


Anna Mittelholz

PhD

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APPOINTMENTS

- starting 09/2023 **SNF Ambizione Fellow**, *Institute of Geophysics, ETH Zürich, Zürich, Switzerland*
Topic: Using Magnetic Fields to Explore Terrestrial Planets in our Solar System
- 02/2022-08/2023 **Reginald A. Daly Postdoctoral Fellow**, *Harvard University, Cambridge, USA*
Topic: Planetary magnetic fields, independent postdoc
- 09/2020-01/2022 **ETH Postdoctoral Fellow**, *ETH Zurich, Zurich, Switzerland*
Topic: Planetary magnetic fields, SEG Group
- 2019 - 2020 **Postdoctoral Researcher**, *The University of British Columbia, Vancouver, Canada*
Topic: Mars magnetic field, with Prof. Catherine L. Johnson

EDUCATION

- 2013 - 2019 **PhD**, *The University of British Columbia, Vancouver, Canada*
Upgrade from MSc to PhD in May 2015
Thesis: Mars' external and internal fields from orbital observations, with Prof. Catherine L. Johnson
- 2010 - 2013 **BSc**, *Technical University of Munich and Ludwig-Maximilians-Universität, Munich, Germany*
Thesis: Marsquakes - Single station planetary seismology, with Prof. Heiner Igel

PROFESSIONAL EXPERIENCE

- 05/2018 - 01/2019 **Science Outreach Consultant**, *Department of Education, The University of British Columbia, Vancouver, Canada*
Developing teaching material for future high school teachers.
Integrating museum resources and exhibitions of the Pacific Museum of the Earth into easily accessible material for teachers and interested museum visitors.
- 2013 - 2019 **Teaching Assistant**, *Department of Earth, Ocean and Atmospheric Sciences, The University of British Columbia, Vancouver, Canada*
Courses: The Solid Earth: A Dynamic Planet (EOSC110), Laboratory Exploration of Planet Earth (EOSC111), Computational Methods in Earth, Ocean and Atmospheric Sciences (EOSC211), Earth and Life Through Time (EOSC326), The Earth and the Solar System (EOSC310)
- 2012 - 2013 **Assistant for Instrument System Integration**
Kayser-Threde, Dr. Clemens Kaiser, Ralf Paschetag and Jürgen Breikopf, Munich, Germany
Several projects (TET, Sentinel5, Galileo) in a 6 week apprenticeship followed by a job offer.
Working in two different areas for the weather satellite Meteor Third Generation: Mechanical Ground Support Equipment; Assembly, Integration and Testing
Tools: IBM DOORS, Microsoft Office and CATIA.

MANAGEMENT AND LEADERSHIP

- since 01/2020 **InSight working group lead**
Interior Exploration using Seismic Investigations, Geodesy and Heat Transport mission: Co-lead of the Magnetics Working Group, member of the Science Team and the Leadership Team.
- 11/2020 **NASA Decadal Survey**
Led a group of scientists involved in research regarding Mars' magnetic field to identify major science and exploration goals for the next 10 years. This was published as part of the NASA Decadal Survey and presented in front of a NASA steering committee. [Link](#)
- since 2019 **Conference Organisation**
Served as session chair for several (10+) conferences at AGU, LPSC and EGU.
- 2015-2016 **CanMars: Raman Team Lead**
Co-lead of the Mastcam and Raman Spectrometer Team during a mission analogue experiment organized by the Canadian Space Agency resulting in two publications and several conference presentations at the lunar and planetary science conference.

TEACHING

2015 EOOSC212: Topics in Earth and Planetary Sciences (1 Lecture)
2013 - 2019 Teaching Assistant at UBC Vancouver
Assisting professors in teaching and grading of a variety of courses
Assisting in computer lab courses resulting in the Departmental Teaching Assistant Award

VOLUNTEER ACTIVITIES

2021/2022 **NASA Planetary Data System Reviewer**
Reviewing planetary mission data products to be published on the Planetary Data System (PDS).
2021/2022 **NASA NSPIRES Reviewer and Panel member**, Evaluation of proposals submitted to the Solar System Workings Program.
since 2018 **Journal Reviewer**, Reviewer for journals such as Nature Astronomy, Journal of Geophysical Research, Geophysical Research Letters, Planetary and Space Science.
2014 **Mars Workshop**, *The University of British Columbia, Vancouver, Canada*
Organization of the new Pacific Museum of the Earth Mars workshop that was presented at the Geological Society of America meeting. The workshop is an introduction to planetary science for children with a focus on Mars.
2013 - 2016 **Graduate Council**, *The University of British Columbia, Vancouver, Canada*
Grad Council Coordinator 2014-2016; organized academic and social events to engage graduate students; represented graduate students in department committees. Positions held: Council Coordinator, Social Coordinator, Public Relations / Internal Relations Representative, Officer of Sustainability.

CONFERENCE ORGANISATION

Session Chair at Scientific Conferences
12/2023 AGU Fall Meeting, San Francisco: Planetary Magnetism
03/2022 LPSC, Texas: Martian Geophysics and Tectonics
12/2021 AGU Fall Meeting, New Orleans (hybrid): Diving Deep: Investigations of Planetary Interiors through Observation, Modeling and Experiments
12/2021 AGU Fall Meeting, virtual: Planetary Magnetism
12/2020 AGU Fall Meeting, virtual: Planetary Magnetism
03/2020 LPSC, Texas: One Year on Mars with InSight
04/2019 EGU, Vienna: First InSight Results
12/2019 AGU Fall Meeting, San Francisco: Planetary Magnetism

AWARDS AND SCHOLARSHIPS

2022 SNF Ambizione Fellowship (starting date September 2023)
Postdoctoral Awards: Received competitively-awarded postdoctoral fellowships
2020 Harvard Daly Fellowship
2020 ETH Fellowship
2020 Marie-Curie Fellowship (declined)
Doctoral Awards – The University of British Columbia
2015 - 2019 Four Year Fellowship (\$18,200/year)
2015 MacKay Memorial Scholarship (\$9,990.00)
2014 - 2018 CREATE CPSX Natural Sciences and Engineering Research Council of Canada (NSERC)
2014 W H Matthews Scholarship (\$2,500.00)
2014 J.Jay McNee Memorial Scholarship (\$1,600.00)
2013 - 2019 International tuition award
Other Awards
2019 Outstanding Student Paper Award (EGU Vienna)
2015 Outstanding Student Paper Award (AGU Fall Meeting)
2015 Departmental Teaching Assistant Award (\$500)
2014 - 2015 DAAD: Jahresstipendien für Graduierte und Promovierte (€950/Monat)

MEDIA COVERAGE

11/2021 EOS Editor Highlights "A Better Look at the Moon's Middle Mantle" [Link](#)
Selected media coverage related to InSight
11/2022 Science News "Marsquakes hint that the planet might be volcanically active after all" [Link](#)
09/2020 SciTechDaily "Surprise on Mars – Unexpected Reaction to Solar Eclipses From Martian Moon Phobos" [Link](#)
07/2020 Virtual Cosmic Nights of the MacMillan Space Center (2020): "Mars InSight Mission" Link to interview: [Link](#)
02/2020 EurekAlert: "Magnetic Field at Martian Surface Ten Times Stronger than Expected" [Link](#)
Selected media coverage of Mittelholz et al., (2020)
06/2020 Eos Magazine "A Longer-Lived Magnetic Field for Mars" [Link](#)
05/2020 Science Daily "New timeline for ancient magnetic field on Mars" [Link](#)
05/2020 Universe Today "When Did Mars Lose its Global Magnetic Field?" [Link](#)

WORKSHOPS

- ESA-China Mars School (Beijing, 2023): Presenting and serving as expert in Mars' magnetism.
- Low-cost science mission concepts for Mars Exploration (Pasadena, 2022): Advocating for regional magnetic field studies using helicopters.
- Participation in the CanMars analogue mission (AZ/UT, 2015/2016) as part of the Science team operating from London (ON). Two papers are results of this: Osinski et al., 2019 and Caudill et al., 2019
- Participation in field work and workshops offered during NSERC CREATE meetings 2016/2017

SELECTED ADDITIONAL PRESENTATIONS

- Visiting Speaker (2023), *NASA GSFC, USA*: "Mars' Magnetic Field: Progress and Puzzles"
- Planetary Lunch Seminar (2023), *MIT, Cambridge, USA*: "Mars' Magnetic Field: Progress and Puzzles"
- Visiting Speaker (2023), *LPG Nantes, France*: "Mars' Magnetic Field: Progress and Puzzles"
- Seminar (2022), *UC Berkeley, USA*: "Mars' Magnetic Field as Seen from the Surface with InSight"
- Department Seminar (2021), *ETH Zurich, Switzerland*: "Mars' Magnetic Field as Seen from the Surface"
- Department Seminar (2021), *The University of British Columbia, Vancouver, Canada*: "Dragons on Mars"
- NASA Decadal Survey (2020): "Mars' Ancient Dynamo and Crustal Remanent Magnetism"
- Visiting Speaker (2020), *DLR, Berlin, Germany*: "Planetary Magnetic Fields: A focus on Mars"
- Virtual Cosmic Nights of the MacMillan Space Center (2020): "Mars InSight Mission"
- Visiting Speaker (2019), *Simon Fraser University, Vancouver, Canada*: "Mars Crustal Magnetism: Progress and Puzzles"
- Pint of Science (2019), *Vancouver, Canada*: "InSight - Getting to the Heart of Mars"
- Visiting Speaker (2019), *ETH Zurich, Switzerland*: "Mars Crustal Magnetism: Lessons Learned from Orbit and on the Ground"
- Mars 2020 Landing Site Workshop (2018), *Pasadena, USA*: "The Mars 2020 Candidate Landing Sites: A Magnetic Field Perspective"
- Visiting Speaker (2017), *Berlin, Germany*: "Global-scale external magnetic fields at Mars"
- NSERC CREATE CPSX annual meeting (2017), *Utah, USA*: "Understanding Mars"
- NSERC CREATE CPSX annual meeting (2016), *Canada, Kingston*: "The large-scale geometry and temporal variability of the external magnetic field of Mars"
- 3 Minute thesis competition (2015), *The University of British Columbia, Vancouver, Canada*: "The Magnetic Field of Mars"
- EarthTalks (2015), *The University of British Columbia, Vancouver, Canada*: "The Martian Magnetic Field"

PUBLICATIONS

- (submitted) B. Pinot, D. Mimoun, N. Murdoch, ... **A. Mittelholz**, ... (2023): The in-situ Evaluation of the SEIS Noise Models. *Space Science Reviews*.
- (accepted) L. Cheng, R. Lillis, Y. Wang, **A. Mittelholz**, ... (2023): Martian bow shock oscillations driven by solar wind variations: simultaneous observations from Tianwen-1 and MAVEN. *GRL*.
- (accepted) **A. Mittelholz**, L. Heagy, C. L. Johnson, J. Bapst, J. Espley, A. Fraeman, B. Langlais, R. Lillis (2023): Exploring Martian Magnetic Fields with a Helicopter. *Planetary Science Journal*.
- M. Golombek, T. Hudson, P. Bailey, ..., **A. Mittelholz**, ... (2023): Results from InSight Robotic Arm Activities. *Space Science Reviews*.
- L. Ojha and **A. Mittelholz**, (2023): Insight into the formation mechanism of the Medusae Fossae Formation on Mars from magnetic field data. *Icarus*.
- A. Mittelholz**, C. L. Johnson, M. Fillingim, R. E. Grimm, S. Joy, S. N. Thorne, W. B. Banerdt (2023): Mars' external magnetic field as seen from the surface with InSight. *Journal of Geophysical Research: Planets*, 128, e2022JE007616. <https://doi.org/10.1029/2022JE007616>
- C. Yan, A. Barik, S. Stanley, ..., **A. Mittelholz**, ... (2023): An ancient dynamo driven by hemispheric heating: effect of thermal boundary conditions. *Planetary Science Journal*. 4,1. 10.3847/PSJ/acae93
- S. Stähler, **A. Mittelholz**, C. Perrin, ..., (2022): Tectonics of Cerberus Fossae unveiled by marsquakes. *Nature Astronomy*, 1-11. <https://doi.org/10.1038/022-01803-y>
- T. Kawamura, M. Grott, R. Garcia, ..., **A. Mittelholz**, ... (2022): An autonomous lunar geophysical experiment package (ALGEP) for future space missions. *Experimental Astronomy*, 1-24. <https://doi.org/10.1007/s10686-022-09857-6>.
- S. Thorne*, C. L. Johnson, **A. Mittelholz**, ..., (2022): Investigation of magnetic field signals during vortex-induced pressure drops at InSight. *Planetary and Space Science*, p.105487. <https://doi.org/10.1016/j.pss.2022.105487>
- M. Wieczorek, A. Brocquet, S. M. McLennan, ... **A. Mittelholz**, ..., (2022): InSight constraints on the global character of the Martian crust. *JGR Planets*. <https://doi.org/10.1029/2022JE007298>
- A. Mittelholz** and C. Johnson (2022): The Martian Crustal Magnetic Field. *Frontiers in Astronomy and Space Sciences*. 9:895362., doi: 10.3389/fspas.2022.895362
- H. Luo, A. M. Du, Y. S. Ge, C. L. Johnson, **A. Mittelholz**, ... (2022): Natural Orthogonal Component Analysis of Daily Magnetic Variations at the Martian Surface: InSight Observations, *JGR Planets*, 127(2). <https://doi.org/10.1029/2021JE007112>
- A. Mittelholz**, C. L. Johnson, M. Fillingim, ..., (2021): Space Weather Observations with InSight, *Geophysical Research Letters*, 48(22). <https://doi.org/10.1029/2021GL095432>
- A. Mittelholz**, A. Grayver, A. Khan, A. Kuvshinov (2021): The Global Conductivity Structure of the lunar upper and midmantle. *JGR: Planets*, 126 (11). <https://doi.org/10.1029/2021JE006980>
- A. Mittelholz**, J. Espley, J. Connerney, R. F. C. L. Johnson, B. Langlais, ... B. P. Weiss (2021): Mars' Ancient Dynamo and Crustal Remanent Magnetism. *Bulletin of the AAS*, 53(4). <https://doi.org/10.3847/25c2cfcb.471d6bfb>
- B. Knappmeyer-Endrun, M. Panning, ..., **A. Mittelholz**, ..., (2021): Thickness and structure of the Martian crust from InSight seismic data, *Science* 373, 438–443, doi: 10.1126/science.abf8966.
- M. Volk, R. Fu, **A. Mittelholz**, J. Day (2021): Paleointensity and Rock Magnetism of Martian Nakhilite Meteorite Miller Range (MIL) 03346: Evidence for Intense Small Scale Crustal Magnetization on Mars, *JGR: Planets* 126.5, doi:e2021JE006856.
- C. Charalambous, McClean J. B., ..., **A. Mittelholz**, ..., (2021): Vortex-dominated aeolian activity at InSight's landing site, Part 1: Multi-instrument Observations, Analysis and Implications, *JGR Planets*, doi.org/10.1029/2020JE006757
- A. Mittelholz**, C. L. Johnson, S. N. Thorne, ..., (2020): The origin of observed magnetic variability for a sol on Mars from InSight, *JGR Planets*, doi.org/10.1029/2020JE006505

14. S. C. Stähler, R. Widmer-Schmidrig, J.-R. Scholz, M. van Driel, **A. Mittelholz** , ..., (2020): Geophysical observations of Phobos transits by InSight, *Geophysical Research Letters*, 47, doi.org/10.1029/2020GL089099
13. **A. Mittelholz**, C. L. Johnson, J. Feinberg, B. Langlais, R. J. Phillips, (2020): New constraints on dynamo timing and crustal magnetization on Mars from MAVEN observations, *Science Advances*, 6, 18, doi: 10.1126/sciadv.aba0513
12. B. Banerdt, S. Smrekar, ..., C. L. Johnson, **A. Mittelholz**, ... (2020): Early Results from the InSight Mission: Mission Overview and Global Seismic Activity, *Nature Geoscience*, doi.10.1038/s41561-020-0544-y
11. C. L. Johnson, **A. Mittelholz**, B. Langlais, ... (2020): Crustal and Time-Varying Magnetic Fields at the InSight Landing site on Mars, *Nature Geoscience*, doi: 10.1038/s41561-020-0537-x
10. D. Banfield, A. Spiga, ..., C. L. Johnson, **A. Mittelholz**, ... (2020): An overview of the initial results on atmospheric science from InSight measurements, *Nature Geoscience*, doi: 10.1038/s41561-020-0534-0
9. C. Hanneson, C. L. Johnson, **A. Mittelholz**, M. M. Al Asad, C. Goldblatt (2019): Dependence of the Interplanetary Magnetic Field on Heliocentric Distance at 0.3–1.7 AU: A Six-Spacecraft Study, *JGR Space Physics*, doi: 10.1029/2019JA027139
8. R. J. Lillis, M. O. Fillingim, Y. Ma, F. Gonzalez-Galindo , F. Forget, C. L. Johnson, **A. Mittelholz**, ... (2019). Modeling wind-driven ionospheric dynamo currents at Mars: Expectations for InSight magnetic field measurements, *Geophysical Research Letters*, 246, doi: 10.1029/2019GL082536
7. S. E. Smrekar, P. Lognonné, T. Spohn, ..., C. L. Johnson, **A. Mittelholz**, ... (2019): Pre-mission InSights on the Interior of Mars, *Space Science Reviews*, 215: 3, doi: 10.1007/s11214-018-0563-9
6. D. Banfield, J. A. Rodriguez-Manfredi, C. T. Russell, ..., C. L. Johnson, **A. Mittelholz**, ... (2019): InSight Auxiliary Payload Sensor Suite (APSS), *Space Science Reviews*, 215: 4, doi: 10.1007/s11214-018-0570-x
5. G. Osinski, M. Battler, C. Caudill, ... , **A. Mittelholz**,... (2019): The CanMars Mars Sample Return Analogue Mission, *Space Science Reviews*, 166: 110–130, doi: 10.1016/j.pss.2018.07.011
4. C. Caudill, A. Pontrefact, **A. Mittelholz**, A. Grau Galofre, T. Tianqi, G.R. Osinski, and the CanMars Science team (2019): CanMars mission Science Team operational results: Implications for operations and the sample selection process for Mars Sample Return (MSR). *Planetary and Space Science*, 172: 43–56, doi: https://doi.org/10.1016/j.pss.2019.04.004
3. **A. Mittelholz**, A. Morschhauser, C. L. Johnson, B. Langlais, R.J. Lillis, F. Vervelidou, B. Weiss (2018): The last 3 Mars2020 landing sites from a magnetic field perspective, *Earth and Space Sciences*, 5.9: 410–424, doi: d10.1029/2018EA000420
2. **A. Mittelholz**, C. L. Johnson, A. Morschhauser (2018): A New Magnetic Field Activity Proxy for Mars from MAVEN Data, *Geophysical Research Letters*, 45.12: 5899–5907, doi: 10.1029/2018GL078425.
1. **A. Mittelholz**, C.L. Johnson, R.J. Lillis (2017): Global-scale external fields measured at satellite altitudes, *JGR Planets*, 122, 1243–1257, doi:10.1002/2017JE005308.

SELECTED CONFERENCE PUBLICATIONS

- **A. Mittelholz**, C. L. Johnson, S. N. Thorne, ... (2022). External Magnetic Fields as seen from InSight (talk), LPSC, Houston, USA.
- **A. Mittelholz** (2022). Space Weather Observations with InSight (talk), AMS 102nd Annual Meeting, (invited online).
- **A. Mittelholz**, C. L. Johnson, S. N. Thorne, V. Yau, S. Joy, E. Barrett,... (2021). Magnetic Variations of a Sol Observed Over a Year on Mars with InSight (talk), MACH, (online), Houston, USA.
- **A. Mittelholz**, C. L. Johnson, S. N. Thorne, V. Yau, S. Joy, E. Barrett,... (2021). Magnetic Variations of a Sol Observed Over a Year on Mars with InSight (talk), RAS, (online), Houston, USA.
- **A. Mittelholz**, C. L. Johnson, S. N. Thorne, V. Yau, S. Joy, E. Barrett,... (2020). Magnetic Variations of a Sol Observed Over a Year on Mars with InSight (talk), LPSC, (online), Houston, USA.
- **A. Mittelholz**, C. L. Johnson, R. E. Grimm, ... (2020). Towards magnetic sounding of Mars using diurnal variations (talk), AGU Fall Meeting, San Francisco, USA.
- **A. Mittelholz**, C.L. Johnson, B. Langlais, R. J. Phillips, J. Feinberg (2019). New Constraints on the Crustal Magnetic Field from MAVEN (talk), AGU Fall Meeting, San Francisco, USA.
- **A. Mittelholz**, C.L. Johnson, B. Langlais, ...(2019). Mars Crustal Magnetism: Lessons Learned from Orbit and on the Ground (talk), 9th Mars Conference, Pasadena, USA.
- **A. Mittelholz**, C.L. Johnson, B. Langlais, ...(2019). First results from the InSight FluxGate magnetometer: Constraints on Mars' crustal magnetic field at the landing site (poster), EGU Meeting, Vienna, Austria.
- **A. Mittelholz**, C. Johnson (2017). New insights on crustal magnetic fields on Mars from MAVEN data (poster), LPSC, Houston, USA.
- **A. Mittelholz**, C.L. Johnson (2016). Crustal magnetic fields on Mars from MAVEN data (oral), AGU Fall Meeting, San Francisco, USA.
- **A. Mittelholz**, C.L. Johnson (2016). Global-scale external fields at Mars measured at satellite altitudes: Preparation for magnetic sounding of the martian interior (poster), LPSC, Houston, USA.
- **A. Mittelholz**, M. Maloney, G. R. Osinski (2016). The use of Raman spectroscopy for the 2015 CanMars MSR Analogue Mission (poster), LPSC, Houston, USA.
- **A. Mittelholz**, C.L. Johnson, B. Langlais (2014). Large-scale geometry and temporal variability of the Martian external magnetic field (poster), AGU Fall Meeting, San Francisco, USA.