

29th European Meeting of Environmental and Engineering Geophysics

Held at Near Surface Geoscience Conference and
Exhibition 2023

Edinburgh, United Kingdom
3 – 7 September 2023

ISBN: 978-1-7138-8419-4

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© (2023) by the European Association of Geoscientists & Engineers (EAGE)
All rights reserved.

Printed with permission by Curran Associates, Inc. (2024)

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

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
Web: www.proceedings.com

TABLE OF CONTENTS

Environmentally Friendly Low Impact, Low Carbon Footprint, Low Power Electromagnetic Technique for Shallow Geothermal Exploration	1
<i>G. Stove</i>	
Developing Tactile Resources from Archaeo-Geophysical Data to Benefit Engagement with Heritage Data.....	6
<i>A. Booth, B. Thomas, R. Holt, S. Feroletto Sanchez, L. Makin, S. Ok, T. Roberts</i>	
GPR and ERT Application for the Detection and Characterization of NYF-Type Pegmatite Deposits in Tysfjord, Norway.....	11
<i>G. Tassis, A. Müller, B. E. Larsen, M. Brönnner</i>	
Estimating S-Wave Statics Via a PS-Receiver-Stack Image.....	16
<i>Y. Sun, M. Almubarak, V. Dolgov</i>	
Mapping the Geology Beneath the Future Havant Thicket Reservoir: An Integrated Geophysical and Intrusive Ground Investigation	21
<i>D. Drummond, M. Stringfellow, T. Semmens</i>	
Monitoring Velocity Changes of P-, SH- And SV-Waves During a CO2 Injection at the Svelvik Test-Site.....	26
<i>T. Fechner, U. Ködel</i>	
Potential of Seismic Attenuation for Geotechnical Investigation of Carbonate Subsurface.....	31
<i>F. Bouchaala, J. Matsushima, M. Ali</i>	
Geophysical Survey to Investigate the Deep Structure and the Geothermal Potential of Methana Volcano, Greece.....	36
<i>G. Apostolopoulos, C. Orfanos, K. Leontarakis, S. Karizonis, S. Chailas, E. Spyridonos</i>	
Distributed Acoustic Sensing and Machine Learning: Rockfall Detection at Mt. Meager, B.C.....	41
<i>J. Mish, R. Ferguson, C. Mosher</i>	
Machine Learning and Seismic Hodogram Analysis for Ice-Event Locating: Mt. Meager, Canada.....	46
<i>R. Ferguson, C. Mosher, S. Sood</i>	
A High-Resolution Reflection Seismic Survey in the Historical Kefalonia Island, Greece	51
<i>S. Zappala', A. Malehmir, M. Papadopoulou, G. Apostolopoulos</i>	
Recovering the Induced Polarization Effect from 1-D Coupled Inversion of TEM Data.....	56
<i>F. Sharifi, B. Tezkan</i>	
The Shape of Permafrost in the Fuglebekken Catchment, Spitsbergen as a Result of Time-Lapse Geophysical Imaging.....	61
<i>M. Majdanski, A. Marciniak, W. Dobinski</i>	
Spectral Ground Penetrating Radar - An Innovative Tool for Multispectral Subsurface Probing and Modelling	66
<i>M. Dyrda, A. Kulak, Z. Trzesniowski, M. Trzesniowski, T. Trzesniowski, C. Worek, K. Zietara</i>	
Full-Waveform Inversion of Ground-Penetrating-Radar Data Using an Optimal-Transport Distance.....	71
<i>J. Hunziker, N. Linde</i>	

GPR Investigation at Submerged Archaeological Site in Maranhão State, Brazil: Preliminary Results	76
<i>J. L. Porsani, A. G. Navarro, A. C. D. Siqueira Neto, R. C. Rangel, L. G. D. Lima, M. C. Stangari, L. A. P. D. Souza, V. R. N. D. Santos</i>	
Assessment of Near-Surface Geophysical Measurements for Geotechnical Purposes at the Area of Goudi (Athens, Greece).....	81
<i>J. D. Alexopoulos, V. Gkosios, S. Dilalos, I. K. Giannopoulos, G. S. Mitsika, I. Barbaresos, N. Voulgaris</i>	
A Preliminary Geophysical Investigation Regarding the Possible Extension of Alistrati Cave in Serres Greece.....	86
<i>I. K. Giannopoulos, J. D. Alexopoulos, G. S. Mitsika, A. Konsolaki, S. Dilalos, E. Vassilakis, N. Voulgaris</i>	
GLOBAL SEARCH INVERSION FOR ELECTROMAGNETIC INDUCTION DATA USING LAYERED MODELS	91
<i>M. Carrizo, D. Werthmüller, E. Slob</i>	
3D Inversion of Radio-Magnetotelluric (RMT) and Controlled-Source RMT (CSRMT) Data of a Waste-Site in Cologne, Germany	96
<i>S. Fadavi, B. Tezkan, P. Yogeshwar, A. Saraev, A. Shylkov, M. Smirnova</i>	
Seismic Imaging of the Gassum Formation in Denmark for CO ₂ Storage Potential Using a Dual-Recording Method.....	101
<i>M. Westgate, A. Malehmir, E. Konstantinidis, K. Kucinskaite, L. Hjelm, U. Gregersen, M. Keiding, M. Bjerager</i>	
Development of a 2D Modified Liquefaction Potential Index Map Using Geophysical Data in Pohang, Korea	106
<i>A. Lee, S. Oh, H. Kwon</i>	
Characterising Deep Groundwater Salinity in the Lower Kutai Basin, Indonesia, from Resistivity Logs.....	111
<i>A. Arifin, R. G. Taylor, M. Shamsudduha, A. M. Ramdhan</i>	
Integrated Geophysical Imaging Reveals Driving Slip Factors of Anthropogenic Origin, Cisiec, Southern Poland	116
<i>A. Marciniak, M. Majdanski, S. Kowalczyk, W. Gajek, J. Cader, A. Górszczyk, B. Owoc, S. Orynski, R. Czarny, I. Stan-Kleczek, A. Nawrot</i>	
Assessing Thermal Maturity Levels in Unconventional Hydrocarbon Reservoirs Through Interval Inversion and Simulated Annealing.....	121
<i>R. Valadez Vergara, N. P. Szabó</i>	
Borehole Nuclear Magnetic Resonance Studies at Four Danish Peatlands	126
<i>S. R. Mashhadi, D. Grombacher, J. B. Pedersen, M. A. Kass, A. V. Christiansen, D. H. Zak, C. Hoffmann, H. E. Andersen, P. E. Lærke, R. J. Petersen</i>	
Monitoring of Water Table Level and Volume of Water in a Porous Storage by Seismic Data	131
<i>T. Lähivaara, P. Göransson, S. Heinonen, B. Bojan, J. S. Hesthaven, M. Khalili, A. Pasanen, R. Yadav, M. Vauhkonen</i>	
An Unbiased Spiral Array for MASW: A Step Towards 3D Survey	135
<i>K. Suto</i>	

PP- And SP-Reflection Imaging of the Volcanogenic Massive Sulphide Deposits from the Neves-Corvo Mining Site, Portugal.....	140
<i>Y. Ding, A. Malehmir</i>	
Integrated Magnetic and ERT Surveys to Detect Spanish Civil War Bombs Hidden for 80 Years.....	145
<i>A. Casas, M. Himi, R. Lovera, J. Mandaña, A. Sendrós, A. Urruela, L. Rivero</i>	
Imaging of Near-Surface Seismic Reflections with Light Vibratory Sources	150
<i>A. Ben Khalifa, M. Lehujeur, D. Leparoux, U. Polom, S. Unterseh, A. Vallage, R. Mieszkalski</i>	
Improving Seismic Velocity Mapping Using Standard Penetration Test Data in a Cokriging Interpolation	155
<i>H. Binet, P. Masoudi, C. Simon, B. Pelletier, F. Rambert, Y. Assy</i>	
Broadband Seismic Acquisition and Processing in Hardrock Environment: A Case Study from Blötberget, Sweden.....	160
<i>L. Gyger, A. Malehmir, M. Manzi, L. Vivin, J. Lepine, A. Kaslilar, O. Valishin, P. Marsden, R. Hamerslag</i>	
Direct 1D Resistivity Estimation from Data Rescaling Using Cumulative Resistance Models	165
<i>O. I. Calderon Hernandez, L. V. Socco, E. Slob</i>	
DasVision 3D IP Distributed Array System: Two Case Studies	170
<i>C. Nind, C. Phaneuf, P. Coles</i>	
Las Cruces Mine. a Living Laboratory for Applied Geophysics.	175
<i>I. Fernández, A. Menguini, A. Viezzoli</i>	
Using Vehicle-Induced Noise as Local Seismic Source Through ML and Interferometry	180
<i>T. Khoveiledy, M. Karimpour, V. Socco</i>	
Data Driven Auto-Picking of Surface Wave Dispersion Curve	185
<i>A. Zargar, M. Karimpour, V. Socco</i>	
Making the Most of Seismic Data for Quick-Clay Landslide Studies.....	190
<i>A. Malehmir</i>	
Towards Seismic-Powered Rockfall Alarm Systems for Railway Monitoring.....	195
<i>T. Rebert, C. Cai, A. Hallier, T. Bardainne</i>	
Application of Ground Penetrating Radar (GPR) for Marble Quality Assessment in a Quarry	200
<i>A. Koufopoulou, N. Diamanti, G. Vargemesis, P. Tsourlos, A. Dimitrief</i>	
Radiometrics with a RPAS: Calibration Method, Surveying, and Comparison to Historical Data	205
<i>N. Martin-Burtart, T. Ferbey, E. Elia</i>	
Understanding the Origins of the Colonial Fort of San Lorenzo, Panama Through Geophysical Surveys	210
<i>A. Mojica, F. Rejiba, A. Wang, C. Finco, G. Hovhannissian, T. Mendizabal, J. Pourcelot, J. Martin-Rincon, C. Ho</i>	
Electrical Resistivity Tomography for Archaeological Characterization of a Late Antique Island Occupation, Isla Del Fraile, Spain.....	215
<i>P. Martínez-Pagán, M. A. Martínez-Segura, A. Quevedo, F. J. Moreno-Martín, M. Gutiérrez-Rodríguez, J. D. D. Hernández-García</i>	

A Bayesian Approach to Elastic Full-Waveform Inversion: Application to a Semi-Real Near Surface Model	220
<i>S. Berti, M. Aleardi, E. Stucchi</i>	
2D Reprocessing of a Sparse 3D Seismic Dataset in Central Sweden for Improved Targeting Purposes	225
<i>J. Putnaite, A. Malehmir, M. Markovic</i>	
Scanning for Near-Surface Velocity Anomalies Using Surface-Wave Dispersion Characteristics.....	230
<i>S. Hassing, D. Draganov, C. Weemstra, E. Verschuur</i>	
Novel Electrode Design for Non-Destructive Resistivity Measurement on Material in Geotechnical Standard Sample Cylinders	235
<i>T. Dahlin, M. Lumetzberger, P. Hedblom, S. Rejckjær, P. Olsson</i>	
Fault Zone Identification Using Seismic Noise Autocorrelations at a Prospective Geothermal Site in Singapore.....	240
<i>K. Lythgoe, Y. E. Li, S. Wei, J. Poh, H. Tjiawi</i>	
Estimating Areal Extent of Accidental Oil & Gas Leakage into Near Surface Formation Using InSAR Data	245
<i>A. Mudavakkat, A. Al-Gareeb, P. Bansal, R. Kotecha, C. Giannico, S. Cespa</i>	
Imaging of Subsurface Structures by AEM Surveys in Korea	250
<i>M. Yi, S. Jeong, A. Johmori, Y. Sasaki</i>	
4D Continuous Geoelectrical Monitoring of Freeze-Thaw Processes in Deglaciated Arctic Soils	255
<i>M. Cimpoiasu, O. Kuras, H. Harrison, P. Wilkinson, J. Chambers, P. Meldrum, D. Liljestrand, C. Oroza, T. Irons, S. Schmidt, J. Bradley</i>	
A Possible New Find of an Iberian Ceramic Kiln	260
<i>L. Rivero, R. Cardona, L. Galone, R. Lovera, A. Sendrós, M. Himi, A. Casas, A. Urruela, A. Rodríguez, C. Abancó, R. Jornet, J. Pou, D. Asensio, J. Morer, B. Gil, F. J. Cantero, M. Pinto</i>	
New Insights in the Use of Electrical Resistivity Tomography for the Detection of Archaeological Remains.....	265
<i>A. Urruela Garcia, M. Himi, X. Costa-Badia, L. Rivero I Marginedas, A. Sendrós, R. Lovera, C. Abancó, W. Alegría-Tejedor, B. Mallofré López, J. Vallverdú Pastó, A. Casas Ponsatí</i>	
Passive Seismic Experiments in Front of a Svalbard Outlet Glacier: Opportunities and Challenges for Glacier Monitoring	270
<i>H. M. Stemland, B. O. Ruud, T. A. Johansen</i>	
Monitoring Internal Erosion in Embankment Dams Using 3D Electrical Resistivity Tomography: Älvkarleby Test Embankment Dam.....	275
<i>R. Norooz, T. Dahlin, P. Olsson, A. Nivorlis, T. Günther, C. Bernstone</i>	
Optimizing Onshore Seismic Acquisition by Estimating Near-Surface Property from Ambient Noise.....	280
<i>T. Dotare, S. Masaya, K. Kusuda, N. Nakata</i>	
Comparison of tTEM-IP and ERT-IP: Cases from Mine Tailing Sites in Sweden.....	285
<i>L. M. Madsen, M. R. Asif, P. K. Maurya, A. K. Kühn, D. Domenzain, C. Jensen, T. Martin, M. Bastani, L. Persson</i>	

Separation and Calculation of Anthropogenic and Natural Dose Rate from Airborne Gamma Ray Spectrometer Data	290
<i>V. C. Baranwal, M. Dumais, F. Ofstad, M. Brönnner</i>	
Geophysical Investigation of Submerged Archaeological Site on the Eastern Brazilian Amazon: Preliminary Results	295
<i>R. Correa Rangel, J. Luís Porsani, A. Guida Navarro, A. Carlos De Siqueira Neto, L. Gonçalves De Lima, M. Cesar Stangari, L. Antonio Pereira De Souza</i>	
Ground Geophysical Measurements Made on Mine-Tailings in Sweden. Case Studies and Lessons Learnt.	300
<i>M. Bastani, C. Brolin, L. Persson, V. Leroux, T. Martin, P. Maurya</i>	
Ground Penetrating Radar Investigation in the Central Yangsan Fault, Republic of Korea	305
<i>C. Sun, T. Kobayashi, J. Choi</i>	
Water Accumulation Dynamics of Tête Rousse Glacier Revealed by 3D-SNMR Measurements	310
<i>J. Baltassat, A. Legchenko, J. Girard</i>	
Validation of a Mixed-Dimensional Code for the Analysis of Highly Resistive Liners in Landfills.....	315
<i>L. Panzeri, A. Fumagalli, L. Zanzi, L. Longoni, M. Papini, D. Arosio</i>	
A Novel Normalization Method of Transient Electromagnetic Data for Efficient Neural Network Training	320
<i>S. He, Y. Wang, H. Cai, A. V. Christiansen, M. R. Asif</i>	
A Geophysical Study of Central Kyparissiakos Gulf Coastal Dune Field (Ionian Sea, Greece).....	325
<i>G. S. Mitsika, J. D. Alexopoulos, I. K. Giannopoulos, V. Gkosios, S. Poulos</i>	
Variational Mode Decomposition-Based Processing of Time-Domain Induced Polarization Data.....	330
<i>K. Naveed, L. M. Madsen, D. Grombacher, J. J. Larsen</i>	
Removing of Vehicle Noise Events Observed in Magnetic Fields by Fitting of Magnetotelluric Time Series Data	335
<i>R. Kyeongho, K. Hyoung-Seok, O. Seokhoon</i>	
Decoding the Coda: Crosshole Surveys Using Distributed Acoustic Sensing at UKGEOS Glasgow Observatory, UK.....	340
<i>A. Butcher, J. Holmgren, M. J. Werner, J. Chambers, J. Kendall, S. Lapins, J. Verdon</i>	
A New Light Weight and Easy-To-Use Transient Electromagnetic Instrument for Subsurface Characterization: sTEM.....	345
<i>T. Bording, P. Maurya, E. Auken, N. Foged, K. V. Lassen, L. Liu</i>	
Shallow Shear-Wave (SV) Reflection Surveying with Distributed Acoustic Sensing in Zuidbroek, the Netherlands.....	350
<i>D. Zhang, G. Drijkoningen</i>	
Estimating the Volume of Recoverable Materials from a Former Gypsum Landfill Using Frequency-Domain Electromagnetics	355
<i>W. Deleersnyder, A. Bah, G. Blanchy, T. Hermans, E. Van De Vijver</i>	
Objective Function Approximation Through Machine Learning: Application to a Global Inversion of ERT Data.....	360
<i>F. Macelloni, M. Aleardi, E. M. Stucchi</i>	

3D Ultra High Resolution Seismics in a Confined Lake Environment, Mjøsa, Norway.....	365
<i>A. L. Mikalski</i>	
GPR and UAV Remote Sensing for Detecting Changes in Soil Moisture Across a Heterogeneous Agricultural Field	370
<i>M. Zajc, A. Koroša, J. Urbanc, L. Rupar, B. Koçyigit, A. Krivic, U. Pecan, M. Glavan</i>	
Global Inversion of Electrical Resistivity Tomography Data for Cavity Detection	375
<i>M. Cercato, G. De Donno</i>	
A Case Study for Archaeo-Geophysics: GPR Application on Hacimusalar Mound/Elmalı/Antalya	380
<i>B. Karadoller, C. Imren, B. Arikan, I. N. Özdogru</i>	
High-Resolution Core-Log-Seismic Integration and Igneous Seismic Geomorphology of IODP Expedition 396 Sites on the mid-Norwegian Margin	385
<i>S. Planke, N. Lebedeva-Ivanova, S. Bünz, C. Binde, C. Berndt, J. I. Faleide, R. Huismans, D. Zastrozhnov, B. Manton, H. Stokke, P. Betlem, J. Millett</i>	
Diachronic Monitoring of Psatha Active Fault at a Costal Zone, by Combining Near Surface Geophysical Methods	390
<i>C. Katsora, E. Vassilakis, A. Konsolaki, J. D. Alexopoulos</i>	
Trial of the PRIME System for Geoelectrical Condition Monitoring on Critical Railway Earthwork Infrastructure	395
<i>P. Wilkinson, J. Chambers, P. Meldrum, R. Swift, H. Harrison, J. Ngui, O. Kuras, J. Harms, G. Jessamy</i>	
3D Inversion of Airborne Transient Electromagnetic Data Including Topography	400
<i>S. Jeong, M. Yi, S. Oh</i>	
Hyperbola Fitting for Characterising Cylindrical Targets in GPR Data Using Deep Learning Permittivity Predictions	405
<i>O. Patsia, A. Giannopoulos</i>	
Using Multilevel Composition to Map Rare Seafloor Gas-Seepage Habitats of the Palmahim Disturbance, Southeastern Mediterranean Sea	410
<i>M. Lawal, R. Findlay, O. Bialik, A. Neuman, N. Waldermann, Y. Makovsky</i>	
Dispersion Image Constraint for Linear-Array Passive Surface Wave Via mini-Sosie Technique.....	415
<i>Y. Li, J. Wang</i>	
Optimized Measuring Schemes for Three-Dimensional Electrical Resistivity Tomography Applied for Imaging Wall Foundations	420
<i>P. Louvaris, P. Tsourlos, G. Vargemezis, G. Tsokas, G. Zacharopoulou</i>	
Multi-Sensor Geophysical Measurements in a Simulated, Lab-Scaled Urban Environment.	425
<i>R. Nieboer, E. Obando, E. Leentvaar, P. Doornenbal, C. Bremmer, M. Pefkos, M. Karaoulis, E. Ahlrichs</i>	
Efficient Finite-Difference Time-Domain Simulation of Step-Frequency Continuous-Wave Ground Penetrating Radar Systems	430
<i>A. Giannopoulos, C. Warren, I. Giannakis</i>	
Can We Detect Seismic Anisotropy in Glacial Sediments Using Crosshole Seismics?	435
<i>S. Beraus, T. Burschil, H. Bunes, D. Köhn, T. Bohlen, G. Gabriel</i>	

Romanian Ccs Demo Project - Reservoir Simulation Model Construction.....	440
<i>S. Anghel</i>	
Geostatistical Joint Inversion of FDEM and ERT Data: A Three-Dimensional Real Case Application.....	445
<i>J. Narciso, L. Azevedo, E. Van De Vijver</i>	
Development and Assessment of MASwAI - A Deep Learning Algorithm for Shear Wave Velocity Prediction.....	450
<i>J. Adcock, D. Campos Halas, O. Létourneau, J. Desgagné</i>	
P- And S-Wave Reflection Seismic Imaging Using DAS and Nodal Receivers: An Example from Kurikka, Finland.....	455
<i>B. Brodic, M. Malinowski, N. Putkinen, E. Koskela, V. Laakso, S. Heinonen</i>	
Electrical Resistivity Method in Supporting Electro Kinetic Remediation of Vertisoil Polluted by Hydrocarbon.....	460
<i>R. F. V. Rodríguez, Z. Plank, P. B. R. Mendoza, J. A. G. Melo, E. H. Sánchez, J. C. Mijangos, E. B. Bustos</i>	
Ambient Seismic Noise and Surface Wave Tomography of the Thinia Valley (Kefalonia, Greece).....	465
<i>C. Colombero, F. Khosro Anjom, M. Karimpour, A. R. Zargar, V. Socco</i>	
Horizon and Fault CNN Identification Technique for Coal Field 3D Seismic Data.....	470
<i>W. Du, S. Peng, Y. Guo, X. Cui, D. Li</i>	
Integrated Analysis of Geoelectric Methods in a Brownfield: Characterization and Environmental Assessment.....	475
<i>M. Barros, V. Elis, A. Ustra, L. Dantas, A. Barbosa, M. Stangari</i>	
Geophysical Evidence of the Most Common Gas Expressions in the Western Black Sea Area.....	480
<i>M. Sammartini, M. Marelllo, F. Zolezzi</i>	
Rapid Grout Level Monitoring in UKGEOS Boreholes Using Downhole Electrical Measurements.....	485
<i>Y. J. Ngui, M. Cimpoiasu, W. Hartas, W. Nickson, P. I. Meldrum, P. B. Wilkinson, J. E. Chambers, R. A. Dearden, M. J. Spence, O. Kuras</i>	
Supervised Neural Network for Surface Waves Data-Driven Vs-Model Prediction.....	490
<i>F. Rincón, S. Berti, M. Aleardi, E. Stucchi</i>	
Latest Developments of OhmPi: A New Software Architecture for Modular, Flexible and Evolutive ERT Acquisition Systems.....	495
<i>O. Kaufmann, A. Watlet, G. Blanchy, V. Dubois, Y. Fargier, N. Forquet, H. Guyard, V. Quatela, R. Clément</i>	
Latest Developments of OhmPi: Towards Small-Scale ERT Surveys and Monitoring Experiments in the Field.....	500
<i>A. Watlet, R. Clément, G. Blanchy, F. Camus, V. Dubois, Y. Fargier, N. Forquet, H. Guyard, A. Imig, V. Quatela, O. Kaufmann</i>	
Stimulated Noise and Surface Wave Interferometry Processing for Hybrid Seismic Imaging.....	505
<i>T. Bardainne, R. Tarnus, L. Vivin, C. Cai, T. Rebert, T. Allemand, H. Toubiana</i>	
Mapping a Nutrient-Rich Groundwater Plume from a Septic System to Lake Water Using Electrical Resistivity Tomography.....	510
<i>C. Power, S. Rakhimbekova, C. Robinson</i>	

Multi-Scale Characterisation of a Clay Flood Embankment, Warden, Northumberland..... 515
A. White, A. Watlet, A. Blake, P. Wilkinson, B. Dashwood, J. Chambers

Enhancing Site Investigation for Karst Geohazards Using High-Resolution, quasi-3D Electrical
Resistivity Tomography Surveying 520
J. Whiteley, E. Cox

Author Index