

# **First Conference on Geophysics for Mineral Exploration and Mining**

Held at Near Surface Geoscience 2016

Barcelona, Spain  
4 - 8 September 2016

ISBN: 978-1-5108-3967-0

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2016) by the European Association of Geoscientists & Engineers (EAGE)  
All rights reserved.

Printed by Curran Associates, Inc. (2017)

For permission requests, please contact by the European Association of Geoscientists & Engineers (EAGE)  
at the address below.

European Association of Geoscientists & Engineers (EAGE)  
PO Box 59  
3990 DB Houten  
The Netherlands

Phone: +31 88 995 5055  
Fax: +31 30 634 3524

[eage@eage.org](mailto:eage@eage.org)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

<b>Induced Polarization Effect in Rock Samples Collected from Submarine Hydrothermal Deposit.....</b>	<b>1</b>
<i>M. Endo, V. Burtman, E. Petersen, A. Gribenko, M. Zhdanov, S. Lee, E. Asakawa</i>	
<b>Downhole Physical Properties Measurements Supporting Iron-oxide Deep Exploration and Mining in Blöthberget, Sweden .....</b>	<b>6</b>
<i>G. Maries, A. Malehmir, E. Backstrom</i>	
<b>Analysis and Visualization of Dynamic Elastic Properties in 3D Space for High Density Minerals.....</b>	<b>11</b>
<i>A. Kassam, B. Milkereit, D. Shi</i>	
<b>Investigation of a Co-sourced Magnetic and AGG Anomaly Pair - An Example from the Falcon Pindan Survey, West Australia.....</b>	<b>16</b>
<i>C. Foss</i>	
<b>Geological Analysis of Aeromagnetic Data over the Blyklippen Lead-zinc Mine at Mesters Vig, Central East Greenland .....</b>	<b>21</b>
<i>A. Brethes, P. Guarnieri, T. Rasmussen, T. Bauer</i>	
<b>Model Sensitivity Studies to Support Drill Tests of Buried Remanent Magnetization in the Coompana Area, South Australia.....</b>	<b>26</b>
<i>C. Foss, G. Reed, T. Keeping, T. Wise, R. Dutch</i>	
<b>Innovative Airborne TEM Method for Costefficient Mineral Exploration .....</b>	<b>31</b>
<i>F. Efferso, N. Nyboe</i>	
<b>Shooting Fish in a Barrel? Using VTEM for Gold Exploration in Sierra Leone .....</b>	<b>36</b>
<i>C. Archer, A. Reid</i>	
<b>SPM Discrimination in Airborne TDEM Data – A Case Study from the Maniitsoq Area, Southwestern Greenland.....</b>	<b>41</b>
<i>N. Bournas, G. Plastow, A. Prikhodko, K. Kwan, J. Legault, P. Berardelli, S. Taylor</i>	
<b>Integrated Helicopter ZTEM-gravity-magnetic System Results over the Vredefort Dome Structure, South Africa .....</b>	<b>46</b>
<i>J. Legault, C. Izarra, G. Plastow, A. Latrous, T. Wade</i>	
<b>Relationship Between Electrical Resistivity and Physical Properties of Rocks .....</b>	<b>51</b>
<i>S. Park, S. Shin, D. Lee, C. Kim, J. Son</i>	
<b>Estimation of the Volume of Debris Material for the Feldspar Mineral Mining in the Baveno Pink Granite Quarry .....</b>	<b>56</b>
<i>S. Stocco, E. Bena, C. Gagliardi</i>	
<b>2-D Audiomagnetotelluric Modelling of Ore Deposits - Improvements of Model Constraints by Inclusion of Borehole Measurement.....</b>	<b>61</b>
<i>T. Kalscheuer, N. Juhojuntti, K. Vaittinen</i>	
<b>Application of a Finite-difference Solver with a Contraction Preconditioner to 3D EM Modeling in Mineral Exploration .....</b>	<b>66</b>
<i>N. Yavich, P. Puchkarev, M. Zhdanov</i>	
<b>The Use of 3D Approach for EMS-IP Technology Data Processing in Search of Kimberlite Pipes .....</b>	<b>71</b>
<i>Y. Davidenko, M. Persova, A. Novopashina, D. Bogdanovich, P. Popkov</i>	
<b>Quasi-analytical Approximation for Acoustic 3D Full-waveform Inversion .....</b>	<b>76</b>
<i>M. Malovichko, N. Khokhlov, N. Yavich, M. Zhdanov</i>	
<b>A Study of the Parametric Modeling Algorithm for the Seismic Prospecting Random Noise .....</b>	<b>81</b>
<i>T. Zhong, R. Song, Y. Li, B. Yang, H. Tian</i>	
<b>Deep Mine Wavefront Reconstruction Using True 3D Sparse Data .....</b>	<b>86</b>
<i>A. Carey, B. Milkereit, D. Shi</i>	
<b>The Seabed TDEM Towed by ROV for the Ocean Bottom Hydrothermal Deposits.....</b>	<b>91</b>
<i>K. Nakayama, A. Saito</i>	
<b>Multi-stage and Integrated Approach for Seafloor Massive Sulfide (SMS) Exploration .....</b>	<b>96</b>
<i>E. Asakawa, T. Sumi, T. Yamakawa, M. Kose</i>	
<b>3D Inversion and Interpretation of the Induced Polarization Survey Data Collected over a Mineral Deposit Using GEMTIP Mo.....</b>	<b>101</b>
<i>M. Zhdanov, M. Endo, L. Cox, D. Sunwall, M. Cuma</i>	
<b>Unconstrained 2D and 3D Magnetotelluric Inversion - Detection of a Ni-Cu-PGE Ore Zone and Carbonaceous Phyllites - Kevitsa .....</b>	<b>106</b>
<i>C. Le, B. Harris, A. Pethick</i>	
<b>Paradigm Change in Interpretation of AEM Data by Using a Large-scale Parallel 3D Inversion .....</b>	<b>111</b>
<i>M. Cuma, L. Cox, M. Zhdanov</i>	

<b>Geometrical Nonlinear 3D Inversion of Airborne Time Domain EM Data</b> .....	116
<i>M. Persova, Y. Soloveichik, D. Vagin, O. Trubacheva</i>	
<b>3D Cooperative Parametric Inversion of Frequency and Time-domain Airborne Electromagnetic Data</b> .....	121
<i>M. McMillan, C. Schwarzbach, E. Haber, D. Oldenburg</i>	
<b>Novel Scintillators for Logging while Drilling</b> .....	126
<i>M. Carson, A. Keping</i>	
<b>The Development of Magnetometer UAV Platforms for Geoscience</b> .....	131
<i>R. Gordon</i>	
<b>Keynote Speech - Mapping Seafloor Massive Sulfides at the Central Indian Ridge with a Novel Central Loop Electromagnetic Profiler</b> .....	136
<i>H. Mueller, K. Schwalenberg, C. Hilgenfeldt, T. Dobeneck</i>	
<b>Keynote Speech - Sustaining Geophysical R&amp;D through the Boom and Bust Cycles of the Mineral Exploration Business</b> .....	141
<i>P. Eaton</i>	
<b>Keynote Speech - Magnetotellurics in Polarizable Medium</b> .....	146
<i>F. Kamenetsky, G. Trigubovich, A. Chernyshev</i>	
<b>Automatic Classification of Iron Ore Lithologies Using Petrophysical and Geochemical Data</b> .....	151
<i>M. Kitzig, A. Keping</i>	
<b>Estimation of P-wave Velocity from Other Borehole Data</b> .....	156
<i>D. Kieu, M. Kitzig, A. Keping</i>	
<b>The Capability to Better Direct Boreholes Towards Their Target Using Downhole Magnetometry</b> .....	161
<i>C. Foss</i>	
<b>Geophysical Methods to Improve Productivity of a Marble Quarry</b> .....	166
<i>G. Apostolopoulos, M. Menegaki, G. Amolochitis, D. Karaiskos</i>	
<b>Fracture System Characterization Using Wavemode Conversions and Tunnel-surface Seismics</b> .....	171
<i>B. Brodic, A. Malehmir, C. Juhlin</i>	
<b>3D Traveltime Tomography and Reflection Imaging for Mine Planning and Exploration in the Kevitsa Ni-Cu-PGE Mine, Finland</b> .....	176
<i>A. Malehmir, A. Tryggvason, C. Wijns, T. Lindqvist, P. Skytta, E. Koivisto, M. Montonen</i>	
<b>Comparison on Finite-difference and Common Focusing Point Redatuming Technique for Hard Rock Seismic</b> .....	181
<i>K. Ung, A. Bona</i>	
<b>The First Experimental Seismic Investigation over Prospective Uranium Deposits at Mulga Rock, Western Australia</b> .....	186
<i>M. Urosevic, S. Ziramov, X. Moreau</i>	
<b>3D Seismic Waveform Modeling of an Ore Body within a Stochastic Heterogeneous Medium</b> .....	191
<i>O. Ahmadi, A. Malehmir</i>	
<b>Advanced Method for Joint 3D Inversion of Multiple Geophysical Data Using Gramian Constraints</b> .....	196
<i>M. Zhdanov, Y. Zhu, M. Endo, Y. Kinakin</i>	
<b>Imaging Deep Crustal Structures and Mineralised Zones by 3D Modeling of Potential Field and Magnetotelluric Data - Example</b> .....	201
<i>A. Lundin, M. Bastani, S. Wang, J. Jonberger</i>	
<b>Fuzzy Clustering Constrained Magnetelluric Inversion - Case Study over the Kevitsa Ultramafic Intusion, Northern Finland</b> .....	206
<i>D. Kieu, A. Keping, V. Le</i>	
<b>Joint Interpretation of AEM and Aeromagnetic Data Acquired over the Drybones Kimberlite, NWT (Canada)</b> .....	211
<i>D. Massa, M. Fedi, G. Florio, V. Kaminski, A. Viezzoli, A. Vitale</i>	
<b>Novel Gamma Ray Spectral Analysis for Loggingwhile-drilling</b> .....	216
<i>I. Far, A. Keping, M. Carson</i>	
<b>Comparative Study of Crosshole Seismic Reflection and VSP Imaging</b> .....	221
<i>F. Menu, A. Greenwood, A. Keping</i>	
<b>Preliminary Evaluation of In-mining GPR Surveys for the Identification of Karst Anomalies in a Gypsum Quarry</b> .....	226
<i>C. Caselle, S. Bonetto, C. Comina, S. Stocco</i>	
<b>A Case for Camp-scale Seismic for IOCG Exploration</b> .....	231
<i>A. Keping, E. Okan</i>	
<b>Seismic Exploration of Mineral Resources – An Australian Perspective</b> .....	236
<i>M. Urosevic, S. Ziramov, J. Kinkela, J. Dwyer, D. Pridmore</i>	
<b>Iron Grades Estimation Using Bayesian Sequential Simulation - Lalor Case Study</b> .....	241
<i>A. Bouchedda, M. Blouin, S. Tirdad, E. Gloaguen, B. Giroux</i>	

<b>Laboratory and Field Measurements of Electrical Resistivity to Study Heap Leaching Pad No. 3 at Sarcheshmeh Copper Mine.....</b>	<b>246</b>
<i>M. Moradipour, H. Ranjbar, A. Hojat, S. Nasab, S. Daneshpajouh</i>	
<b>Author Index</b>	