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Career objective

Geophysicist with 20 years of experience in geophysical electromagnetic forward and inverse modeling and 8 years of experience in hydrogeophysical inverse modeling. R&D100 – awarded skills in solution-oriented industrial geophysical imaging code development for high-performance computers.

Core competencies

- Strong numerical programming and parallel computing skills coupled with geophysical background and extensive 3D and 4D inversion experience
- Experience in providing tailored, highly parallel, and efficient modeling and imaging solutions to the needs of many oil and gas companies
- Broad portfolio of research experience in geophysical electrical/electromagnetic, gravity, and seismic modeling and imaging, and hydrogeological modeling and history matching
- Innovative development of 4D hydrogeophysical inversion framework MPiTOUGH2 based on the flow- and transport simulator TOUGH2 widely used in industry and academia
- Excellent interpersonal and written skills

Education

- 2004: Ph.D. in Geophysics, Institute of Geophysics and Meteorology, University of Cologne, Germany
- Dissertation title: Three-dimensional inversion of transient-electromagnetic data: A comparative study
 - Final grade point average: Magna Cum Laude
 - Conducted research in 3D time-domain electromagnetic modeling and inversion
 - Project management of EM field surveys at Merapi volcano, Indonesia
 - Summer internship at Sandia National Laboratories, Albuquerque, NM
- 1999: Geophysics Diploma, Institute of Geophysics and Meteorology, University of Cologne
- Diploma thesis title: A special method for the combined inversion of long-offset transient electromagnetic and magnetotelluric data
 - Departmental Award “Completed With Distinction”
 - Conducted research in one-dimensional joint inversion of CSEM and magnetotelluric data

Awards

- 2017: District D57 (The Redwood District - Northern California) winner in Toastmasters international public speaking contest; semifinalist at international contest in Vancouver, BC
- 2009: R&D 100 Award by R&D Magazine (www.rdmag.com/2009/08/2009-r-d-100-award-winners) for EMGeo ElectroMagnetic Geological Mapper: 3D geophysical imaging package for

- large-scale CSEM and MT data sets that arise in hydrocarbon exploration
- 2005 – 2007: Feodor-Lynen-Fellowship, research scholarship granted by the German Alexander-von-Humboldt Foundation
- 2004: Klaus-Liebrecht-Award for outstanding Ph.D. dissertation, University of Cologne
- 2001: Exchange visitor scholarship, German Academic Exchange Service (DAAD)

Professional experience

Research activities and professional development before Ph.D.

1996-1999: Scientific research assistant and computer system administrator at the Department of Exploration Geophysics, Institute of Geophysics and Meteorology, University of Cologne

- Assisted in acquisition, processing and interpretation for two long-offset transient electromagnetic (LOTEM) field campaigns at Mount Vesuvius (Italy) and Mount Merapi (Indonesia)
 - Installation and lead operation of 30-Ampere LOTEM transmitter system
 - Deployment of LOTEM receiver units and post-processing of time-domain EM data
 - Coordinated field logistics between transmitter crew and local Indonesian assistants
 - Acquisition and processing of GPS data during surveys
- Implemented OCCAM-type inversion methodology for the joint inversion of LOTEM and magnetotelluric (MT) data
 - Enhanced one-dimensional inversion code to jointly interpret LOTEM and MT data
 - Augmented one-dimensional inversion code to include electrical anisotropy
 - Investigated multiple a-priori-data and regularization constraints as inversion stabilizers
- Administered heterogeneous computing network at the Dept. of Exploration Geophysics
 - Network- and user-support for Windows, Linux/UNIX, and VAX/VMS systems
 - Installation and upgrading of Windows and Linux/UNIX operating systems
 - Hardware acquisition and installation; negotiating with vendors

1999-2000 (6 months): System engineer at STN Atlas Elektronik, Bremen, Germany

- Performed acoustic noise routine benchmarking measurements on Dolphin-class submarines
- Performed acoustic data analysis for sonar system calibration
- Enhancement of Matlab-based Fourier-transform routines for acoustic noise analysis
- Investigation of new technique for phase-modulation in underwater communication systems
- Investigation of near-field acoustic beam-forming for sonar detection

2000 (4 months): Fraunhofer-Institute for Intelligent Analysis- and Information Systems IAIS, St. Augustin, Germany

- Developed Java code for analysis of planetary spectroscopy data collected by Time-of-Flight Secondary Ion Mass Spectrometry (ToF-SIMS) system
- Investigated interactive ways of spectroscopy data visualization

2000-2004: Scientific researcher at the Department of Exploration Geophysics, Institute of

Geophysics and Meteorology, University of Cologne

- Investigated different methodologies for three-dimensional time-domain electromagnetic data inversion
 - Gradient-based inversion methods for large-scale imaging problems
 - Gauss-Newton based inversion methods using reciprocal transmitter-receiver relationships
 - Marquardt-Levenberg method for parametric inversion for three-dimensional models
- Comparative study of inversion methodologies with respect to three-dimensional model resolution and application appropriateness
- Ph.D. Dissertation: “Three-dimensional inversion of long-offset transient-electromagnetic data – A comparative study”; awarded the Klaus-Liebrecht Award 2004 of the University of Cologne for the most outstanding Ph.D. Dissertations of the year (two awards out of 100 submissions)
- Successful 3D interpretation of volcanic LOTEM data over Mount Merapi (Indonesia)
- Campaign leader during 2001 LOTEM survey within DFG (Deutsche Forschungsgemeinschaft) – sponsored multi-year project “Investigation of the electrical conductivity structure of Mount Merapi using LOTEM”
 - Survey-planning, organization of material shipping, coordination of customs formalities
 - Organization of team of 14 and project management during 6-week survey
 - Negotiation and contracting with locals at measurement site

2001: New advances in three-dimensional finite-difference time-domain modeling and imaging

Sponsor: Deutsche Forschungsgemeinschaft (German Research Foundation – DFG), short-term scholarship for internship at Sandia National Laboratories (Albuquerque, New Mexico)

- Implementation of major modifications and improvements to new 3D finite-difference time-domain (FDTD) methodology initiated by G.A. Newman
- Developed new parallelization approaches for Cartesian mesh decomposition
- Carried out accuracy checks and benchmarking tests against two other 3D TEM simulators: 1) Spectral Lanczos decomposition method, 2) Integral-equation method

Research and development activity at Lawrence Berkeley National Laboratory (LBNL) 2004-present

2004-2006: Accelerated finite-difference time-domain methodology

Sponsor: Feodor-Lynen research scholarship jointly sponsored by the German Alexander-von-Humboldt Foundation (AvH) and Lawrence Berkeley National Laboratory

- Implementation of multi-grid concepts for accelerated forward-simulation of explicit time-domain EM using finite-differences (FDTD)
- Developed material-averaging upscaling method for electrical conductivity and magnetic permeability
- Developed field-mapping operators for upscaling of electric and magnetic fields from fine to coarse FD grid (interpolation operator) and coarse to fine (prolongation operator)
- Developed methodology for EM-diffusion-time dependent time-step increase to further improve computing efficiency
- Developed portable library for fast parallel communication on Cartesian topology using MPI (message passing interface) to be reused in later projects for other finite-difference simulators

2006-2010: New advances in frequency-domain EM modeling and imaging

Sponsor: Exxon Mobil Upstream Research Company (URC)

- Performed extensive code development to transform academic R&D type of frequency-domain CSEM imaging code by Gregory A. Newman et al. into high-performance modeling and imaging package for industrial-scale applications
- Established EM imaging code brand name EMGeo (ElectroMagnetic Geological Mapper)
- Designed and carried out EMGeo 2-day training course to be held at ExxonMobil Upstream Research Company office in Houston; developed presentation slide set, hands-on modeling/imaging examples, manual, tutorials, and test-quiz
- Awarded the R&D 100 award 2009 (also known as the “Oscars of Innovation”) for turning EMGeo into one of the 100 most innovative R&D products of the year, awardees are Michael Commer and Gregory A. Newman
- Implemented grid-separation and multi-grid concepts into frequency-domain EM modeling and imaging algorithm; achieved computational acceleration by factor 10 through optimization of FD meshes for Krylov-type iterative FD solvers
- Implemented multi-level parallelization scheme to handle arbitrarily large number of parallel processes for large-scale industrial imaging applications
- Enabled, coordinated, and successfully performed large-scale benchmark test on the IBM supercomputer BlueGene (Watson Research Center, New Jersey):
 - Successful inversion of industrial-sized ExxonMobil CSEM data set measured over the Campos Basin (Brazil)
 - Utilized fixed 24-hour time window on BlueGene to complete large-scale CSEM field data inversion experiment on 32,768 CPUs
 - Extensive coordination and project management activity with staff at IBM Watson Research Center and ExxonMobil Upstream in order to fulfill 24-hour time window deadline
- Implementation of imaging methodology for electrical anisotropy

2009-2010: Joint imaging of CSEM, magnetotelluric and gravity data

Sponsor: Exxon Mobil Upstream Research Company (URC)

- Augmented CSEM modeling/imaging package EMGeo to handle joint inversion of CSEM, magnetotelluric (MT), and gravity data
- Developed data-weighting scheme to properly weight CSEM against MT data
- Implemented gravity and gradiometry forward and inversion methods into EMGeo code package
- Implemented cross-gradient method to couple disparate model parameter types in joint inversion of CSEM, MT, and gravity data
- Augmented the EMGeo imaging package by Gauss-Newton/Newton optimization method
- Developed innovative hybrid of pixel-based and parametric inversion methodology
- Developed auxiliary data- and model pre- and post-processing toolbox and manuals

2009-2012: Enhanced subsurface fluid characterization using joint hydrological and geophysical imaging

Sponsor: Lawrence Berkeley National Laboratory (Laboratory-directed research and development project - LDRD)

- Developed joint inversion methodology for geophysical and hydrogeological data types with the goal of advancing the understanding of fluid flow and transport in complex geologic formations
- Code development involved merging three major components: 1) a parallel version of the flow and transport simulator TOUGH2 for non-isothermal, multi-phase, multi-component fluid flow; 2) the hydrogeological parameter estimation code iTOUGH2; 3) the geophysical simulator package EMGeo (containing electrical and electromagnetic forward simulators)
- Investigated fully coupled and uncoupled inversion approaches for the estimation of hydraulic permeability and porosity parameters; experimented with cross-gradient constraints
- Implemented and tested geostatistical inversion approaches for model parameter reduction
- Investigated petrophysical and rock-physics functionals for mapping from hydrogeological to geophysical model properties
- Developed inversion workflow for inclusion of petrophysical function parameters into parameter estimation scheme

2010-2011: Accelerated geophysical modeling and imaging on graphical processing units (GPU)

Sponsor: Chevron Energy Technology Company

- Implemented several iterative Krylov subspace solvers (CG, BiCG, QMR) for large linear matrix systems on accelerated hardware platforms
- Exploited the parallel computing platform and programming model CUDA developed by NVIDIA for general computing on graphical processing units
- Achieved factor of approx. 1.5 higher performance compared against available iterative Krylov solvers available through CUDA libraries
- Performed industrial-sized CSEM imaging experiments on GPU hardware
- Systematically studied performance improvements in comparison to CPU hardware and remaining bottlenecks on hybrid CPU-GPU hardware
- Cooperated with company Maxeler Technologies to investigate porting of EMGeo solution drivers onto field-programmable gate arrays

2012-2013: Advanced technology for geophysical electromagnetic-seismic subsurface imaging

Sponsor: Lawrence Berkeley National Laboratory (LBNL Innovation Grant)

- Implemented joint inversion methodology for frequency-domain CSEM and Laplace/Fourier – transformed seismic data using the FD method
- Implemented FD methodology for seismic acoustic and elastic modeling methods
- Adapted cross-gradient method for coupled imaging of electrical conductivity and seismic velocity
- Adapted multi-grid concept for the optimization of computational FD meshes; separation of common modeling and computational FD mesh for large number of seismic sources
- Investigated and implemented material-averaging algorithm for mapping of seismic velocity and density properties between non-conforming FD meshes
- Performed joint seismic-EM imaging experiments to alleviate hydrocarbon-signature-hiding effects caused by deep salt bodies

2016: Large-Scale 3-D Geophysical Inverse Modeling of the Earth using many-core hardware

Sponsor: U.S. Department of Energy, Office of Science, Basic Energy Sciences

- Key software development contributor in one out of 20 projects selected by the National Energy Research Scientific Computing Center's (NERSC) Exascale Science Applications Program (NESAP), a collaborative effort in which NERSC partnered with code teams and library and tools developers to prepare for the NERSC-8 Cori many-core architecture
- Collaborated with NERSC, Cray, and Intel
- Prepared application code EMGeo for new energy-efficient many-core hardware architecture
- Developed hybrid OpenMP - MPI parallelization schemes for 3D EM inversion code EMGeo

2014-2017: Improved saturation estimation in CO₂-EOR and CO₂-sequestration through joint inversion of production, time-domain EM data and surface seismic AVA data

Sponsor: Chevron Energy Technology Company

- Performed hydrological model design and flow modeling of alternating CO₂-water flood of oil reservoir modeled after the Chevron Vacuum (New Mexico) site
- Designed geophysical time-domain EM and seismic amplitude-versus-angle (AVA) models to couple with hydrological model and capture geophysical signatures during fluid injection process
- Performed coupled hydrogeophysical simulations of the fluid injection process and the corresponding geophysical TEM and AVA signatures
- Carried out sensitivity studies and geostatistical model parameter design for 4D inversion
- Performed 4D joint inversions of 60-day fluid injection period combining injection, production and TEM data; performed 4D joint inversions combining injection, production, and AVA data
- Assessed enhanced-oil-recovery (EOR) and CO₂ storage potential achieved through hydrogeophysical joint inversions

2014-2017: Improved hydraulic fracture characterization through inverse modeling of coupled flow and time-domain EM data

Sponsor: Chevron Energy Technology Company

- Designed hydrological dual-continuum fractured-domain flow model for the flow and transport simulator TOUGH2
- Simulated brine fluid injection into fractured reservoir at depth 3000 m in 4D fashion
- Coupled flow modeling process to time-domain surface-to-surface EM simulations
- Designed geophysical model to capture TEM surface-to-surface signature due to fluid alteration and replacement processes
- Included highly-conductive steel casing into joint hydrogeophysical modeling using grid upscaling
- Creation of parameter set describing fracture's orientation, size, location, and permeability as input to parametric inversion
- Carried out hydrological, geophysical TEM, and joint hydrogeophysical inversions to assess the improved fracture characterization through 4D joint inversion
- Assessed fluid-distribution forecasting potential provided by TEM surface-to-surface layouts

2016-2017: Enhanced oil recovery surveillance through time-domain EM and flow data joint inversion

Sponsor: Chevron Energy Technology Company

- Developed 4D inversion workflow for assessment of water-affected volume in enhanced oil

- recovery (EOR) zone at depth 4.5 km
- Performed hydrological flow modeling of 7-day fluid injection into EOR target zone
- Converted Chevron flow models to electrical resistivity models using available log data
- Simulated borehole-to-surface TEM surveys at different (flow) times during injection process
- Inclusion of borehole casing infrastructure with metallic electrical conductivity into the EM modeling process
- Experimented with proper material averaging/upscaling approaches for approximating metallic casing electrical conductivities on coarse mesh
- Performed 4D joint inversion experiments of TEM and flow rate data to estimate hydrological modeling parameters of a dual-continuum permeability model: background fracture permeability, background matrix permeability, permeability of target fracture zone, geometrical fracture zone parameters, relative permeability functional parameters, capillary pressure functional parameters
- Assessed the applicability of the technology to real-world scenarios through sensitivity studies and trial inversions
- Successfully inverted Chevron relative permeability and capillary pressure measurements through simplified flow model

2015-2016: Assessment of risks form storage of carbon dioxide in deep underground geological formations

Sponsor: U.S. Department of Energy Office of Fossil Energy, National Risk Assessment Partnership (NRAP)

- Designed workflow and carried out 4D inversion of electrical resistivity tomography (ERT) data from two NRAP pilot sites; one shallow injection experiment and one deep injection experiment
- Developed innovative gradient-weighting scheme to address model parameter sensitivity loss due to unfavorable ERT survey layouts
- Successfully explained time-lapse electrical resistivity development due to injection and fluid displacement using prior hydrogeological 4D inversion results

2015-2016: Induced polarization phenomena in transient-electromagnetics

Sponsor: Petromarker, U.S. Department of Energy, Office of Science, Basic Energy Sciences

- Augmented 3D time-domain EM FDTD modeling scheme to include induced polarization effects due to electrically polarizable media
- Developed optimization scheme to determine Debye decomposition parameters for arbitrary degrees of polarization described by Cole-Cole model parameters
- Investigated description of weak induced polarization effects through simple Debye models
- Experimented with inversion methods to estimate Cole-Cole model parameters

2016-2018: An intelligent reservoir monitoring system for the Archer Daniels Midland Company CO2 sequestration site in Decatur, Illinois

Sponsor: U.S. Department of Energy: Carbon Storage Program, Assistant Secretary for Fossil Energy, Office of Clean Coal and Carbon Management through the National Energy Technology Laboratory

- Designed software workflow for CO2 sequestration monitoring at Archer Daniels Midland Company's world-scale agricultural processing and biofuels production complex

- Co-designed intelligent monitoring system using a real-time multi-technology architecture to fully integrate and enhance the ADM site's existing monitoring infrastructure, including
 - multi-level three-component seismic arrays
 - distributed acoustic sensing (DAS)
 - multi-level pressure/temperature sensors
 - distributed temperature sensing (DTS)
 - borehole seismometers
 - surface seismic stations
- Converted hydrogeological models provided by Schlumberger for the *ECLIPSE* industry-reference simulator to input models for the flow- and transport simulator TOUGH2
- Designed fine-scale and coarse-scale 3D reservoir models for the ADM CO₂ injection site
- Conducted synthetic hydrogeological flow modeling experiments to simulate pressure/temperature evolution over three-year injection period
- Completed software-merge of parallel hydrogeological parameter estimation framework MPiTOUGH2 with parallel 2D finite-difference simulation and full-waveform tomography code for viscoelastic wave propagation
- Coupled hydrogeological process modeling with geophysical reflection seismic survey simulation in 4D fashion

2017: Phase II Field Demonstration at Plant Smith Generating Station: Assessment of opportunities for optimal reservoir pressure control, plume management and produced water strategies

Sponsor: U.S. Department of Energy, National Energy Technology Laboratory

- Investigated hydrogeophysical reservoir monitoring opportunities combining hydrological fluid flow monitoring with cross-well CSEM monitoring
- Carried out CSEM sensitivity studies for detection of fluid alterations due to freshwater injection for given pumping schedule in brine-saturated environment
- Combined parallel sparse direct solver package MUMPS with EMGeo modeling/imaging workflow
- Employed an evolutionary algorithm for hydrological inversion of layered permeability model

Entrepreneurial activity

2012-2015: Co-founder of Terra Firma Imaging, LLC, California

- Chief Technology Officer at Terra Firma Imaging LLC
- Addressed optimization of high-performance computing resources and CSEM imaging solution needs for the hydrocarbon exploration industry
- Provided CSEM imaging solutions and computing solutions to companies Saudi Aramco, BP, RSI, ENI, Schlumberger, Conoco Phillips, PGS, BHP Billiton

Electromagnetic inversion code licensing accomplishments

- Enabled technology transfer of 3D frequency-domain electromagnetic modeling/imaging code EMGeo in cooperation with Lawrence Berkeley National Laboratory
 - EMGeo licenses sold to: ExxonMobil, BP, Saudi Aramco, Shell, Chevron, Statoil, ENI,

- RSI, Schlumberger, Conoco Phillips, PGS, BHP Billiton
 - Enabled approximately 2 million US\$ in licensing revenue to LBNL
 - Provided ongoing user-support to licensees
- Enabled technology transfer of 3D time-domain electromagnetic modeling/imaging code TEMinv3D in cooperation with Lawrence Berkeley National Laboratory
 - TEMinv3D licenses sold to: ExxonMobil, Saudi Aramco, Chevron, Petromarker AS
 - Enabled approximately 600k US\$ in licensing revenue to LBNL
 - Provided ongoing user-support to licensees

Journal publications

1. Commer, M., Newman, G.A., 2004, A parallel finite-difference approach for three-dimensional transient electromagnetic modeling with galvanic sources, *Geophysics*, 69, 1192-1202.
2. Commer, M., Helwig, S.L., Hördt, A., Tezkan, B., 2005, Interpretation of long-offset transient electromagnetic data from Mount Merapi, Indonesia, using a three-dimensional optimization approach, *Journal of Geophysical Research*, 110, B03207, doi:10.1029/2004JB003206.
3. Newman, G.A., Commer, M., 2005, New advances in three-dimensional transient electromagnetic inversion, *Geophysical Journal International*, 160, 5-32.
4. Commer, M., Newman, G.A., 2006, An accelerated time domain finite difference simulation scheme for three-dimensional transient electromagnetic modeling using geometric multigrid concepts, *Radio Science*, 41, RS3007, doi:10.1029/2005RS003413.
5. Commer, M., Helwig, S.L., Hördt, A., Scholl, C., Tezkan, B., 2006, New results on the resistivity structure of Merapi Volcano (Indonesia), derived from 3D restricted inversion of long-offset transient electromagnetic data, *Geophysical Journal International*, 167, 1172-1187.
6. Kalscheuer, T., Commer, M., Helwig, S.L., Hördt, A., Scholl, C., Tezkan, B., 2007, Electromagnetic evidence for an ancient avalanche caldera rim on the south flank of Mount Merapi, Indonesia, *Journal of Volcanology and Geothermal Research*, 162, 81-97.
7. Commer, M., Newman, G.A., 2008, New advances in three-dimensional controlled-source electromagnetic inversion, *Geophysical Journal International*, 172, 513-535.
8. Commer, M., Newman, G.A., Carazzone, J.J., Dickens, T.A., Green, K.E., Wahrmond, L.A., Willen, D.E., Shiu, J., 2008, Massively-parallel electrical-conductivity imaging of hydrocarbons using the Blue Gene/L supercomputer, *IBM Journal of Research and Development*, 52-1/2, 93-103.
9. Commer, M., Newman, G.A., Carazzone, J.J., Dickens, T.A., Green, K.E., Wahrmond, L.A., Willen, D.E., Shiu, J., 2008, Massively-parallel electrical-conductivity imaging of hydrocarbons using the Blue Gene/L supercomputer, *First Break*, 26, 93-102 (Reprint of Commer et al., 2008, *IBM Journal of Research and Development*).
10. Commer, M., Newman, G.A., 2009, Three-dimensional controlled-source electromagnetic and magnetotelluric joint inversion, *Geophysical Journal International*, 178, 1305-1316.
11. Newman, G.A., Commer, M., 2009, Massively Parallel Electrical Conductivity Imaging of the Subsurface, *Journal of Physics, Conference Series* 180(1), 012063.
12. Newman, G.A., Commer, M., Carazzone, J.J., 2009, Imaging CSEM data in the presence of electrical anisotropy, *Geophysics*, 75, F51-F61.
13. Commer, M., Newman, G.A., Williams, K.H., Hubbard, S.S., 2011, Three-dimensional induced polarization data inversion for complex resistivity, *Geophysics*, 76, F157-171, 2011.
14. Commer, M., 2011, Three-dimensional gravity modelling and focusing inversion using

rectangular meshes, *Geophysical Prospecting*, 59, 966–979, doi: 10.1111/j.1365-2478.2011.00969.x.

15. Kowalsky, M.B., Finsterle, S., Commer, M., Williams, K.H., Murray, C., Newcomer, D., Englert, A., Steefel, C.I., Hubbard, S.S., 2012, On parameterization of the inverse problem for estimating aquifer properties using tracer data, *Water Resources Research*, 48, W06535, doi:10.1029/2011WR011203.
16. Commer, M., Maia, F.R.N.C., Newman, G.A., 2012, Iterative Krylov solution methods for geophysical electromagnetic simulations on throughput-oriented processing units, *International Journal of High Performance Computing Applications*, 26(4), 378–385, doi: 10.1177/1094342011428145.
17. Um, E.S., Commer, M., Newman G.A., 2012, Iterative Finite-Difference Solution Analysis of Acoustic Wave Equation in the Laplace-Fourier Domain, *Geophysics*, 77(2), T29-T36, doi: 10.1190/geo2011-0220.1.
18. Um, E.S., Commer, M., Newman, G.A., 2013, Efficient preconditioned iterative solution strategies for the electromagnetic diffusion in the earth: finite-element frequency-domain approach, *Geophysical Journal International*, 193, 1460–1473, doi:10.1093/gji/ggt071.
19. Commer, M., Kowalsky, M.B., Doetsch, J., Newman, G.A., Finsterle, S., 2014, MPiTOUGH2: A parallel parameter estimation framework for hydrological and hydrogeophysical applications, *Computers and Geosciences*, 65, 127-135, doi:10.1016/J.Cageo.2013.06.011.
20. Um, E.S., Commer, M., Newman, G.A., 2014, A strategy for coupled 3D imaging of large-scale seismic and electromagnetic data sets: Application to subsalt imaging, *Geophysics*, 79, ID1-ID13, doi:10.1190/geo2013-0053.1.
21. Commer, M., Hoversten, G.M., Um, E.S., 2015, Transient-electromagnetic finite-difference time-domain earth modeling over steel infrastructure, *Geophysics*, 80, E147-E162, doi:10.1190/geo2014-0324.1.
22. Um, E.S., Commer, M., Newman, G.A., Hoversten, G.M., 2015, Finite element modelling of transient electromagnetic fields near steel-cased wells, *Geophysical Journal International*, 202, 901-913, doi:10.1093/gji/ggv193.
23. Hoversten, G.M., Commer, M., Haber, E., Schwarzbach, C., 2015, Hydro-frac monitoring using ground time-domain electromagnetics, *Geophysical Prospecting*, 63, 1508–1526, doi: 10.1111/1365-2478.12300.
24. Vasco, D.W., Pride, S.R., Commer, M., 2016, Trajectory-based modeling of fluid transport in a medium with smoothly-varying heterogeneity, *Water Resources Research*, 52, 2618–2646, doi:10.1002/2015WR017646
25. Commer, M., Doetsch, J., Dafflon, B., Wu Y., Daley, T.M., Hubbard, S.S., 2016, Time-lapse 3-D electrical resistance tomography inversion for crosswell monitoring of dissolved and supercritical CO₂ flow at two field sites: Escatawpa and Cranfield, Mississippi, USA, *International Journal of Greenhouse Gas Control*, 49, 297-311. doi:10.1016/j.ijggc.2016.03.020.
26. Finsterle, S., Commer, M.; Edmiston, J.K., Jung, Y., Kowalsky, M.B., Pau, G.S.H., Wainwright, H.M., Zhang, Y., 2016, iTOUGH2: A multiphysics simulation-optimization framework for analyzing subsurface systems, *Computers and Geosciences*, <http://dx.doi.org/10.1016/j.cageo.2016.09.005>.
27. Commer, M., Petrov, P.V., Newman, G.A., 2017, FDTD modelling of induced polarization phenomena in transient electromagnetics, *Geophysical Journal International*, 209, 387-405. doi:10.1093/gji/ggx023.
28. Pride, S.R., Berryman, J.G., Commer, M., Nakagawa, S., Newman, G.A., Vasco, D.W., 2017, Changes in geophysical properties caused by fluid injection into porous rocks: analytical

models, *Geophysical Prospecting*, 65, 766-790. doi:10.1111/1365-2478.12435.

29. Um, E.S., Kim, J., Kim, S.-S., Commer, M., 2017, A feasibility study of a top-casing electric source method for detecting and imaging a shallow hydraulically-active fractured zone: 3D finite element direct current modeling approach, *Geophysical Journal International*, ggx431. doi: <https://doi.org/10.1093/gji/ggx431>.

Other related skills

- Programming languages and computer skills: Fortran, C, basic knowledge of C++ and Java, Python, NVIDIA-CUDA, UNIX Shell scripting, R, Matlab, LaTeX
- Languages: German, English, basic knowledge of Spanish
- Competent Communicator Award by Toastmasters International, an international organization promoting leadership and public speaking skills