

## MICHAEL JORGENSEN

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### RESEARCH INTERESTS

Development of advanced methods for joint inversion of potential fields and electromagnetic data. Topics of interest include magnetization vector inversion, massively parallel inversion of large potential fields data sets, joint inversion of multiphysics data using Gramian constraints and joint focusing constraints, mineral and geothermal energy exploration, and the Yellowstone geothermal system.

### EDUCATION

#### University of Utah

Salt Lake City, UT

Ph. D. in Geophysics

April 2020

*Dissertation:* “Imaging Yellowstone magmatic system by the joint Gramian inversion of gravity and magnetotelluric data”

*Advisor:* Dist. Prof. Michael S. Zhdanov

*Committee Members:* Dist. Prof. Michael S. Zhdanov (chair), Prof. Keith Koper, Prof. Michael Thorne, Dr. Martin Cuma, Dr. Le Wan

#### University of Utah

Salt Lake City, UT

M. Sc. in Geophysics

May 2019

*Thesis:* “Joint 3D inversion of magnetotelluric and magnetovariational data”

*Advisor:* Dist. Prof. Michael S. Zhdanov

*Committee Members:* Dist. Prof. Michael S. Zhdanov (chair), Prof. Erich U. Petersen, Dr. Le Wan

#### Utah Valley University

Orem, UT

B. Sc. in Physics

April 2012

*Advisor:* Prof. Bonnie Andersen

### RESEARCH EXPERIENCE

#### Consortium for Electromagnetic Modeling and Inversion (CEMI)

Salt Lake City, UT

#### University of Utah

February 2021-present

#### Research Associate (with Dist. Prof. Michael S. Zhdanov)

- Designed Matlab applications (GUI) for the data processing and inversion of total field and full tensor magnetic data.
- Conducted regional-scale 3D inversion of total field magnetic data in central Utah, USA. The inversions were conducted using a massively parallel inversion algorithm employing a moving sensitivity domain to decrease computation time.
- Inverted a new type of airborne magnetic gradiometry data based on a superconducting quantum interference device (SQUID) towards magnetic susceptibility and magnetization vector models.
- Developed novel methods to decompose the magnetization vector recovered from inversions into the induced and remanent components to aid in exploration.

**Consortium for Electromagnetic Modeling and Inversion (CEMI)** Salt Lake City, UT  
**University of Utah** September 2012-April 2020  
**Graduate Research Assistant (with Dist. Prof. Michael S. Zhdanov)**

- Designed Matlab applications (GUI) for the data processing and joint inversion of potential fields data.
- Conducted the joint inversion of gravity and magnetotelluric data towards unified density and resistivity models of the Yellowstone geothermal system.
- Conducted the large-scale inversion of magnetotelluric data to image deep remnant slab structure underlying the northwestern USA and southern Alberta, Canada.
- Developed a CSAMT static-shift correction technique using the radon transform.

**Dept. of Physics** Orem, UT  
**Utah Valley University** 2010-2012

**Research Assistant (with Prof. Bonnie Andersen)**

- Researched the optimal geometric parameters for components of thermoacoustic prime movers, which convert heat into electricity with no moving parts.

## TEACHING EXPERIENCE

**Adjunct assistant professor** for “Electromagnetic Methods”, University of Utah 2023

- Instructed through lectures and demonstrations
- Prepared and graded home assignments and tests
- Maintained office hours to help students with questions
- Integrated CANVAS into classroom instruction
- Provided hands-on Matlab and LaTeX tutorials

**Teaching assistant** for “Inversion Theory”, University of Utah 2020-2022

- Dist. Prof. Michael S. Zhdanov
- Led weekly Matlab tutorial, office hours, grading

**Teaching assistant** for “Electromagnetic Methods”, University of Utah 2020-2022

- Dist. Prof. Michael S. Zhdanov
- Led weekly Matlab tutorial, office hours, grading

**Teaching assistant** for “Intro. To Earth Systems”, University of Utah 2015-2018

- Prof. Paul Jewell and Prof. Erich Petersen
- Lab lecture, office hours, grading

**Teaching assistant** for “Numerical Methods”, University of Utah 2017

- Dr. Alex Gribenko
- Office hours, grading

**Teaching assistant** for “Oceans”, University of Utah 2015

- Prof. Brenda Bowen
- Office hours, grading, field trip logistics

## ACADEMIC HONORS

- Mental Attitude award (the Bernie) at the Summer of Applied Geophysical Experience (SAGE) sponsored by the Institute of Geophysics, Planetary Physics and Signatures (IGPPS Center) of Los Alamos National Laboratory (2015)
- Outstanding Student, Dept. of Physics, Utah Valley University (2011)

## PROFESSIONAL ASSOCIATIONS AND EDITORIAL

**Associations**

- Consortium for Electromagnetic Modeling and Inversion (CEMI), University of Utah
- Society of Exploration Geophysicists
- European Association of Geoscientists and Engineers

**Editorial**

- Reviewer: *Geophysics, Minerals, Journal of Applied Geophysics, Earth and Space Science, IEEE Geoscience and Remote Sensing Letters, Geodesy and Geodynamics*

## INDUSTRY EXPERIENCE

**TechnoImaging, LLC**

Geophysicist

Salt Lake City, UT

January 2019-current

- Commercial mineral and geothermal energy exploration

## PUBLICATIONS

**Journal papers**

Zhdanov, M.S., Jorgensen, M., and Tao M. (in press). Probabilistic approach to Gramian inversion of multiphysics data. *Frontiers in Earth Science*, **11**, 1127597.  
<https://doi.org/10.3389/feart.2023.1127597>

Zhdanov, M.S., Jorgensen, M., and Wan, L. 2022. Three-dimensional gravity inversion in the presence of the sediment-basement interface: a case study in Utah, USA. *Minerals*, **12**(4), 448.  
<https://doi.org/10.3390/min12040448>

Jorgensen, M., and M.S. Zhdanov. 2021. Recovering magnetization of rock formations by jointly inverting airborne gravity gradiometry and total magnetic intensity data. *Minerals*, **11**(4), 366.  
<https://doi.org/10.3390/min11040366>

Zhdanov, M.S., Jorgensen, M., and Cox, L. 2021. Advanced methods of joint inversion of multiphysics data for mineral exploration. *Geosciences*, **11**(6), 262.  
<https://doi.org/10.3390/geosciences11060262>

Jorgensen, M., and Zhdanov, M.S. 2019. Imaging Yellowstone magmatic system by the joint Gramian inversion of gravity and magnetotelluric data. *Physics of the Earth and Planetary Interiors*, **292**, 12-20.  
<https://doi.org/10.1016/j.pepi.2019.05.003>

Luan, X., Di, Q., Cai, H., Jorgensen, M., and Tang, X. 2018. CSAMT Static Shift Recognition and Correction Using Radon Transformation. *IEEE Geoscience and Remote Sensing Letters*, **15**(7), 1001-1005.  
<https://doi.org/10.1109/LGRS.2018.2820743>

**Conference papers**

Jorgensen, M., Zhdanov, M.S., and Parsons, B. 2022. 3D inversion of QMAGT airborne magnetic gradiometry data for susceptibility and magnetization vector models of the Thompson Nickel Belt in Manitoba, Canada. *Proceedings of Second International Meeting for Applied Geoscience & Energy*, 1135-1139.

<https://doi.org/10.1190/image2022-3739311.1>

Zhdanov, M.S., Jorgensen, M., Gribenko, A., Ikeya, M., and Usui, Y. 2022. 3D joint Gramian inversion of airborne gravity gradiometry and magnetotelluric data for geothermal resource exploration. *Proceedings of Second International Meeting for Applied Geoscience & Energy*, 1155-1159.

<https://doi.org/10.1190/image2022-3737503.1>

Gribenko, A., Cox, L., Jorgensen, M., Zhdanov, M.S., Ikeya, M., and Usui, Y. 2022. Integrated 3D inversion of magnetotelluric and HeliTEM data collected in the geothermal area of Japan. *Proceedings of Second International Meeting for Applied Geoscience & Energy*, 682-686.

<https://doi.org/10.1190/image2022-3737534.1>

Cox, L., Jorgensen, M., Zhdanov, M.S., Pitcher, D., and Niemi, J. 2022. Inversion of Airborne Data for Three-Dimensional Conductivity, Chargeability, and Magnetic Properties Models in Wawa, Ontario, Canada. *Proceedings of 83rd EAGE Annual Conference & Exhibition, 2022*, 1-5.

<https://doi.org/10.3997/2214-4609.202210294>

Tao, M., Jorgensen, M., and Zhdanov, M.S. 2021. Mapping the salt structures from magnetic and gravity gradiometry data in Nordkapp Basin, Barents Sea. *Proceedings of First International Meeting for Applied Geoscience & Energy*, 874-878.

<https://doi.org/10.1190/segam2021-3583664.1>

Zhdanov, M.S., Jorgensen, M., Wan, L. 2021. Two-step approach to 3D gravity inversion: Case study in the State of Utah. *Proceedings of First International Meeting for Applied Geoscience & Energy*, 916-920.

<https://doi.org/10.1190/segam2021-3594481.1>

Jorgensen, M., Cox, L., and M.S. Zhdanov. 2020. Joint inversion of airborne electromagnetic and total magnetic intensity data using Gramian structural constraints. *Proceedings of EAGE20, European Association of Geoscientists and Engineers, 2020*, 1-5.

<https://doi.org/10.3997/2214-4609.202010750>

Jorgensen, M., and M.S. Zhdanov. 2020. Application of Gramian and focusing structural constraints to joint inversion of gravity and magnetic data. *Proceedings of NSG20, European Association of Geoscientists and Engineers, 2020*, 1-5.

<https://doi.org/10.3997/2214-4609.202020043>

Jorgensen, M., and Zhdanov, M.S. 2018. Joint 3D inversion of gravity and MT data using Gramian constraints: a case study from Yellowstone. *SEG Technical Program Expanded Abstracts, 2018*, 2307-2311.

<https://doi.org/10.1190/segam2018-2995041.1>

Jorgensen, M., Cuma, M., and Zhdanov, M.S. 2015. 3D joint inversion of magnetotelluric and magnetovariational data to image conductive anomalies in Southern Alberta, Canada. *SEG Technical Program Expanded Abstracts, 2015*, 990-995.

<https://doi.org/10.1190/segam2015-5848713.1>