ANTON RESHETNIKOV

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PROFESSIONAL SUMMARY

Research scientist and software engineer with 15 years experience finding solutions for ill-posed problems, designing computationally efficient numerical algorithms and building software for HPC systems. Expertise in computational physics and data science.

EXPERIENCE

Consulting Geoscientist

Since 11/2014
Implementing novel algorithms to solve various geophysical problems and building tools for enhanced characterization of unconventional oil and gas reservoirs.

Department of Geophysics, Free University, Berlin, Germany

Research associate, 10/2013 – 05/2017
Research and development of new methods for better understanding the physics of fluid induced seismicity, supervising master and doctoral students.

Research assistant, 09/2007 – 10/2013
Design a new method of reflection imaging using microseismic waveform data induced by stimulation of unconventional oil and gas reservoirs, consulting for industrial sponsors of PHASE university consortium.

GEOVERS, Moscow, St. Petersburg, Russia

Team leader, 02/2005 – 09/2007
Organization and management of a subsidiary in St. Petersburg, Russia.
Software architecting, development of software for seismic data processing and interpretation. Completed projects: 2D inverse kinematic problem solver; 2D and 3D pre-stack depth migration; 3D travel time grid calculation program based on the ray tracing technique.

Software engineer, 02/2001 – 02/2005
Development of new algorithms for nonlinear inverse problems and numerical simulation of elastic wave propagation in media with curved interfaces.

EDUCATION

2008 – 2013	PhD degree, Free University of Berlin, Department of Geophysics. Thesis title: “Microseismic Reflection Imaging”.
2003 – 2006	Master’s degree in Physics, Saint–Petersburg State University, Faculty of Physics, Department of Computational Physics.
1999 – 2003	Bachelor’s degree in Physics, Saint–Petersburg State University, Faculty of Physics.

PERSONAL SKILLS AND COMPETENCES

Personal skills	Team management Public speaking Scientific writing
Technical skills	C++, C, Fortran Parallel programming: MPI Computational theory and practice, numerical methods for large-scale problems

PROJECT HIGHLIGHTS

Micoseismic reflection imaging of a hydraulic reservoir stimulation

09/2010 – 09/2012, PhD research project at FU Berlin in cooperation with Geothermal Explorers Ltd. and Tohoku University

Application of the microseismic reflection imaging approach to the data Basel 1 geothermal reservoir stimulation. There are two separate 3D images of the waveforms from the microseismic cloud recorded at two downhole stations was constructed. The first image represents the large scale fault system 1 km east from the injection well. The second one is the high resolution image of microseismic cloud interior near the open hole interval which is consistent with the event locations and the information about fractures from the borehole.

A. Reshetnikov, J. Kummerow, S. Shapiro, H. Asanuma and M. Häring (2011). Using microseismicity to image the structure of the Basel geothermal reservoir. Expanded abstracts, Accepted to EAGE 73 annual meeting and technical exhibition, Vienna

Location of hydraulic fracturing induced microseismic events using single vertical borehole array

09/2011–11/2011, Consulting work done for one of the sponsors of PHASE consortium

In this study I analyzed the microseismic data induced by hydraulic fracturing recorded at single vertical downhole sensor array. The aim was to build a velocity model and to locate the events. In order to build and calibrate a velocity model I used sonic logs and the data from perforation shots. I performed optimisation of velocities and Thompsen anisotropy parameters using fitting the perforation shots locations. I constructed isotropic and anisotropic velocity models and located the corresponding microseismic event locations.

Construction of 3D permeability model from fluid injection-induced microseismicity

03/2010, Research at FU Berlin in the frames of MeProRisk project

Using seismicity based reservoir characterization (SBRC) approach the hydraulic permeability for three fluid injection experiment stages at KTB was estimated, at depth 4 km, 5.4k m and 9 km which is consistent with first fault zone, background rocks and second fault zone respectively. Then assuming correlation between seismic reflectivity and permeability I constructed a permeability model from the reflectivity cube obtained by the surface seismic imaging.

A. Reshetnikov, M Jaya, S. Buske, J. Kummerow and S. A. Shapiro (2011). Characterization of a geothermal reservoir using microseismic data. Geophysical Research Abstracts, Vol. 13, EGU2011-10308, EGU General Assembly 2011, Vienna

Seismic imaging using natural microearthquakes as a seismic sources

09/2007 – 06/2009, PhD research project at FU Berlin

Development of a new passive seismic reflection imaging approach which consists of two steps. First, the hypocenter of the microseismic event is precisely located. Second, this event is treated as a "pseudo-active" seismic source and the reflections within the recorded wavefield are processed by using a directional migration algorithm in order to construct a high resolution image of the illuminated subsurface region. This approach was applied to a number of microseismic events recorded by a borehole array in the SAFOD (San-Andreas-Fault-Observatory-at-Depth) main hole. Results obtained were high-resolution 3D images of different SE-NW oriented reflectors related to the SAF system in the close vicinity of the borehole.

A. Reshetnikov, S. Buske, and S. A. Shapiro (2010), Seismic imaging using microseismic events: Results from the San Andreas Fault System at SAFOD, Journal of Geophysical Research, 115, B12324

Modeling of direct and single-reflected waves for 3D layered model

03/2007 – 08/2007, responsible for product architecture and development

Development of the program for ray-tracing based 3D modeling of the kinematical and dynamical characteristics of the direct and single reflected waves for VSP acquisition systems. The program was developed in the frame of the contract with BGP, China.

Inverse Kinematic Problem for VSP data

06/2004 – 05/2007, responsible for product architecture and development

Development of the method of 2D velocity model estimation using VSP travel times. The model is represented by a number of layers with smooth interfaces defined by cubic splines. Each layer is defined by the P and S velocities and its vertical gradients. The method consists of three steps: construction of the first order 1D model, construction of the model with the interfaces represented in form of the second or third order polynomial functions and construction of the model with spline boundaries and gradient velocities. The program was included into the commercial software package.

Dynamic decomposition of the wavefield and reconstruction of the media

06/2002 – 09/2005, responsible for the design and implementation of the computational part

Implementation of the interactive tool for velocity model correction, ray-tracing, and imaging of the reflected waves of different types, including multiples. The program is a part of VSP seismic processing and interpretation software UNIVERS.

A. Reshetnikov, V. Reshetnikov, I. Soltan, and A. Tabakov (2003). Dynamic decomposition of seismic wavefields and media model reconstruction with raytracing method by VSP data. International Conference and Exhibition “Geophysics of the XXI Century — Leap into the Future”, Moscow, Expanded Abstracts

PUBLICATIONS LIST

2017

B. Schaeffer, L. McGreaham, and A. Reshetnikov. Unconventional parent-child well completion evaluation via microseismic analysis: A Delaware Basin case study. Extended abstract, SEG Annual Meeting. Society of Exploration Geophysicists. 2017

M. Mark, S. Taylor, J. King, B. Schaeffer, J. Rich, D. Kahn, D. Langton, B. Elliott, A. Biholar, and A. Reshetnikov. Can Moment Tensor Inversion Aid Engineering Decisions? A Delaware Basin Case Study. Unconventional Resources Technology Conference, Austin, Texas, 24-26 July 2017, pp. 2922-2934. Society of Exploration Geophysicists, American Association of Petroleum Geologists, Society of Petroleum Engineers, 2017.

2015

A. Reshetnikov, J. Kummerow, H. Asanuma, M. Häring, and S. A. Shapiro. (2015). Microseismic reflection imaging and its application to the Basel geothermal reservoir. Geophysics, 80(6), WC39-WC49, 10.1190/geo2014-0593.1

A. Reshetnikov and S. A. Shapiro. Using Multipath Shear Wave Arrivals for Enhanced Microseismic Location in Strongly Anisotropic Shale. Extended abstract, SEG Annual Meeting. Society of Exploration Geophysicists. 2015

N. Shimoda, A. Reshetnikov, and S. A. Shapiro. Arrival Time Picking on Common Receiver Gather for Borehole Array Datasets. Extended abstract, SEG Annual Meeting. Society of Exploration Geophysicists. 2015

A. Reshetnikov and S. A. Shapiro. Using Multipath Shear Wave Arrivals for Enhanced Microseismic Location in Strongly Anisotropic Shale. 77th EAGE Conference & Exhibition: extended abstract. Madrid. 2015

2014

A. Reshetnikov and S. A. Shapiro. Receiver Based Analysis of Microseismic Recordings: A Tool for Assessing Quality of Time Picks and Event Locations. Extended abstract, SEG Annual Meeting. Society of Exploration Geophysicists. 2014.

Abstract

A. Reshetnikov and S. A. Shapiro. Common-receiver Gathers as a Tool for Analysis of Microseismic Waveforms and Quality of Time Picks. 76th EAGE Conference & Exhibition: extended abstract. Amsterdam. 2014.

2013

A. Reshetnikov. Microseismic Reflection Imaging. PhD diss., Freie Universität Berlin, 2013.

A. Reshetnikov, J. Kummerow, S. A. Shapiro, H. Asanuma, and M. Häring. Microseismic Reflection Imaging of Stimulated Reservoirs and Fracture Zones. 75th EAGE Conference & Exhibition: extended abstract. London. 2013.

C.P. Yu, A. Reshetnikov, and S. A. Shapiro. Simultaneous Inversion of Anisotropic Velocity Model and Microseismic Event Location-Synthetic and Real Data Examples 75th EAGE Conference & Exhibition: extended abstract. London. 2013.

C. Schmelzbach, J. Kummerow, P. Wigger, A. Reshetnikov, and S.A. Shapiro. Seismic-reflection imaging of the crust using earthquake waveform recordings-A case study from the Central Andes. EGU General Assembly Conference Abstracts (Vol. 15, p. 13862). 2013.

2012

A. Reshetnikov, J. Kummerow, S. A. Shapiro, H. Asanuma, and M. Häring. Microseismic reflection imaging using data from a hydraulic reservoir stimulation. 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec.

J. Kummerow, A. Reshetnikov, M. Häring, and H Asanuma. 3-D Vp/Vs Ratio Distribution in the Geothermal Reservoir at Basel, Switzerland, from Microseismic Data. 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec.

A. Reshetnikov, J. Kummerow, S. A. Shapiro, H. Asanuma, and M. Häring. Multi-source multi-receiver microseismic reflection imaging: Case study Basel. SEG Technical Program Expanded Abstracts 2012. September 2012, 1-5, doi:10.1190/segam2012-1192.1.

J. Kummerow, A. Reshetnikov, M. Häring, and H Asanuma. Distribution of the Vp/Vs Ratio within the Basel 1 Geothermal Reservoir from Microseismic Data. EAGE Conference & Exhibition: extended abstract, Copenhagen, Denmark. 2012.

2011

A. Reshetnikov, J. Kummerow, S. A. Shapiro, H. Asanuma, and M. Häring. Using Microseismicity to Image the Structure of the Basel Geothermal Reservoir. 73rd EAGE Conference & Exhibition: extended abstract. Vienna, Austria. 2011

J. Kummerow, A. Reshetnikov, S. A. Shapiro, H. Asanuma, and M. Häring. Application of a Waveform Similarity- Based Location Algorithm to the Basel 1 Microseismic Data. European Geosciences Union General Assembly 2011. Vienna, Austria. 2011

A. Reshetnikov, M. Jaya, S. Buske, J. Kummerow, and S. A. Shapiro. Characterisation of a geothermal reservoir using microseismic data. European Geosciences Union General Assembly 2011. Vienna, Austria. 2011

A. Reshetnikov, J. Kummerow, S. Buske and S. A. Shapiro. Microseismic imaging at KTB. 71st DGG Annual meeting. Cologne, Germany. 2011

2010

A. Reshetnikov, S. Buske, and S. A. Shapiro (2010), Seismic imaging using microseismic events: Results from the San Andreas Fault System at SAFOD, J. Geophys. Res., 115, B12324, doi:10.1029/2009JB007049

A. Reshetnikov, J. Kummerow, S. Buske, S. A. Shapiro. Microseismic imaging from a single geophone: KTB. SEG Expanded Abstracts 29, 2070, Denver, USA. 2010.

A. Reshetnikov, J. Kummerow, S. Buske, S. A. Shapiro. Microseismic Imaging at KTB. 72nd EAGE Conference & Exhibition: extended abstract, Barcelona, Spain. 2010.

M. S. Jaya, S. Buske, J. Kummerow, A. Reshetnikov, S. A. Shapiro. Seismic Attribute Analysis of the 3-D Depth Migrated Image and Its Correlation with the Induced Microseismicity. Proceedings World Geothermal Congress 2010, Bali, Indonesia. 2010.

2009

A. Reshetnikov, S. Buske, S. A. Shapiro. Active Seismic Imaging Using Microseismic Events: Results From the San Andreas Fault System at SAFOD. AGU Fall Meeting: expanded abstracts, San Francisco, USA. 2009.

A. Reshetnikov, S. Buske, S. A. Shapiro. Active Seismic Imaging Using Microseismic Events. SEG Expanded Abstracts 28, 1668, Houston, USA. 2009.

A. Reshetnikov, S. Buske, S. A. Shapiro. Active Seismic Imaging Using Microseismic Events. 71st EAGE Conference & Exhibition: extended abstract, Amsterdam, Netherlands. 2009.

M.S. Jaya, S. Buske, J. Kummerow, A. Reshetnikov, S.A. Shapiro. Seismic Attribute Analysis of the 3-D Depth-migrated Image and Its Correlation With the Induced Microseismicity. 71st EAGE Conference & Exhibition: extended abstract, Amsterdam, Netherlands. 2009.

S. Buske, S. Gutjahr, A. Reshetnikov, S. A. Shapiro. Seismic imaging of the San-Andreas-Fault system at SAFOD. EGU General Assembly, Viena, Austria. 2009.

A. Reshetnikov, S. Buske, S. A. Shapiro. Active seismic imaging using microseismic events. EGU General Assembly, Viena, Austria. 2009.

2008

A. Reshetnikov, S. Buske, S. A. Shapiro. Active seismic imaging using microseismic events: results from the San-Andreas-Fault system at SAFOD. AGU Fall Meeting: expanded abstracts, San Francisco, USA. 2008.

S. Gutjahr, S. Buske, A. Reshetnikov, S. A. Shapiro. New Seismic Images of the San-Andreas-Fault System at SAFOD. AGU Fall Meeting: expanded abstracts, San Francisco, USA. 2008.

2007

A. Mukhin, A. V. Reshetnikov, I. A. Girman. Technology of direct and single-reflected elastic waves field calculation for 3D non-parallel layered models. 6th Conference and Exhibition «Gal'perin Readings», Moscow, Abstract. 2007.

U. A. Stepchenkov, A. V. Reshetnikov, I. A. Girman. Velocity model parameters estimation from walkaway and 3D VSP data. 6th Conference and Exhibition «Gal'perin Readings», Moscow, Abstracts. 2007.

2006

A. V. Reshetnikov, A. A. Tabakov, A. A. Mukhin, I. A. Girman. 2006. Technology of calculation of elastic waves kinematic characteristics using ray-tracing method in the case of multiple ray paths. 6th Conference and Exhibition «Gal'perin Readings», Moscow, Abstracts.

Yu. A. Stepchenkov, A. V. Reshetnikov, A. A. Tabakov, A. S. Kolosov. 2006. Generation of velocity model using multiple waves from several VSP sources. 6th Conference and Exhibition «Gal'perin Readings», Moscow, Abstracts.

2005

Reshetnikov, A. V., Mukhin, A. A., Tabakov, A. A., Eliseev, V. L. 2005. DDR: the technology and results of synthetic and real data processing. 5th Conference and Exhibition «Gal'perin Readings», Moscow, Astracts. 40-44.

Stepchenkov, Yu.A., Tabakov, A.A., Reshetnikov, A.V. 2005. Estimation of the velocity model from full vector VSP wave field. 5th Conference and Exhibition «Gal'perin Readings», Moscow, Abstracts. 31-35. (published in Russian only)

2004

Reshetnikov, A.V., Stepchenkov, Yu.A., Tabakov, A.A., Eliseev V. L. 2004. Joint imaging of the media using different types of waves. 4th Conference and Exhibition «Gal'perin Readings», Moscow, Abstracts. 60-62.

2003

Reshetnikov, A.V., Reshetnikov, V.V., Soltan, I.E., Tabakov, A.A. 2003. Dynamic decomposition of seismic wavefields and media model reconstruction with raytracing method by VSP data. International Conference and Exhibition «Geophysics of the XXI Century — Leap into the Future», Moscow, Expanded Abstracts.

2002

Tabakov, A.A., Soltan, I.E., Reshetnikov, A.V.,Reshetnikov, V.V. 2002. Dynamic decomposition of the wave-field and reconstruction of the media in VSP data processing. 2th Conference and Exhibition «Gal'perin Readings», Moscow, Abstracts. 12-13.