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28 Febr. 2014

Prof. Dr. Heiner Igel  
Department für Geo- und Umweltwissenschaften  
Geophysik  
Universität München  
Theresienstr. 41  
80333 München  
Deutschland

**Application for a postdoctoral position in geophysics/seismology (24.01.2014)**

Dear Prof. Igel,

with this letter, I want to apply for one of the announced postdoctoral positions in geophysics/seismology. Due to my study of physics and later research associate position in applied geophysics with specialization in seismic methods, I have experience in designing seismological experiments accompanied with a consolidated knowledge in the physical and mathematical description of processes occurring in seismology. During my PhD thesis, I performed the full workflow of a seismic study for subsurface structure investigation, starting with the arrangement of a 3D seismic array over data processing and data inversion ending with a structural interpretation. Hence, I have an overview of the stepwise execution of a complete seismic study.

Moreover, during my employment as a research associate, I gained a lot of skills in processing data and modelling of geophysical problems using a wide range of different methods. From my repertoire of the gathered experiences, I have the ability to achieve solutions for technical problems occurring at these steps of data handling. Beside the research at an university, I also have experience in academic teaching for more than 5 years.

The working group I am currently part of is rather small. For achieving individual research results, each member of the working group is reliant on the support of her or his colleagues. Thus, I am familiar with the meaning of teamwork for achieving research results. From the announcement of positions in the framework of ROMY with individual and consecutive fields of work, I expect that this kind of teamwork will be important to assure the success of the project.

I would appreciate an invitation for a job interview.

Yours sincerely,

Martin Krause

Please note, that I did not receive my PhD yet, however, the expected submission of the PhD thesis is April 2014. Find the following attachments to this application:

- I) Curriculum Vitae
- II) Special skills
- III) Publications
- IV) Statement of research interests
- V) References
- VI) Diploma certificate

# I) Curriculum Vitae

## Personal Data

Name: Dipl. Phys. Martin Krause  
Address: Talstr. 6, 07743 Jena  
Phone: +493641/948763  
E-Mail: m.krause@uni-jena.de  
Day of birth: 02 April 1985 in Eisenach  
Nationality: German  
Family Status: unmarried, father of one daughter



## Education

1991 - 1995 Primary School: 2. Grundschule, Eisenach  
1995 - 2003 Secondary School: Ernst-Abbe-Gymnasium, Eisenach  
06/2003 Graduation with final secondary-school examinations (Abitur)

## Studies

02/2010 Graduation: Diploma in Physics  
10/2004 - 04/2010 Study of Physics at the Friedrich Schiller University of Jena,  
Specialisation: Solid State Physics

## Professional Career

04/2014 Expected submission of PhD thesis (title: „A 3D travelttime tomography for investigation of near-surface seismic structure of the Thuringian Basin“)

11/2010 - now Research associate at the Friedrich Schiller University Jena (Institute of Geosciences, Applied Geophysics): PhD student in the multi-disciplinary project INFLUINS (BMBF), seismic tomography for investigation of elastic properties of the Thuringian Basin

04/2010 - 10/2010 Research associate at the Friedrich Schiller University Jena (Institut für Festkörpertheorie und -optik, Professor Friedhelm Bechstedt): Investigation of magnetic properties of MnTe (SFB InfraRed Optical Nanstructures)

10/2007 – 02/2010 Student assistant at the Friedrich Schiller University Jena, Arbeitsgruppe Fachdidaktik der Physik und Astronomy, Professor Karl-Heinz Lotze: Tutor for mathematics for physicians („Mathematische Methoden der Physik“)

## II) Special skills

### IT skills

- Use of operating systems:
  - Linux, Unix, Windows
- Programming languages:
  - Shell, Fortran, Matlab (expert)
  - C, C++, Python, Wolfram Mathematica (advanced)
- Command of common software:
  - ArcGIS (geographic information system, ESRI)
  - Seismic Unix (seismic data processing)
  - Paraview (data visualization)

### Practical skills

- Experience in design and execution of land-seismic surveys: reflection (basics) and wide-angle refraction seismics (expert) for investigation of near-surface seismic structure (Measuring equipment: GEODE from GEOMETRICS, DSS-Cubes from GFZ Potsdam)
- Experience in processing of seismic data based on VibroSeis source signals (advanced)
- Experience in execution of laboratory seismic measurements (Measuring equipment: UKS-D from GEOTRON ELEKTRONIK)
- Experience in the structure and process of a scientific drilling program (Participation at the INFLUINS scientific drilling 2013)
- Experience in academic teaching:
  - mathematics for physicians (seminars, 5 semesters)
  - basics in seismology (lectures and seminars, 3 semesters)
  - basics in potential field methods (seminars, 2 semester)
  - guide at studental field trips
  - supervision of diploma and master students

### Theoretical skills

- Inverse problems in geophysics:
  - tomography using traveltimes (expert)
  - tomography using acoustic waves, ambient seismic noise and electromagnetic waves (basics)
- Physical simulations:
  - Forward modelling of traveltimes, acoustic waves based on finite difference grids (expert)
  - Forward modelling of elastic wavefields, steady-state electromagnetic wavefields and gravity fields, based on finite difference and finite element grids (basics)

### III) Publications

#### Peer-reviewed publications:

Krause, M., and Friedhelm B. "Structural and Magnetic Properties of MnTe Phases from Ab Initio Calculations." *Journal of superconductivity and novel magnetism* 26.5 (2013): 1963-1972.

#### Submitted publications:

Krause, M., Rochlitz, R., Goepel, A., and Kukowski, N. "Slice – A MATLAB toolbox for multi-scale 2D active source seismic traveltime tomography including finite frequency modelling". *Computers & Geosciences*. Manuscript submitted for publication.

#### Conference contributions:

Krause, M., Ortmann, F., Bechstedt, F., and Hannewald, K. (2010) "Electrons, Holes, and Polarons in Durene-based Materials", Abstract HL 62.4 presented at DPG Spring Meeting 2010, Regensburg, Germany, 21-26 March.

Goepel, A., Kukowski, N., and Krause, M. (2011) "New Seismic Reflection Data Crossing the Erfurt Fault Zone in the Thuringian Basin, Central Germany", Abstract T11A-2295 presented at 2011 Fall Meeting, AGU, San Francisco, Calif., 5-9 Dec.

Krause, M., Goepel, A., and Kukowski, N. (2012) "Seismic Imaging of the Thuringian Basin, Central Germany", Abstract SE-P.162 presented at the 72. Jahrestagung der Deutschen Geophysikalischen Gesellschaft, Hamburg, Germany, 5-8 March.

Goepel, A., Krause, M., and Kukowski, N. (2012) "Seismic Imaging of the Thuringian Basin, Central Germany, in the framework of INFLUINS", Abstract EGU2012-8553 presented at European Geosciences Union General Assembly 2012, Vienna, Austria, 22-27 April.

Krause, M., Goepel, A., Bleibinhaus F., and Kukowski N. (2013) "A 2.5D seismic velocity model for the Thuringian Basin based on first arrival times from a reflection seismic data set", Abstract SE-P.002 presented at 73. Jahrestagung der Deutschen Geophysikalischen Gesellschaft, Leipzig, Germany, 4-7 March.

Krause, M., Goepel, A., Bleibinhaus F., and Kukowski N. (2013) "A 2.5D seismic velocity model for the Thuringian Basin based on first arrival times from a reflection seismic data set", Abstract GPH-P02 presented at Sedimentary Basins Jena, Jena, Germany, 23-25 September.

## IV) Statement of research interests

My basic research interest lies in understanding physical processes taking place in the earth's interior, which are related to propagation of wave fields. On the one hand, this includes the investigation of the earth's intrinsic wave propagation phenomena, on the other hand, the earth's response on induced wavefields, which are based on active source stimulations. As the focus of my current work lies in investigating elastic wavefields, I intent to make use of expertises and experiences made in this field to gain deeper knowledge of their nature in my future work.

An essential part of achieving a complete understanding of elastic wave propagation and origin in the earth is a suitable physical description. Due to a great complexity of the earth's structure, an explanation of processes connected to seismic waves requires a reliable numerical modelling. Hence, an important issue in my future work is the implementation and application of numerical modelling techniques for representing these processes at an even higher level of accuracy. Here, my special interest is to improve the applicability of modelling schemes regarding a limited amount of computational ressources.

Of course, proper numerical modelling is the key for obtaining the earth's response on elastic waves, which is the outcome of solving seismic inverse problems. In order to reveal the subsurface structure of the earth, the application of seismic tomography is intended to play an important role in my work. Thereby, my field of interest covers the full range of seismic data that can be used for tomography: extracting the low-wavenumber seismic structure of the earth using traveltime inversion is just as important as obtaining high-wavenumber subsurface response from full waveform inversion. Moreover, in order to obtain a complete picture of the earth's resonance on elastic waves, the use of seismic data available from active source, local earthquake, teleseismic and ambient noise signals is desired.

However, the most important factor for validation of elastic wave modelling and application of inverse modelling of the earth's elastic properties is the availability of real seismic data. Therefore, an essential part of my future work deals with the aspect of applicability of numerical methods. Moreover, in order to prove the understanding acquired about elastic wave propagation from numerical modelling, it is mandatory to assure that it reflects reality. Therefore, of great importance for me is to improve quality and quantity of seismic data including the development of new acquisition methods.

## V) References

For a reference, please contact:

**Prof. Dr. Florian Bleibinhaus**

Friedrich-Schiller-Universität Jena  
Institut für Geowissenschaften  
Lehrstuhl für Angewandte Geophysik  
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**Prof. Dr. Nina Kukowski**

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VI) Diploma certificate

KOPIE

FRIEDRICH-SCHILLER-UNIVERSITÄT JENA

Physikalisch-Astronomische Fakultät



ZEUGNIS

Herr Martin K R A U S E  
geboren am 02. April 1985 in Eisenach hat sich der

**Diplomprüfung  
im Studiengang Physik**

an der Friedrich-Schiller-Universität Jena unterzogen  
und die Prüfung mit der Gesamtnote <sup>1)</sup>

**Sehr gut**

bestanden.

Die Leistungen wurden im einzelnen wie folgt bewertet:

Prüfer:

Experimentalphysik	sehr gut	(1,3)	Prof.Dr.techn.habil.C.Spielmann
Theoretische Physik	sehr gut	(1,3)	Prof.Dr.rer.nat.habil.G.Schäfer
Physikalisches Wahlfach:			
Festkörpertheorie	sehr gut	(1,3)	Prof.Dr.rer.nat.habil.F.Bechstedt
Nichtphysikalisches Wahlfach:			
Geophysik	sehr gut	(1,0)	Prof.Dr.rer.nat.habil.T.Meier
Diplomarbeit	sehr gut	(1,0)	

Das Thema der von Prof. Dr. rer. nat. habil. F. Bechstedt ausgegebenen Arbeit lautete:  
„Ab-initio-Untersuchungen zu Elektronen und Polaronen in Durene-basierten Materialien“

Die Richtigkeit vorstehender  
Abschrift / Ablichtung  
wird nach Vergleich mit dem  
Original bestätigt:

Jena, den 23.02.2010 *K.H. Lotze*  
FRIEDRICH-SCHILLER-UNIVERSITÄT



Jena, 12.02.2010

Der Vorsitzende des Prüfungsausschusses

*K.-H. Lotze*

Prof. Dr. rer. nat. habil. K.-H. Lotze

1) mit Auszeichnung, 1 - sehr gut, 2 - gut, 3 - befriedigend, 4 - ausreichend  
Nichtphysikalisches Wahlpflichtfach: Gewichtungsfaktor 0,5, Diplomarbeit: Gewichtungsfaktor 2