

ANNA D. AVDEEVA

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Birth date: 6th April 1981

SUMMARY

I am a geophysicist with a strong mathematical background and experience of leading, organizing and participating in geophysical field experiments. My main expertise lies at the interface between mathematical modelling and inversion of large-scale geophysical datasets, optimization methods and high performance computation. I have applied my skills in a variety of academic and industry projects to image the Earth's subsurface from the first 10 metres to upper-mantle structures. I have published my results in internationally recognised journals, and presented my work at numerous international conferences. I am also an Associate Editor for "Geophysical Prospecting". Through my activities as a geophysical consultant, I have developed my entrepreneurial spirit, established industry contacts and founded my own companies. In my research I have a demonstrated track record of taking on new challenges and finding innovative solutions. I am inquisitive by nature, have a high work ethic, and can work independently and with colleagues.

ACADEMIC QUALIFICATIONS

- PhD in Geophysics (2008), National University of Ireland, Galway, Ireland and Dublin Institute for Advanced Studies, Dublin, Ireland as part of COSMOGRID: Grid-enabled Computational Physics of Natural Phenomena funded by the Higher Education Authority, Ireland

PhD thesis title: "[Three-dimensional Magnetotelluric Inversion](#)", supervisors Professors C. Brown (National University of Ireland, Galway) and A. G. Jones (DIAS)

- Diploma with honours (Russian equivalent to MSc, Hons) in Mechanics and Applied Mathematics (2003), Lomonosov Moscow State University, Moscow, Russia

Diploma thesis title: "Weak Quasi-transverse Shock Waves in Anisotropic Elastic Media", supervisor Professor A. G. Kulikovskiy

POSTS HELD

11/2015–present Co-founder and Director of Modelling/Inversion at Complete MT Solutions. CMTS offers the full spectrum of services for magnetotelluric (MT) imaging of the Earth, from training to survey design to acquisition to processing to modelling/inversion to interpretation.

02/2014–10/2015 Research Associate at the Department of Physics, University of Münster, Germany (with Prof. Michael Becken):
I was the responsible researcher on this very risky and innovative project dealing with electromagnetic (EM) imaging of the Earth using fields

emitted by railway lines. The outcomes of the project (still ongoing) should facilitate the use of EM methods in many areas where so far it was considered impossible. The project was funded through Shell's GameChanger programme.

- 09/2012–present Founder and consultant at Geophysical Imaging Services, LLP - company providing consultancy services on EM data analysis and inversion.
- 11/2012–12/2013 Postdoctoral fellow at GEOMAR, Kiel, Germany (with Dr. Marion Jegen): I was working on 3D inversion of MT data from Walvis Ridge as a part of SACOM project funded through DFG in the framework of Priority Program SAMPLE.
- 02/2012–11/2012 Research Associate at the Department of Geology, University of Leicester, UK:
Joint inversion of controlled and natural source EM data (with Dr. Max Moorkamp).
1D spatially-constrained inversion of DualEM-421 data (with Dr. Ian Hill).
- 10/2011–12/2012 Teaching Assistant at the Department of Mathematics, University of Leicester, UK.
- 07/2008–08/2011 Postdoctoral fellow at IFM-GEOMAR, Kiel, Germany as part of TIMBA project focussing on development of shallow water EM for subsalt exploration funded by Wintershall (with Dr. Marion Jegen)

TEACHING EXPERIENCE

- 2012 – present Co-supervisor of a PhD student, based in GEOMAR, Kiel, Germany
- 2015 Prepared and delivered a course on “Electromagnetic Methods in Geophysics”, as part of a Geophysics M.Sc. at Aberdeen University, UK
- 2011 – 2012 As TA at the University of Leicester, UK, I was involved in running, marking and invigilating undergraduate computer practicals. These included “Methods of Applied Mathematics”, “Differential Equations”, “Vector Calculus”, “Introductory Statistics” and “Introduction to Computing”
- 2009–2011 Prepared and delivered lectures on “EM Inversion” and computer practicals on “EM Induction” for undergraduate students at the Department of Geophysics, Christian-Albrechts-Universität zu Kiel, Germany
- 09/2001–01/2002 Private tutor for a 1st year undergraduate student in mathematics

SUPPORT FROM RESEARCH GRANTS

- 07/2012 Recipient of Financial Support (£1200) to attend 21st EM Induction Workshop held in Darwin, Australia from 25th to 31st of July, 2012
- 06/2010–07/2012 Co-Investigator of FREIA (£180 000): 3D Mapping of basalt thickness and basement structure in the South Eastern Faroe Shetland Trough derived from commercial 3D multi component data set
Funded by international oil company consortia SINDRI

FIELD WORK

03/2014	Planned, organized and led EM field work in the vicinity of a railway line in the Northern Netherlands (31 sites, 3 weeks)
12/2008	Organized and performed test marine MT measurements at the North sea (2 sites, 2 days)
06/2004–08/2004	Installed and maintained MT sites in the Northwest Territories, Canada with Dublin Institute for Advanced Studies (25 sites, 5 weeks)
2004, 2005	Participated in MT field work in central Ireland (1 week)

OTHER ACADEMIC ACTIVITIES

- Associate Editor for “Geophysical Prospecting”
- Reviewer for various international journals including “Geophysical Journal International”, “Geophysics”, “Geophysical Prospecting”, “Journal of Geophysical Research - Solid Earth” and “Hydrology and Earth System Sciences”

SELECTED COLLABORATIONS

since 07/2012	Collaboration with Shane Evans, founder of Moombarriga Geoscience. Moombarriga Geoscience is a Perth-based company committed to providing high quality geophysical data for the discovery of new mineral and energy deposits in Australia. The company specializes in the acquisition, processing and interpretation of MT data. As a consultant, I performed 3D inversion of various data sets.
since 11/2008	“Euroseistest Volvi-Thessaloniki” project: To support the seismic wave propagation modelling process and site effect assessment in the area in which a 3D array of EM data was collected. My task was to perform 3D MT inversion of this data set to map the top-of-basement on the area; Collaboration with Maxim Smirnov (Department of Physics, University of Oulu, Finland), Alexandros Savvaidis (Institute of Engineering Seismology and Earthquake Engineering, Thessaloniki, Greece) and Professor Laust Pedersen (Department of Earth Sciences, Uppsala Universitet, Sweden).
since 07/2008	Collaboration with the Marine Electromagnetic Group (Dr. Marion Jegen) in GEOMAR, Kiel, Germany. After my post-Doctoral research in IFM-Geomar I continued this collaboration. One of our mutual interests is the development of controlled-source electromagnetic (CSEM) inversion code. IFM-Geomar owns hybrid MT/CSEM equipment and acquires marine EM data.
since 04/2004	Collaboration with Geophysics section (Professor Alan Jones) in Dublin Institute for Advanced Studies (DIAS), Ireland. After my PhD in DIAS I continued this collaboration. The Geophysics section acquires large amounts of geophysical data. Recently I installed my 3D MT inversion code on their clusters and I provide support to users of the code.

- 06/2007–07/2007 Collaborative research visit to Earthquake Research Institute, University of Tokyo, to work with Dr. Dmitry Avdeev on development of a software for 3D EM inversion (5 weeks).
- 07/2006–09/2006 Collaborative research visit to Lawrence Berkeley National Laboratory, to work with Dr. Gregory Newman and Dr. Michael Commer on 3D marine CSEM modelling (2 months).

SHORT-COURSE ATTENDANCE

- 08/2005 SAGE: the Summer of Applied Geophysical Experience, field school on different geophysical techniques, organized by Los Alamos National Laboratory (4 weeks).

AWARDS

- 2004 Hamilton Scholar medal at Dublin Institute for Advanced Studies
- 1998 Certificate of programmer, Lyceum #1533 of Information Technology, Moscow, Russia with specialization in C++ and numerical methods

LANGUAGES Russian (native), English (fluent), German (basic)

PERSONAL UK residence card holder
Full, manual UK and Russian driving license holder

PEER-REVIEWED PUBLICATIONS

- Jegen, M., Avdeeva, A. D., Berndt, C., Franz, G., Heincke, B., Hölz, S., Neska, A., Matri, A., Planert, L., Chen, J., Kopp, H., Baba, K., Ritter, O., Weckmann, U., Meqbel, N., and Behrmann, J. (2016) 3-D magnetotelluric image of offshore magmatism at the Walvis Ridge and rift basin. *Tectonophysics*, **683**, 98–108.
- Avdeeva, A. D., Moorkamp, M., Avdeev, D., Jegen, M. and Miensopust, M. P. (2015) Three-dimensional joint inversion of magnetotelluric impedance tensor data and full distortion matrix. *Geophysical Journal International*, **202**, 464–481.
- Miensopust, M. P., Queralt, P., Jones, A. G., and the **3D MT modellers**. (2013). Magnetotelluric 3-D inversion - a recapitulation of two successful workshops on forward and inversion code testing and comparison. *Geophysical Journal International*, **193**, 1216–1238.
- Avdeeva, A. D., Avdeev, D. B., and Jegen, M. (2012). Detecting a salt dome overhang with magnetotellurics: 3D inversion methodology and synthetic model studies. *Geophysics*, **77**, E251–E263.
- Avdeev, D. B., and Avdeeva, A. D. (2009). 3D magnetotelluric inversion using a limited-memory quasi-Newton optimization. *Geophysics*, **74**, F45–F57.

- Spratt, J. E., Jones, A. G., Jackson, V. A., Collins, L., and **Avdeeva, A. D.** (2009). Lithospheric geometry of the Wopmay orogen from a Slave craton to Bear Province magnetotelluric transect. *Journal of Geophysical Research*, **114**, B01101.
- **Avdeeva, A. D.**, Commer, M., and Newman, G. A. (2007). Hydrocarbon reservoir detectability study for marine CSEM methods: time domain versus frequency domain. In *SEG Expanded Abstracts*, **26**, 628–632.
- **Avdeeva, A. D.**, and Avdeev, D. B. (2006). A limited-memory quasi-Newton inversion for 1-D magnetotellurics. *Geophysics*, **71**, G191–G196.
- Avdeev, D. B., and **Avdeeva, A. D.** (2006). A rigorous three-dimensional magnetotelluric inversion. *PIER*, **62**, 41–48.
- **Avdeeva, A. D.**, and Avdeev, D. B. (2006). QN inversion of large-scale MT data. *PIERS Online*, **2**, 210–213
- **Avdeeva, A. D.**, and Sveshnikova, E. I. (2004). Quasi-transverse shock waves in an elastic medium with a complex form of the elastic potential energy. *Mechanics of Solids*, **39**(6), 78–86.

SELECTED INVITED TALKS

- M. Moorkamp, A. D. Avdeeva, E. Erdogan, A. Başokur, “Three-dimensional magnetotelluric inversion with distortion correction, practical experience and solution recipes”, EGU, Vienna, Austria, 2016 (20 min)
- A. D. Avdeeva, “Imaging the Earth with electromagnetic methods from the first 10 m to upper mantle structures”, School of Geosciences, University of Aberdeen, UK, 2015 (45 min)
- A. D. Avdeeva, “Imaging the Earth with electromagnetic methods from first 10 m to upper mantle structures”, Earth and Planetary Science Research Institute Seminar, University of Edinburgh, UK, 2013 (40 min)
- A. D. Avdeeva, “Imaging the Earth with electromagnetic methods: From sedimentary basins in Greece to upper mantle structures around Yellowstone”, Department of Geology, University of Leicester, UK, 2013 (45 min)
- A. D. Avdeeva, “3D limited memory quasi-Newton inversion of electromagnetic data”, Department of Mathematics, University of Leicester, UK, 2011 (45 min)
- A. D. Avdeeva, D. B. Avdeev, M. Jegen, “Three-dimensional Magnetotelluric Inversion on Synthetic Salt Dome Data,” JIBA (Joint Inversion with Bayesian Analysis) - Workshop, Stavanger, Norway, 2010 (45 min)
- A. D. Avdeeva, D. B. Avdeev, “3D MT inversion with a limited-memory QN method: confirmation of robustness,” 23rd International Review of Progress in Applied Computational Electromagnetics, ACES, Verona, Italy, 2007 (20 min)
- A. D. Avdeeva, D. B. Avdeev, “Limited-memory quasi-Newton magnetotelluric inversion as an example of optimization problem in geophysics,” Winter Symposium, DIAS, Dublin, Ireland, 2006 (1h)

SELECTED CONFERENCE PRESENTATIONS

- A. D. Avdeeva, M. Moorkamp, “Three-dimensional forward and inverse modelling results for MT3DINV3 tasks”, MT3DINV-3, Bari, Italy, 2016 (2 talks × 30 mins)
- A. D. Avdeeva, M. Becken, R. Streich, “Towards imaging the Earth using EM fields emitted by DC railways,” 22st EM Induction Workshop, Weimar, Germany, 2014 (talk)
- A. D. Avdeeva, M. Yu. Smirnov, A. S. Savvaidis, M. Gurk, L. B. Pedersen, “A 3D magnetotelluric study of the basement structure in the Mygdonian Basin (Northern Greece) including galvanic distortion correction.,” 5th International Symposium on Three-Dimensional Electromagnetics, Sapporo, Japan, 2013 (poster)
- A. D. Avdeeva, M. Moorkamp, D. B. Avdeev, “3D inversion of magnetotelluric impedance tensor data and full distortion matrix,” 21st EM Induction Workshop, Darwin, Australia, 2012 (talk)
- A. D. Avdeeva, D. B. Avdeev, M. Jegen, “Introduction to 3D MT inversion code $x3Di$,” 2nd MT 3D Inversion Workshop, DIAS, Dublin, Ireland, 2011 (1h talk)
- A. D. Avdeeva, D. B. Avdeev, M. Moorkamp, “Inverting Dublin secret dataset 2 with $x3Di$,” 2nd MT 3D Inversion Workshop, DIAS, Dublin, Ireland, 2011 (talk)
- A. D. Avdeeva, R. Gehrman, M. Jegen, “Salt dome overhang detectability study for marine magnetotelluric method,” IAGA 11th Scientific Assembly, Sopron, Hungary, 2009 (talk)
- A. D. Avdeeva, D. B. Avdeev, “3D MT inversion with a limited memory QN method,” MT 3D Inversion Workshop, DIAS, Dublin, Ireland, 2008 (1h talk)
- A. D. Avdeeva, D. B. Avdeev, “Three-dimensional magnetotelluric inversion using quasi-Newton minimization,” 4th International Symposium on Three-Dimensional Electromagnetics, Freiberg, Germany, 2007 (talk)
- A. D. Avdeeva, M. Commer, G. A. Newman, “Hydrocarbon reservoir detectability study for marine CSEM methods: time-domain versus frequency-domain,” SEG International Exposition and 77th Annual Meeting in San Antonio, Texas, USA, 2007 (talk)
- A. D. Avdeeva, D. B. Avdeev, “A parallel implementation of 3-D EM forward modelling,” 18th IAGA WG 1.2 Workshop on Electromagnetic Induction in the Earth, El Vendrell, Spain, 2006 (poster)
- A. D. Avdeeva, D. B. Avdeev, “QN inversion of large-scale MT data,” PIERS, Cambridge, USA, 2006 (talk)