UTD DEPARTMENT OF geosciences

Faculty and Research

George A. McMechan

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Ida M. Green Professor of Geosciences,
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Education

B. Sc., University of Victoria, 1983
M.S., University of Toronto, 1971
B.A. Sc., University of British Columbia, 1970

Research Interests

Current research emphasizes seismology and ground-penetrating radar.

In seismology, projects include development of software for numerical simulation of scalar, acoustic, elastic, viscoelastic, and poroelastic isotropic and anisotropic responses, and the corresponding inversion, imaging and migration processes. Applications include reservoir and aquifer characterization, AVO, cross-well and VSP, earthquake source studies, 3-D, multicomponent and wide-aperture analyses.

OF RELATED INTEREST

Center for Lithospheric Studies – a research institution devoted to the study of the lithosphere through geophysical and geochemical means.

In ground penetrating radar, projects include development of software for numerical simulation of dielectric and moderately conducting materials in 2-D, 2.5-D and 3-D, and the corresponding inverse problems. Applications include 3-D characterization of reservoir analogs, sedimentological mapping, earthquake fault mapping, and engineering and environmental problems. Projects include experiment design and data acquisition, as well as processing and interpretation.

Dissertations and Theses Supervised:

Upendra Kumar Tiwari, PhD, 2007. Dissertation: Viscoelastic time lapse reservoir characterization for a gas sandstone reservoir.

Yogesh K. Agnihotri, MS, 2006. Thesis: Parsimonius migration of 3-C 3-D VSP data.

Ibrahim Z. Basi Shogar, MS, 2006. Thesis: Evaluation of parsimonius 2D Kirschoff and reverse-time prestack depth migrations of the data from the overthrust region in the western Canadian basin.

Keumsuk Lee, PhD, 2005. Dissertation: Three-dimensional facies architecture of ancient delta-front reservoir analogs using ground-penetrating radar with outcrop and core sedimentology with case studies from the Turonian Wall Creek member, Frontier Formation, Wyoming.

Abuduwali Aibaidula, MS, 2005. Inversion and interpretation of a 3D seismic data set from the Ouachita Mountains, Oklahoma.

Weihong Fei, PhD, 2005. Fast seismic velocity analysis using parsimonious Kirchhoff depth migration.

Keumsuk Lee, PhD, 2005. Three dimensional facies architecture of ancient delta-front reservoir analogs using ground-penetrating radar with outcrop and core sedimentology with case studies from the Toronian Wall Creek member, Frontier Formation, Wyoming.

Nistala, Suresh, MS, 2004. 3-D Modeling of Fracture-Induced Shear-Wave Splitting in the Southern

California Basin

Shaoming Lu, PhD, 2003. Seismic Characteristics of Two Deep-Water Drilling Hazards: Shallow-Water Flow Sands and Gas Hydrate.

Zhang, Zijian, MS, 2003. Elastic Inversion and Interpretation of Seismic Data from Hydrate Ridge, Offshore Oregon, with Emphasis on Structural Controls of the Distribution and Concentration of Gas Hydrate and Free Gas

Gislain Madiba, PhD, 2002. Seismic Amplitude Variation with Offset; Its Effects on Weighted Stacking, and Its Uses in Characterization of Sandstone and Carbonate Reservoirs.

Biaolong Hua, PhD, Fall 2002. Parsimonious Kirchhoff Depth Migration

Szerbiak, Robert Bruce, PhD, 2002. Characterization of Fluvial Reservoir Analogs by Modeling and Inversion of Petrophysical and Electrical Properties

Adam P. Koesoemadinata, PhD, 2001. Petro-seismic Relations, amplitude Versus Angle Curves, and Petro-seismic Inversion for Sandstone Properties.

Adriansyah, PhD, 2000. Seismic AVO Analysis and Interpretation: Application to Carbonate and Clastic Reservoirs in the Northwest Java Basin, Indonesia.

Xu, Fan, MS, 2000. The efficiency of transmitted P-S conversion as a function of frequency, velocity and water saturation

Ramos-Martinez, Jaime, PhD, 2000. Full Wavefield Seismic Modeling and Source Parameter Inversion in 3-D Viscoelastic, Anisotropic Media.

Wang, Deming, MS, 2000. Finite Difference Modeling of Borehole Ground Penetrating Radar Data

Andrey A. Ortega, PhD, 1998. Seismic Modeling in Fractured Media with Applications to Multi-component Multi-azimuth Data from Southwest Venezuela

Zeng, Xiaoxian, PhD, 1998. Numerical Modeling of GPR Wavefields Using Ray-based, Fourier and Finite Difference Algorithms with Applications to Field Data

Zhou, Hongbo, PhD, 1998. 3-D Seismic Depth Migration

Jun Cai, PhD, 1997. Estimation of Electrical Properties from GPR Data by 2.5-D Modeling and Tomography.

Zhang, Jie, PhD, 1997. Imaging of Salt andSub-salt Structures Using Turning Waves and Tomography

Jiao, Yuren, MS, 1996. In-situ 2-D and 3-D Measurements of Directivity Patterns of Half-wave Dipole GPR Antennas

Sudarmo, Bernadus S., MS, 1996. Simulation and imaging of GPR data scattered by reinforcing bars in a concrete bridge deck

Qingbo Liao, PhD, 1996. Seismic Viscoacoustic Modeling and Inversion.

Wu, Yafei, PhD, 1996. Waveform inversion and modeling of seismic data from earthquake sources, hydraulic fracturing, and reflection surveys

Xu. Tong, PhD, 1996. Relaxation mechanisms for 3-D seismic and 2.5-D GPR data with applications to full-wavefield simulation and inversion

Chang, Hungyu, MS, 1995. Numerical simulation of parameter seismic scattering.

Ozdenvar, Turgut, PhD, 1995. Implementation and applications of pseudo-spectral solutions of seismic wave equations.

Rajasekaran, Saraswathi, PhD, 1995. Wave-equation based pre-stack processing for 2-D seismic data.

Stephen M. Kelly, PhD, Spring 1995. Advanced analysis for estimation of seismic statics and anisotropy.Wu, Yanping, MS, 1995. Inversion of seismic multiples.

Yoon, Kwi-Hyon, PhD, 1995. 3-D finite-difference simulation of elastic wave propagation in borehole, refraction, earthquake and whole Earth applications.

Zhengxin Dong, PhD, 1994. Seismic modeling and migration for 3-D anisotropic media.

Ik-Bum Kang, PhD, 1994. Simulation and estimation of viscoelastic and scattering effects of seismic data.

Steve T. Hildebrand, PhD, 1993. Full-wavefield inversion for 1-D acoustic and elastic media.

How-Wei Chen, PhD, 1992. Full-wavefield modeling and prestack depth migration of common-source seismic data.

Ata, Elias Z, MS, 1991. Estimation of near-surface elastic parameters using multi-component data.

Elizabeth A. Fisher, PhD, 1991. Application of seismic processing techniques to ice and ground penetrating radar data.

Matthew A. Brzostowski, PhD, 1991. 3-D Tomography.

Harris, Christopher E., MS, 1990. Reverse time migration with downward continuation for two dimensional post stack seismic data.

Kang, Ik-Bum, MS, 1990. Two dimensional elastic pseudo-spectral modeling of wide-aperture seismic array data with application to the Wichita Uplift-Anadarko Basin region of southwestern Oklahoma.

Morales, Jorge A., MS, 1990. Elastic imaging of earthquake sources.

Zhu, Xianhuai, PhD, 1990. Tomographic inversion and poroelastic modeling for reservoir characterization

Richard G. Anderson, PhD, 1989. Methods for reducing noise on reflection seismograms.

Gaiser, James Eric Gaiser, PhD, 1989. Transverse isotropic velocity estimates from slowness and displacement measurements.

Ruben D. Martinez, PhD, 1989. Modeling and linear inversion of t - p seismic data for one dimensional viscoelastic media.

Sun, Robert J., PhD, 1988. Numerical simulation and imaging of seismic wavefields.

Chern, How-Hueir, MS, 1987. 3-D modeling of transmitted seismic energy with geometrical synthetic seismograms.

Liang-Zie Hu, PhD, 1987. Imaging and processing borehole seismic data.

Yoon, Kwi-Hyon, MS, 1987. Synthetic seismogram modeling of fine oceanic crustal structure near Guadalupe Island, Mexico.

Chang, Wen-Fong, MS, 1985. Reverse time migration of offset VSP data using the excitation time imaging condition.

Liao, Ching-Yi, MS, 1985. 2-D surface to surface tomographic velocity inversion based on a polynominal parameterization using wave slowness data.

Wen, Jing, MS, 1984. Two approaches to analysis of seismic data from structurally complicated regions.

Recent Representative Publications:

Andrey Ortega and George McMechan. 3D ray-based synthesis of zero-offset p-wave and p-to-s converted wave sections for anisotropic media. *Journal of Seismic Exploration* **13** (2005) 353-372.

Biaolong Hua and George A. McMechan. Parsimonious 3D post-stack Kirchhoff depth migration. *Geophysical Prospecting* **53** (2005) 507-522.

Suresh Nistala and George A. McMechan. 3D Modeling of fracture-induced shear-wave splitting in the Southern California Basin. *Bulletin of the Seismological Society of America* **95** (2005) 3, 1090-1100.

Weihong Fei and George McMechan. Fast 2-D model-based migration velocity analysis and reflector shape estimation. *Geophysics* **70** (2005) U9-U17.

Shaoming Lu and George McMechan. Elastic impedance inversion of multi-channel seismic data for estimation of gas hydrate and free-gas distribution and concentration. *Geophysics* **69** (2004) 164-179.

Rucsandra Corbeanu, Mike Wizevich, Janok Bhattacharya, Xiaoxian Zeng, and George McMechan. 3-D architecture of ancient lower delta plain point bars using ground-penetrating radar, Cretaceous Ferron Sandstone, Utah. *American Association of Petroleum Geologists, Studies in Geology* **50** (2004) 427-449.

Craig Forster, Steve Snelgrove, Soo Lim, Rucsandra Corbeanu, George McMechan, Kris Soegaard, Robert Szerbiak, Laura Crossey, and Karen Roche. 3-D fluid flow simulation in a clastic reservoir analogue, based on integrated 3-D GPR and outcrop data from the Ferron Sandstone at Coyote Basin, Utah. *American Association of Petroleum Geologists, Studies in Geology* **50** (2004) 405-425.

Xiaoxian Zeng, George McMechan, Janok Bhattacharya, Carlos Aiken, Xueming Xu, Stan Hammon and Rucsandra Corbeanu. 3D imaging of a reservoir analog in point bar deposits in the Ferron Sandstone, Utah, using ground-penetrating radar. *Geophysical Prospecting* **52** (2004) 151-163.

Robert Sun, George McMechan, Meng Hsiao and Jinder Chow. Separating P- and S-waves in a prestack three-dimensional elastic seismogram by divergence and curl computations. *Geophysics* **69** (2004) 286-297.

Robert Loucks, Paul Mescher, and George McMechan. Three-dimensional architecture of a coalesced, collapsed-paleocave system in the Lower Ordovician Ellenburger Group, central Texas. *American Association of Petroleum Geologists Bulletin* **88** (2004) 545-564.

Zhou Yu, George McMechan, Phil Anno, and John Ferguson. Wavelet-transform based prestack multi-scale Kirchhoff migration. *Geophysics* **69** (2004) 1505-1512.

Adam Koesoemsdinata and George McMechan. Effects of diagenetic processes on seismic velocity anisotropy in near-surface sandstone and carbonate rocks. *Journal of Applied Geophysics* **56** (2004) 165-176.

Andrey Ortega and George McMechan. Estimating anisotropic seismic velocity from 3-component seismic CMP and borehole data from the Barinas Basin, southwest Venezuela. *Journal of Seismic Exploration* **13** (2004) 141-161.

Koesoemadinata, A. P., and G. A. McMechan (2003) Petro-seismic inversion for sandstone properties, *Geophysics,* 68, 1611-1625.

Patel, M. D., and G. A. McMechan (2003) Building 2-D stratigraphic and structure models, from well log data and control horizons, *Computers & Geosciences,* 29, 557-567.

Hua, B., and G. A. McMechan (2003) Parsimonious 2-D prestack Kirchhoff depth migration, *Geophysics,* 68, 1043-1051.

Madiba, G. B., and G. A. McMechan (2003) Processing, inversion, and interpretation of a 2-D seismic dataset from the North Viking Graben, North Sea, *Geophysics,* 68, 837-848.

Koesoemadinata, A. P., and G. A. McMechan (2003) Correlations between seismic parameters, EM parameters and petrophysical/petrological properties for sandstone and carbonate, *Geophysics,* 68, 870–883.

Madiba, G. B., and G.A. McMechan (2003) Seismic impedance inversion and interpretation of a gas carbonate reservoir in the Alberta foothills, western Canada, *Geophysics,* 68, 1460–1469.

Tiwari, U. K., and G.A. McMechan (2003) Estimation of water/gas saturation and effective pressure from seismic velocities and quality factors as functions of frequency: Predictions of an empirical model, *Journal of Seismic Exploration,* 12, 169–185.

Wang, D. M., and G. A. McMechan (2002) Finite difference modeling of borehole ground penetrating radar data, *Journal of Applied Geophysics,* 49, 111–127.

McMechan G. A., R. G. Loucks, P. Mescher and X. Zeng (2002) Characterization of a coalesced collapsed paleocave reservoir analog using GPR and wellcore data, *Geophysics,* 67, 1148–1158.

Ramos–Martinez, J., and G. A. McMechan (2002) Full wavefield inversion to estimate impact source orientation from multi–component land data, *Geophysics,* 67, 562–572.

Adriansyah and G. A. McMechan (2002) Analysis and interpretation of seismic data from thin reservoirs: Northwest Java Basin, Indonesia, *Geophysics,* 67, 14–26.

Lu, S., and G. A. McMechan (2002) Estimation of gas hydrate and free–gas saturation, concentration and distribution from seismic data, *Geophysics,* 67, 582–593.

Hammon III, W. S., X. Zeng, R. M. Corbeanu, and G. A. McMechan (2002) Estimation of the spatial variability of fluid permeability from surface and borehole GPR data and cores, with a 2–D example from the Ferron Sandstone, Utah, *Geophysics,* 67, 1505–1515.

Corbeanu, R. M., G. A. McMechan, R. B. Szerbiak, and K. Soegaard (2002) Permeability and mudstone prediction from GPR attribute analysis: Example from the Cretaceous Ferron Sandstone Member, east–central Utah, *Geophysics,* 67, 1495–1504.

Zeng, X., and G. A. McMechan (2002) Load balancing across a highly heterogeneous processor cluster using file status probes, with application to 3–D ray tracing for Kirchhoff depth migration, *Computers & Geosciences,* 28, 911–918.

Novakovic, D., C. D. White, R. M. Corbeanu, W. S. Hammon, III, J. P. Bhattacharya, and G. A. McMechan (2002) Effects of shales in fluvial–deltaic deposits: Ground–penetrating radar, outcrop observations, geostatistics, and three–dimensional flow modeling for the Ferron Sandstone, Utah, *Mathematical Geology,* 34, 857–893.

Yu, Z., G. A. McMechan, J. F. Ferguson, and P. D. Anno (2002) Adaptive wavelet filtering of seismic data in the wavelet transform domain, *Journal of Seismic Exploration,* 11, 223–246.

Szerbiak, R. B., G. A. McMechan, R. M. Corbeanu, C. Forster and S. H. Snelgrove (2001) 3–D characterization of a clastic reservoir analog: From 3–D GPR to a 3–D fluid permeability model, *Geophysics,* 66, 1026–1037.

Corbeanu, R. M., K. Soegaard, R. B. Szerbiak, J. B. Thurmond, G. A. McMechan, D. Wang, S. Snelgrove, C. B. Forster and A. Menitove (2001) Detailed internal architecture of fluvial channel sandstone determined from outcrop, cores, and 3–D ground–penetrating radar data: Example from the mid–Cretaceous Ferron Sandstone, east–central Utah, *AAPG Bulletin,* 85, 1583–1608.

Adriansyah, and G. A. McMechan (2001) AVA analysis and interpretation of a carbonate reservoir: Northwest Java Basin, Indonesia, *Geophysics,* 66, 744–754.

Sun, R., and G. A. McMechan (2001) Scalar reverse–time depth migration of prestack elastic seismic data,

Geophysics, 66, 1519–1527.

Ramos–Martinez, J., and G. A. McMechan (2001) Source parameter estimation by full waveform inversion in 3–D heterogeneous, viscoelastic, anisotropic media, *Bulletin of the Seismological Society of America,* 91, 276–291.

Koesoemadinata, A. P., and G. A. McMechan (2001) Empirical estimation of viscoelastic seismic parameters from petrophysical properties of sandstone, *Geophysics* 66, 1457–1470.

Koesoemadinata, A. P., and G. A. McMechan (2001) Sensitivity of viscoelastic reflection amplitude variation with angle to petrophysical properties, *Journal of Seismic Exploration,* 9, 269–284.

Hua, B., and G. A. McMechan (2001) Parsimonious 2–D poststack Kirchhoff depth migration, *Geophysics,* 66, 1497–1503.

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