformation Experiments and Numerical Simulations. *Geochemistry, Geophysics, Geosystems*, 24(3), e2022GC010743. doi:10.1029/2022gc010743

Eberhard, L., **Thielmann, M.**, Eichheimer, P., Néri, A., Suzuki, A., Ohl, M., Fujita, W., Uesugi, K., Nakamura, M., Golabek, G. J. and Frost, D. J. (2022). A New Method for Determining Fluid Flux at High Pressures Applied to the Dehydration of Serpentinites. *Geochemistry, Geophysics, Geosystems*, 23(9). doi:10.1029/2021gc010062

Gülcher, A. J. P., Golabek, G. J., **Thielmann, M.**, Ballmer, M. D., and Tackley, P. J. (2022). Narrow, Fast, and “Cool” Mantle Plumes Caused by Strain-Weakening Rheology in Earth’s Lower Mantle. *Geochemistry, Geophysics, Geosystems*, 23(10). doi:10.1029/2021gc010314

Koemets, E., Fedotenko, T., Khandarkhaeva, S., Bykov, M., Bykova, E., **Thielmann, M.**, Chariton, S., Aprilis, G., Koemets, I., Glazyrin, K., Liermann, H.-P., Hanfland, M., Ohtani, E., Dubrovinskaia, N., McCammon, C. and Dubrovinsky, L. (2021). Chemical Stability of FeOOH at High Pressure and Temperature, and Oxygen Recycling in Early Earth History. *European Journal of Inorganic Chemistry*, 2021(30), 3048–3053. doi:10.1002/ejic.202100274

Rebaza, A. M., Posner, E. S., **Thielmann, M.** and Rubie, D. C. and Steinle-Neumann, G. (2021) Experimental determination of carbon diffusion in liquid iron at high pressure. *Am Mineral* 106, 1950–1956, doi: 10.2138/am-2021-7644

Crameri, F., Magni, V., Domeier, M., Shephard, G.E., Chotalia, K., Cooper, G., Eakin, C.M., Grima, A.G., Gürer, D., Király, Á., Mulyukova, E., Peters, K., Robert, B. and **Thielmann, M.** (2020), A transdisciplinary and community-driven database to unravel subduction zone initiation. *Nature Communication* 11, 1–14 (2020), doi:10.1038/s41467-020-17522-9

Thielmann, M. and Schmalholz, S. M. Contributions of Grain Damage, Thermal Weakening, and Necking to Slab Detachment. (2020), *Front. Earth Sci.* 8, 254, doi:10.3389/feart.2020.00254

Papa, S., Pennacchioni, G., Menegon, L. and **Thielmann, M.** (2020), High-stress creep preceding coseismic rupturing in amphibolite-facies ultramylonites. *Earth Plan. Sc. Lett.* 541, 116260, doi:10.1016/j.epsl.2020.116260

Marzotto, E., Hsieh, W.-P., Takayuki, I., Chao, K.-H., Golabek, G., **Thielmann, M.** and Ohtani, E. (2020), Effect of water on lattice thermal conductivity of ringwoodite and its implications for the thermal evolution of descending slabs. *Geophysical Research Letters* 47, e2020GL087607, doi: 10.1029/2020gl087607

Schierjott, J. C., **Thielmann, M.**, Rozel, A. B., Golabek, G. J. and Gerya, T. V. (2020) Can Grain Size Reduction Initiate Transform Faults?—Insights From a 3-D Numerical Study. *Tectonics*, 39, e2019TC005793, doi:10.1029/2019tc005793

- Eichheimer, P., **Thielmann, M.**, Fujita, W. Golabek, G.J., and Nakamura, M. (2020), Combined numerical and experimental study of microstructure and permeability in porous granular media. *Solid Earth*, 11, 1079–1095, doi: 10.5194/se-11-1079-2020
- Thielmann M.**, Golabek .G., and Marquardt, H. (2020), Ferropericlasite Control of Lower Mantle Rheology: Impact of Phase Morphology, *Geochemistry Geophysics Geosystems*, 21(2), e2019GC008688, doi:10.1029/2019GC008688.
- Eichheimer, P., **Thielmann, M.**, Popov A., Golabek G. J. , Fujita W. , Kottwitz M. O., and Kaus B. J. P. (2019), Pore-scale permeability prediction for Newtonian and non-Newtonian fluids, *Solid Earth*, 10(5), 1717-1731, doi:10.5194/se-10-1717-2019.
- Thielmann, M.** (2018), Grain size assisted thermal runaway as a nucleation mechanism for continental mantle earthquakes: Impact of complex rheologies, *Tectonophysics*, 746, 611–623, doi:10.1016/j.tecto.2017.08.038
- Bianchi, F., Wittel, F. K. ,**Thielmann, M.**, Trtik, P., and Herrmann, H. J. (2018), Tomographic Study of Internal Erosion of Particle Flows in Porous Media, *Transport in Porous Media*, 16(13), 1-16, doi:10.1007/s11242-017-0996-8
- Bianchi, F., **Thielmann, M.**, de Arcangelis, L. and Herrmann, H. J. (2018), Critical Bursts in Filtration, *Physical Review Letters*, 120(3), 034503, doi:10.1103/PhysRevLett.120.034503
- Liao J., Gerya T., **Thielmann M.**, Webb A.A.G., Kufner S. and Yin, A. (2017), 3D geodynamic models of continental subduction with opposite polarities in the Hindu Kush-Pamir orogenic system, northwestern Tibetan Plateau, *Earth and Planetary Science Letters*, doi:10.1016/j.epsl.2017.10.005
- Bianchi, F., **Thielmann M.**, Mani R., Or D. and Herrmann H. J. (2016), Tensile Stress Relaxation in Unsaturated Granular Materials, *Granular Matter*, 18(75), doi:10.1007/s10035-016-0673-6
- Schrenk, K. J., Hilário M. R., Sidoravicius V., Araújo N. A. M., Herrmann H. J., **Thielmann M.**, and Teixeira A. (2016), Critical Fragmentation Properties of Random Drilling: How Many Holes Need to Be Drilled to Collapse a Wooden Cube? *Physical Review Letters*, 116(5), 055701, doi:10.1103/PhysRevLett.116.055701,
- Thielmann, M.**, Kaus, B. J. P., and Popov, A. A. (2015). Lithospheric stresses in Rayleigh–Bénard convection: effects of a free surface and a viscoelastic Maxwell rheology. *Geophysical Journal International*, 203(3), 2200–2219,
- Thielmann, M.**, Rozel, A., Kaus, B. J. P., and Ricard, Y. (2015). Intermediate-depth earthquake generation and shear zone formation caused by grain size reduction and shear heating. *Geology*, 43(9), 791–794,
- Melnikov, K., Mani, R., Wittel, F. K., **Thielmann, M.**, and Herrmann, H. J. (2015). Grain-scale modeling of arbitrary fluid saturation in random packings. *Phys. Rev. E*, 92, 022206. <http://doi.org/10.1103/PhysRevE.92.022206>,
- Thielmann, M.**, May, D.A. and Kaus, B.J.P. (2014). Discretization Errors in the Hybrid Finite Element Particle-in-cell Method, *Pure and Applied Geophysics*, 171(9), 2165–2184 ,
- Hidas, K., Garrido, C., Tommasi, A., Padrón-Navarra, J.A., **Thielmann, M.**, Konc, Z., Frets, E. and Marchesi, C. (2013). Strain localization in pyroxenite by reaction-enhanced softening in the shallow subcontinental lithospheric mantle, *Journal of Petrology*, 54(10), 1997–2031,
- Thielmann, M.** and Kaus, B.J.P. (2012). Shear-heating induced lithospheric localization: Does it result in subduction?, *Earth and Planetary Science Letters*, 359-360, 1–13,

Theses

- Geodynamically consistent cross-sections through active mountain belts, Diploma thesis, University of Karlsruhe
- Processes and properties governing the formation of lithospheric-scale shear zones, PhD thesis, ETH Zürich

Invited Talks

- 2012 Breaking the lid: from shear zones to subduction, Seminar Geosciences Montpellier, Montpellier, France
- 2016 Forming plate boundaries: The search for effective strain localization mechanisms, Centre for Earth Evolution and Dynamics seminar, Oslo, Norway

- Shear localization due to grain size evolution and shear heating: an energy perspective, Geophysical Fluid Dynamics seminar, Zürich, Switzerland
- Grain size assisted thermal runaway: A mechanism for plate boundary creation and intermediate-depth earthquake generation?, Structural Geology Seminar, Tübingen, Germany
- 2017 Grain size assisted thermal runaway: a mechanism to generate intermediate-depth earthquakes and ductile shear zones, EGU General assembly, Vienna, Austria
- Latest developments in Earth dynamics models and their impact on surface processes, 4th Central European Geomorphology Conference, Bayreuth, Germany
- Mineral scale modelling of two-phase deformation, BAdW Workshop "Mantle Dynamics and Deep Earth Material Cycles", München, Germany
- Earthquakes Below the Brittle-Ductile Transition: The Role of Grain Size Assisted Thermal Runaway, AGU Fall Meeting, New Orleans, USA
- 2018 Ductile strain localization: the key for plate tectonics on a convective planet, Seminar FAST, Orsay, France
- Earthquakes, shear zones and plate tectonics: the importance of ductile weakening mechanisms, Erdwissenschaftliches Kolloquium, Vienna, Austria
- Intermediate depth earthquakes due to grain size assisted thermal runaway: What are the odds?, Japan Geoscience Union Meeting, Chiba, Japan
- From ductile shear zones to earthquakes, Earth, Sea and Sky III: International Joint Graduate Program Workshop in Earth and Environmental Sciences, Sendai, Japan
- 2019 Deforming two-phase media: From Topology to Rheology, CREEP Final Workshop, Les Houches, France
- Earthquakes and plate tectonics - the importance of ductile weakening mechanisms, Structural Geology and Tectonics Seminar, ETH Zürich, Switzerland
- 2021 The 2013 Wind River earthquake: an example of a ductile seismic rupture?, DGG Jahrestagung, Kiel, Germany
- 2022 Ductile Deep Earthquakes - a numerical perspective, Njord seminar series, Oslo/online, Norway
- Ductile Deep Earthquakes - a numerical perspective, ENS Laboratoire de Géologie Seminar, Paris, France

Conference proceedings (oral, selected)

- 2009 Shear heating and subduction initiation, Swiss Geoscience Meeting, Fribourg/Switzerland
- 2010 Processes and properties controlling the formation of lithosphere-scale shear zones, Crystal2Plate Assessment Session, Orsay/France
- 2012 How to break a plate?, 3rd Crystal2Plate workshop, Bristol/UK
- Intra-oceanic subduction initiation induced by shear heating: What are the odds?, 14th Symposium on Tectonics, Structural Geology and Geology of Crystalline Rocks, Kiel/Germany
- Shear-heating induced lithospheric localization: Can it result in subduction?, EGU General assembly, Vienna/Austria
- 2013 Breaking the lid: how to self-consistently create shear zones in the lithosphere, 4th Crystal2Plate workshop, Fréjus/France
- 2014 Grain size assisted formation of pseudotachylites: A numerical study, EGU General assembly, Vienna/Austria
- 2017 Grain size assisted thermal runaway: a mechanism to generate intermediate-depth earthquakes and ductile shear zones, DGG Jahrestagung, Potsdam/Germany
- 2019 Earthquakes below the brittle-ductile transition: The role of grain size assisted thermal runaway, Specialist discussion meeting of the Royal Astronomical Society, London, UK
- Deep intraslab earthquake rupture due to grain size assisted thermal runaway, Japanese Geoscience Union Meeting, Chiba, Japan
- Ferropericlase control of lower mantle rheology - Impact of phase morphology, International Workshop on Deep Volatile Cycling in the Earth, Tokyo, Japan

	Ferropericlaste control of lower mantle rheology - Impact of phase morphology, 2nd Deep Earth Symposium, Münster, Germany
2021	Impact of ferropericlaste elongation on lower mantle rheology, EGU General Assembly, online Contributions of grain size reduction and shear heating to slab detachment, German-Swiss Geodynamics Workshop, Bad Belzig, Germany
Public outreach	
2011	Le Cervin est-il africain?, SPS meeting, Lausanne/Switzerland, Joint presentation with M. Marthaler, results from numerical experiments were presented by me
2019	Enigmas at depth, EGU Geodynamics Blog, https://blogs.egu.eu/divisions/gd/2019/11/13/enigmas-at-depth/
Teaching	
Introductory lectures	
2013 – 2015	Introduction to Computational Physics - exercises, ETH Zürich
2018 – 2020	Allgemeine Geologie, Universität Bayreuth
2018 – 2021	Introduction to Geophysics, Universität Bayreuth
Advanced lectures	
2010 – 2013	Finite Element Block Course - exercises, ETH Zürich
2010 – 2013	Mantle and Lithosphere dynamics - exercises, ETH Zürich
2013 – 2015	Computational Statistical Physics - exercises, ETH Zürich
2015 – present	Finite difference method, Universität Bayreuth
2015 – present	Geodynamical modeling, Universität Bayreuth
Field courses	
2006 – 2007	Geophysical field course (geoelectrics), Universität Karlsruhe (TH)
2010 – 2013	Geophysical field course (gravimetry), ETH Zürich
Other lectures	
08/2020	Block course on numerical modelling in Geoscience, University of Vienna
03/2022	Tectonic Modelling Short Course, University of Halle
Supervision	
PhD theses	Filippo Bianchi (2014 – 2017), Experimental investigation of clogging of porous media, ETH Zürich (main supervisor: H.J. Herrmann) Philipp Eicheimer (2016–2020), Impact of volatiles on subduction dynamics, University of Bayreuth (main supervisor: G. Golabek) Jana Schierjott (2016–2019), Transform fault formation due to grain size evolution, ETH Zürich (main supervisor: P. Tackley) Enrico Marzotto (2017–2021), Impact of water transport on lower mantle dynamics, University of Bayreuth (main supervisor: G. Golabek) Filippe Ferreira (2017–2021), Grain boundary character distribution of olivine, University of Bayreuth (main supervisor: K. Marquardt)
Master theses	Amir Omeradzic (2014/2015), Numerical Simulations of Directed Particle Assembly, ETH Zürich (main supervisor: H.J. Herrmann) Andrea Adams (2016/2017), Viability of Archean Subduction Initiation by Continental Spreading and Plume-Continent Interactions, master thesis, University of Bayreuth (main supervisor: G. Golabek)
Other	Matteo Berchier (2014/2015), Clogging of porous media, semester project, ETH Zürich (main supervisor: H.J. Herrmann)

Sebastian Honegger (2014/2015), Diffusion Limited Aggregation, Proseminar Theoretical Physics, ETH Zürich (main supervisor: H.J. Herrmann)

Yang Li (2015/2016), A Numerical Parameter Study for the Mixing of the Martian Mantle, semester project, University of Bayreuth (main supervisor: G. Golabek)

Sourav Misra (2016), Impact of inclusions on fold growth rates, semester project, University of Bayreuth (main supervisor: G. Golabek)

Daria Andreieva (2022), Effects of surface tension on inclusion elongation, University of Bayreuth (main supervisor: G. Golabek)