

ANNA GÜLCHER

Computational planetary scientist, Caltech / NASA JPL

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Research Gate: [Anna J. P. Gülcher](https://www.researchgate.net/profile/Anna-J-P-Gulcher)

PROFESSIONAL EXPERIENCE

- 2023 - present **Postdoctoral Researcher**, Planetary Sciences Divisions, Pasadena, CA, US
NASA Jet Propulsion Laboratory and the California Institute of Technology
- 2018 - 2022 **Research assistant**, Institute of Geophysics, ETH Zürich Zürich, Switzerland
- 2015 - 2016 **Consultant Board of Education**, Geosciences Dept., Utrecht University Utrecht, the Netherlands
- 2014 - 2016 **Teaching assistant, lecturer**, Geosciences Dept., Utrecht University Utrecht, the Netherlands
- 2011 - 2016 **Outdoor instructor and coordinator** the Netherlands; Italy
Zeilschool Oer't Hout (NL) and Elba Travels (IT)

PRIZES, AWARDS, AND GRANTS

- 06.2022 **SNF Postdoc Mobility fellowship awardee**, Swiss National Science Foundation
- 05.2019 **Outstanding Student Poster presentation Award (OSPP)**, European Geoscience Union
- 10.2018 **ETH MSc thesis medaille 2018**, ETH Zürich, Switzerland
- 09.2016 **Master Scholarship Award**, ETH Zürich, Switzerland
- 05.2016 **Molengraaff Fonds**, TU Delft, the Netherlands

ACADEMIC QUALIFICATIONS

- 2018 - 2022 **Ph.D in Geophysics | Planetary Sciences**, ETH Zürich Zürich, Switzerland
Thesis: 'Shaping Earth's mantle flow through chemical and rheological heterogeneity in the lower mantle'
Advisors: Maxim D. Ballmer (UCL) and Paul J. Tackley (ETH)
- 2016 - 2018 **MS.c in Earth Sciences | Geophysics**, ETH Zürich, 4.0/4.0 GPA Zürich, Switzerland
Thesis: 'Plume penetration into Venusian lithosphere and the origin of coronae: 3D thermomechanical modelling'. Advisors: Taras V. Gerya (ETH) and Laurént Montési (UMD)
- 2013 - 2016 **BS.c in Earth Sciences**, Utrecht University, *Cum Laude: 4.0/4.0 GPA* Utrecht, the Netherlands

SPACE MISSION INVOLVEMENT

- 2023 - present **VERITAS space mission**, NASA JPL, Scientific collaborator
- 2022 - present **EnVision space mission**, ESA, Radio Experiment Science (RSE) team member

PROFESSIONAL SERVICE (SELECTED)

- 2023 - future **NASA Venus Exploration and Analysis Group (VexAG) Steering committee**, member
- 2020 - present **Conference; session convener/chair**
 - Leading scientific panels and foster discussions as session convener/chair (15+)
 - Responsible for geodynamic workshop and conference organisation
- 2020 - present **Reviewer** for scientific papers (9) and grant proposals (3)
- 2019 - 2022 **Science communicator and outreach manager**, European Geoscience Union (EGU)
 - Blog editor and author for the Geodynamics blog webpage
 - Social media manager for the Geodynamics outreach channels

- 2020 - 2022 **Early Career Scientist Representative**, European Geosciences Union (EGU)
• Vital link between the scientific community, the Division leaders, and the Union board
- 2021 - 2022 **Mentor** for female Early Career Scientists, EGU
- 2015 - 2016 **President** of the **Geological Women's Society Utrecht** (U.G.D.D. Saxifraga)

PEER-REVIEWED JOURNAL PUBLICATIONS

In preparation

- **Gülcher, A. J. P.**, Ballmer, M. D., and Tackley, P. J., Bridgmanite-enriched domains stable in Earth's lower mantle: insights from global 3D mantle convection models
- **Gülcher, A. J. P.**, Yu, T., Stahler, D., and Gerya, T. V., Forming asymmetrical coronae on Venus by plume-plateau interactions: insights from 3D thermochemical models
- Desiderio, M., **Gülcher, A. J. P.**, and Ballmer, M. D., The control of basalt properties on the preservation of recycled and primordial heterogeneity in Earth's lower mantle

Published

- **Gülcher, A. J. P.**, Golabek, G., Thielmann, M., Ballmer, M.D., and Tackley, P.J. (2022). Narrow, fast, and "cool" mantle plumes cause by strain-weakening rheology in the lower mantle. *Geochemistry, Geophysics, Geosystems*, vol. 23, issue 10, e2021GC010314, DOI: <https://doi.org/10.1029/2021GC010314>
- **Gülcher, A. J. P.**, Ballmer, M.D. and Tackley, P.J. (2021). Coupled dynamics and evolution of primordial and recycled heterogeneity in Earth's lower mantle. *Solid Earth*, vol. 12, pp. 2097-2107, DOI: [10.5194/se-12-2087-2021](https://doi.org/10.5194/se-12-2087-2021)
- **Gülcher, A. J. P.**, Gerya, T.V., Montési, L.G.J. and Munch, J. (2020) Corona structures driven by plume-lithosphere interactions and evidence for ongoing plume activity on Venus. *Nature Geoscience*, vol. 13, pp. 547-554, DOI: [10.1038/s41561-020-0606-1](https://doi.org/10.1038/s41561-020-0606-1)
- **Gülcher, A. J. P.**, Gebhardt, D., Ballmer, M.D. and Tackley, P.J. (2020). Variable dynamic styles of primordial heterogeneity preservation in Earth's lower mantle. *Earth and Planetary Science Letters*, vol. 536, 116160, DOI: [10.1016/j.epsl.2020.116160](https://doi.org/10.1016/j.epsl.2020.116160)
- **Gülcher, A. J. P.**, Beaussier, S. J. and Gerya, T.V., (2019). On the formation of oceanic detachment faults and their influence on intra-oceanic subduction initiation: 3D thermomechanical modeling. *Earth and Planetary Science Letters*, vol. 506, pp. 195-208, DOI: [10.1016/j.epsl.2018.10.042](https://doi.org/10.1016/j.epsl.2018.10.042)

BOOK CHAPTERS / REVIEW PAPERS / TECHNICAL PAPERS

Published

- O'Rourke, J., Wilson, C., Ghail, R., **et al. (Gülcher, A. J. P.)** (2023), Venus, the Planet: Introduction to Earth's Sister Planet. *Space Science Reviews*, vol. 219, 10. DOI: <https://doi.org/10.1007/s11214-022-00937-9> (Chapter in book 'Venus: Evolution through Time', Springer, edited by Spohn et al.)
- Rolf, T., Weller, M., **Gülcher, A. J. P.**, et al. (2022), Venus mantle dynamics and evolution through time. *Space Science Reviews*, vol. 218, 70. DOI: <https://doi.org/10.1007/s11214-022-00937-9> (Chapter in book 'Venus: Evolution through Time', Springer, edited by Spohn et al.)
- Cutts, J. A., **et al. (Gülcher, A. J. P.)**, (2020) Venus Coronae and Tessera Explorer (VeCaTEX) Mission Concept Investigating the Surface of Venus from beneath the Clouds, *Venus Exploration and Analysis Group annual meeting*, 18, abstract 8031

Submitted

- Gillman, C., Golabek, G. J., **Gülcher, A. J. P.**, Lefèvre, M., and Avibe, G. Venus. *Submitted as chapter in Treatise on Geochemistry, 3rd edition*

In preparation

- Smrekar, S., Ghail, R., Byrne, P., **et al. (Gülcher, A. J. P.)**, Volcano-tectonic processes on Venus, (to be submitted to *Space Science Reviews*. (Chapter in book 'Venus: Evolution through Time', Springer, edited by Spohn et al.)

OUTREACH ARTICLES (SELECTED)

See full list: www.annagulcher.com/outreach/

- **Gülcher, A. J. P.** (2021). A surprisingly geologically active Venus – evidence for recent volcanic and tectonic activity. *The Science Breaker, Earth and Space*, DOI: [10.25250/thescbr.brk555](https://doi.org/10.25250/thescbr.brk555)
- **Gülcher, A. J. P.** (2020). Evidence for a hotspot Venus - clues from mysterious coronae. *Nature Astronomy* “behind the paper”, <https://go.nature.com/30HHTYP>

APPEARANCE IN/COVERAGE BY MEDIA (SELECTED)

- Interviewed for a Women-in-STEM interview by **GAIA** (Dutch network for women in Earth Sciences): ‘[Interview with dr. Anna Gülcher](#)’, 12.2022
- Scientific guest in podcast episode ‘[Unraveling the geologic history of Venus](#)’, ‘*The Cosmic Cast*’, 04.2022
- [Vénus coronae et panaches actifs](#), *L’Astronomie*, vol. 145, pp. 4-7, 01.2021
- [Venus: Science! Today!](#), *EGU Geodynamics blog series ‘Peculiar Planets*’, 09.2020
- [Venus has crown-shaped hotspots that form its own ‘Ring of Fire’](#), *CNN Space + Science*, 07.2020
- [Venus has dozens of volcanic hotspots, says study](#), *Forbes*, 07.2020
- [The Venus ‘Ring of Fire’](#), *ETH News*, 07.2020
- [Scientists identify 37 recently active volcanic structures on Venus](#), *Reuters*, 07.2020
- [Volcanoes are still active on Venus](#), *Cosmos Magazine*, 07.2020
- [Dozens of active volcano sites spotted on Venus for the first time](#), *New Scientist*, 07.2020
- [“Dit verandert onze kijk op Venus grondig”: volgens nieuwe studie is planeet actiever dan gedacht](#), *VRT nieuws* (July 2020)
- [Vulkanen op Venus zijn nog steeds actief](#), *Scientias.nl*, 07.2020

SUPERVISION

ThinkSwiss research scholarship project PI

- **2022**, T. Yu, Georgia Institute of Technology, GA, ThinkSwiss Research Scholarship 2022, ‘*3D thermo-mechanical modelling of coronae on Venus*’

BSc. thesis research supervision

- **2021**, Theresa Eingartner, Dept. of Computer Sciences (visual computing), Friedrich-Alexander-University Erlangen-Nürnberg, ‘*Visualization Of Earth’s Mantle Convection*’
- **2019**, Deborah Stahler, Dept. of Earth sciences, ETH Zürich, ‘*The origin of asymmetrical coronae on Venus: insights from 3D thermomechanical modelling*’

MSc. research research supervision

- **2019**, Timothy Gray, Dept. of Earth sciences, ETH Zürich, ‘*Numerical modelling of mantle flow driven craton motions on Venus*’
- **2018**, Alejandro Cortes, Dept. of Earth sciences, ETH Zürich, ‘*3D thermo-mechanical modelling of oblique subduction zones*’

TEACHING

2018 - 2022

Course teaching, ETH Zürich, Switzerland

- 3rd yr BSc. / 1st yr MSc. course ‘Dynamics of Mantle and Lithosphere’
- 2nd yr BSc. course ‘Geophysical fieldwork’

- 2014 - 2016 **Course teaching**, Utrecht University, the Netherlands
- 2nd yr BSc. courses 'Differential Equations in Earth Sciences', 'Deformation and Metamorphism of the Crust', and 'Linear Algebra and Vector Analysis'
 - 1st yr BSc. courses 'Physics', 'Mathematics', and 'Geology'

INSTITUTIONAL RESPONSIBILITIES

Dept. of Earth Sciences, ETH Zürich, Switzerland (selected)

- 2021 - 2022, **Fix the Leaky Pipeline** peer-mentoring group **co-organiser** (Women in STEM program)
- 2019 - 2022, **Leading organiser** of the **D-ERDW Doctoral Retreat**
- 2019 - 2022, Group meetings organisation, Geophysical Fluid Dynamics group
- 2019 - 2022, Weekly Department networking event organisation ('**Friday Beers/Peers**')

Geosciences Dept., Utrecht University, the Netherlands (selected)

- 2015 - 2016, Study Association's Board of Advice, **student consultant**
- 2014 - 2026, **Writer and editor** of the Earth Sciences magazine 'PanGeo'

INVITED SEMINAR AND KEYNOTE TALKS

- 02.2023, LPI Venus Surface and Atmosphere meeting, 'Venus Tectonism' session (*declined due to conflict of schedule*) (**Invited keynote speaker**)
- 12.2022, Charles University Prague geophysics seminar (**Invited seminar speaker**)
- 11.2022, AGU Fall Meeting 2022, session 'Exploring multi-scale mantle dynamics with computational methods' (**Invited speaker**)
- 05.2022, EGU General Assembly 2022, session 'Towards the Decade of Venus' (**Invited speaker**)
- 04.2022, VEXAG "Second Planet Second Tuesdays" Colloquium (**Invited speaker**)
- 08.2021, German/Swiss Geodynamics Workshop 2021, Bad Belzig, Germany (**Keynote speaker**)
- 03.2021, NAS Planetary Science and Astrobiology Decadal Survey 2023-2032. 'Venus Geodynamics' open session (**Keynote speaker and panelist**)
- 03.2021, Imperial College Earth and Planets Seminar
- 02.2021, Zehijang University Earth and Data seminar
- 02.2021, Oxford University Geophysics seminar
- 11.2020, ETH Planetary Geophysics seminar
- 10.2020, University of Maryland, Department of Geology seminar series
- 08.2020, NASA GISS mini-conference 'Venus Science Today' (**Invited speaker and panelist**)
- 07.2020, IGCP 648 seminar series 'Supercontinent Cycles and Global Geodynamics'

CONFERENCE/WORKSHOP CONTRIBUTIONS (SELECTED)

See full list: www.annagulcher.com/publications/

Conference talks (selected)

- 05.2022, European Geoscience Union (EGU) 2022 General Assembly, Vienna, session GD2.5, '*Narrow, fast, and "cold" mantle plumes on Earth explained by strain-weakening rheology in the lower mantle*'
- 12.2021, American Geophysical Union (AGU) 2021 Fall Meeting (virtual), session DI34A, '*Shaping Earth's mantle convection via strain-weakening rheology in the lower mantle*'
- 07.2021, Goldschmidt 2021 conference (virtual), session 2cO3, '*Breakdown of primordial layering in the early Earth: implications for tectonic regime and ancient geochemical signals through time*'
- 04.2021, EGU 2021 General Assembly (virtual), session GD1.1, '*Coupled dynamics of primordial and recycled heterogeneity in Earth's lower mantle, and their present-day seismic signatures*'

- [12.2020](#), AGU 2020 Fall Meeting (virtual), session DI017, ‘*The coexistence of recycled and primordial heterogeneity in Earth’s lower mantle: a geodynamical perspective*’
- [09.2020](#), Europlanet Science Congress (EPSC) 2020 (virtual), session TP11, ‘*Widespread ongoing plume activity on Venus revealed by variations in the morphology of large coronae*’
- [04.2020](#), EGU 2020 General Assembly (virtual), session GD2.1, ‘*The formation, preservation and seismic signatures of chemical heterogeneities in the lower mantle*’

Conference posters (selected)

- [12.2021](#), AGU 2022 Fall Meeting (remote), session P51, ‘*The origin of asymmetrical coronae on Venus: Morphology classification and 3D models of plume-margin interactions*’
- [12.2021](#), AGU 2021 Fall Meeting (virtual), session P45E, ‘*The enigma of Venusian coronae and tectonics*’
- [12.2020](#), American Geophysical Union 2020 Fall Meeting (virtual), session DI009, ‘*Strain-weakening rheology in Earth’s lower mantle and its control on mantle convection and tectonics*’
- [07.2020](#), Goldschmidt 2020 conference (virtual), session 02c, ‘*The formation, preservation and seismic signatures of chemical heterogeneities in the lower mantle*’
- [12.2019](#), AGU 2019 Fall Meeting, San Francisco, USA, session DI41D, ‘*Constraints on Primordial Heterogeneity Preservation in the Lower Mantle and Implications for Global-Scale Mantle Dynamics*’
- [08.2019](#), 2019 Ada Lovelace workshop on modelling lithosphere and mantle dynamics, Sienna, Italy, ‘*Rheological constraints on primordial heterogeneity preservation in Earth’s lower mantle*’
- [05.2019](#), EGU 2019 General Assembly, Vienna, Austria, session GD3.6, ‘*Investigating the effect of rheological and tectonic parameters on the preservation of primordial reservoirs in Earth’s lower mantle: a numerical study*’ (**Outstanding Student Poster Presentation award**)
- [12.2018](#), AGU Fall Meeting, Washington DC, USA, session DI33C, ‘*Plume Penetration into Venusian Lithosphere and the Origin of Coronae*’
- [08.2017](#), XV International Workshop on Mantle and Lithosphere Dynamics 2018, Putten, the Netherlands, ‘*On the formation of oceanic detachment faults and their influence on intra-oceanic subduction initiation: 3D thermomechanical modeling*’

OTHER CONTRIBUTIONS TO SCIENCE

Data and supplementary materials

- **Gülcher, A. J. P.**, Montési, L. G. V., Gerya, T. V., and Munch, J. Venus Database for coronae activity classification. Zenodo, DOI: [10.5281/zenodo.3241326](https://doi.org/10.5281/zenodo.3241326) (2020)
- **Gülcher, A. J. P.**, Coupled dynamics and evolution of primordial and recycled heterogeneity in Earth’s lower mantle - Supplementary Videos. Zenodo, DOI: [10.5281/zenodo.4298777](https://doi.org/10.5281/zenodo.4298777) (2021)

Contributions to scientific software

- **StagPy v0.15**, open-source Python module StagPy (Morison et al., 2021, [github release](#), [documentation](#)): *contribution to minor additional features*
- **STAGLAB 5.0 and 6.0**, open-source Geodynamic diagnostics and scientific visualisation software (Crameri, F., 2018, DOI: [doi:10.5194/gmd-11-2541-2018](https://doi.org/10.5194/gmd-11-2541-2018)): *developed new features for reading scientific data, retrieving key mantle convection information, and visualisation thereof*

FURTHER EDUCATION AND TRAINING (SELECTED)

2019 - present Leadership and development

- Leadership and how to succeed in Scientific and Professional Careers, Dr. Sarah Shephard
- Introduction to Collegial Coaching, [SolutionSurfers](#), [International Coaching Federation](#)
- Time management, [Sandra Bajus](#), ETH Zürich
- [Learning to Teach](#), Educational Development and Technology, ETH Zürich
- Scientific writing, Dr. Thomas Armstrong, University of St. Gallen, Switzerland

- Project Management for Research, ETH Zürich
- Strategical Thinking, [Barefoot Thinking Company](#)

2020 - 2021

Scientific/computational

- Visualisation of scientific and abstract data, Computer Graphics Laboratory ETH Zürich
- Parallel Programming with MPI/OpenMPI, High-Performance Computing Center Stuttgart (HLRS)

