

# Gonzalo Zambrano Narvaez

## Curriculum Vitae

Research Associate, P.Eng. Ph.D. Geotechnical Engineering  
Foundation CMG Chair in Reservoir Geomechanics  
AITF Industrial Research Chair in Reservoir Geomechanics  
6-217 Donadeo Innovation Centre for Engineering  
Department of Civil and Environmental Engineering  
University of Alberta  
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### Education

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Ph.D. (Geotechnical Engineering) University of Alberta, 2012  
B.Sc. (Civil Engineering) Universidad Javeriana/New Mexico State University, 2002

### Employment History

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University of Alberta

Research Associate	June 2012 - present
Research Engineer	July 2009 – May 2012

Management of daily operations of research program, including assisting the Chair in coordinating the research projects and interacting with and supervising the graduate students, postdoctoral fellows, research associates and technicians

Carrying out high-level, complex research activities on computational fluid dynamics, unconventional resources geomechanics and CO<sub>2</sub> utilization and geological storage

Financial management, analysis and reporting skills (may include some human resource, budgetary and/or equipment management)

Designing experiments, research methods, data collection protocols and standards on the area of geomechanics and geotechnical physical modelling for geotechnical centrifuge environments

Assisting in the writing of research papers, preparation of presentations and publications

Presenting research results in laboratory meetings, seminars, scientific conferences and or related settings

GZN Consulting Inc.

Co-Founder and President	May 2016 to Present
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Consulting services and training in the area of energy and research.

Opsens Solutions Inc.

Feb 2008 – July 2008

Research Scientist / Field Specialist – E.I.T./ Consultant. Primary responsibility was the Designing, deployment of Downhole Instrumentation for Oil and Gas., including the calibration of Extensometers for SAGD Operations and preparation of technical reports.

Alberta Research Council (now part of Alberta Innovates) Summers of 2006 & 2007  
Research Scientist / Engineer I. While conducting my PhD research on a pilot CO<sub>2</sub> EOR Project. Post-assessment of cement displacement in an instrumented well, using computer fluid dynamic (CFD). Also, Analysis and collection of tiltmeter data to conduct an independent evaluation of surface tiltmeter interpretation for long term reservoir surveillance application, including the geomechanical earth model analysis to predict surface displacements.

Energy International Ltd. 2003-2004  
Geotechnical Engineer. Field Engineer during the entire construction of the power plant, including the supervision of the early the foundation works.

H-MV Engineers Ltd. 2003  
Consultant - Review and assessment of existent geotechnical information, coordinate the geotechnical works, Including the budget analysis (Cost estimation). Prepared the final report for the Feasibility study. Prepared the Cost Estimation for the project.

Geoanalysis Ltd. 2002 to 2009  
Co-Founder, President and Board of Director. Business developer, focusing on geotechnical works.

#### Consulting/Research Project Experience

Member - Expert panel for the Council of Canadian Academies study "*Harnessing Science and Technology to Understand the Environmental Impacts of Shale Gas Extraction assessment*"

Chair – Canada Standards Association Technical Committee developing a standard on the geological storage of CO<sub>2</sub> – CSA Z741

#### Consulting/Research Project Experience

Technical Project Manager of Foundation CMG Industrial Research Consortium In Reservoir Geomechanics for Unconventional Resources (<http://www.geo-ref.ualberta.ca/georef/>) with \$8.3M in funding over five years (2014-2019).

Final Report - Suncor Energy Inc. Firebag SAGD Project Geomechanical Laboratory Test Program (2014).

Speaker in Advanced Workshop for CO<sub>2</sub> Storage on 26 – 27 August 2014, Mexico City DF, Mexico.

Assessment of the Shaft and Tunnel Access Concept for Hydrocarbon Production for Underground Facilities Below Water Bodies for the DOE (2014).

Final Report - Statoil Canada Ltd. Corner Project Geomechanical Laboratory Test Program (2014).

Consultant for a mission in Peru for the Feasibility of Accelerating the Deployment of Carbon, Utilization and Storage (CCUS) in developing APEC Economies.

Design and Installation of specialized multi-instrument observation well for the Aquistore, a fully integrated CCS project, Saskatchewan.

Research and project manager of CFI/AET \$4.3 M award.

Multiple research projects on geomechanical assessment for unconventional hydrocarbon resources (due to non-disclosure agreements the names and institutions cannot be recorded in this document).

Digital fabrication of geo-materials using 3D printing technology.

- Design and construction of innovated triaxial cells for GeoREF.
- Evaluation of surface tiltmeter monitoring system for CO<sub>2</sub> and Enhanced Methane Production (CSEMP) Pilot.
- Computational fluid dynamic assessment of the design and installation of specialized multi-instrument observation well for the Pembina Cardium CO<sub>2</sub>-EOR Project.
- Consultant on Geotechnical program for the design and construction of power plants: DygOil Power Plant Project, Amazonia, Ecuador; and ELCATEX Power Plant Project (Cogeneration power plan), San Pedro Sula, Honduras.
- Coordinator of the Feasibility Study Phase 3 for the Aguadulce Industrial Port, Buenaventura, Colombia.
- “Del Dique- Colombia” Project for Compagnie Nationale du Rhône (CNR, France).

## Publications

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### Patent

1. Zambrano-Narvaez, G., R.J. Chalaturnyk, and P. Lang, Outside Casing Conveyed Low Flow Impedance Sensor Gauge System and Method, Patent number 8555712, October 15, 2013.

### Peer review

2. Zambrano-Narvaez, G. and Chalaturnyk, R. (2011). “Case Study of the Cementing Phase of an Observation Well at the Pembina Cardium CO<sub>2</sub> Monitoring Pilot, Alberta, Canada”. *International Journal of Greenhouse Gas Control*, p. 841-849.
3. Zambrano-Narvaez, G. (2012) “Design, Deployment, Performance and Assessment of Downhole and Near Surface Monitoring Technology for Geological CO<sub>2</sub> Storage” PhD Thesis, University of Alberta, Canada.
4. Zambrano-Narvaez, G. and Chalaturnyk, R. (2014). “The New GeoREF Geotechnical Beam Centrifuge at the University of Alberta, Canada”. 8th ICPMG, Perth, Australia. January 14-17 (1) p. 163.
5. Martinez-Garzon, P, Bohnhoff, M., Kwiatak, G., Zambrano-Narvaez, G., Chalaturnyk, R. (2013) “Microseismic monitoring of CO<sub>2</sub> injection at the Penn West EOR Pilot, Canada: Implications for detection of wellbore leakage”. *Sensors*, Sep 2;13(9):11522-38.
6. Osinga, S., Zambrano-Narvaez, G. and Chalaturnyk, R. (2015). “Study of geomechanical properties of 3D printed sandstone analogue”. 49th US Rock Mechanics / Geomechanics Symposium held in San Francisco, CA. USA, 28 June – 1 July 2015. Paper No. 15-547.
7. Wu, J., Zambrano-Narvaez, G. and Chalaturnyk, R. (2015). “A New developed centrifuge testing program of SAGD Caprock Integrity” 49th US Rock Mechanics / Geomechanics Symposium held in San Francisco, CA. USA, 28 June – 1 July 2015. Paper No.15-557.
8. Zambrano-Narvaez, G., Chalaturnyk, R. and Worth, K. (2015) “Design and Deployment of an Integrated Instrumentation System in a Monitoring Well at Aquistore Geological CO<sub>2</sub> Storage Project, Saskatchewan, Canada” Ninth International Symposium on Field Measurements in Geomechanics held in Sydney, NSW, Australia, 9 – 11 September 2015. p. 717 – 726.
9. Gomez-Ramirez, J., Ardila, N., Chalaturnyk, R., Zambrano-Narvaez G. (2017) “Mechanical Properties characterization of 3D Printed Sandstone Analogues” 6th Biot Conference on Poromechanics held in Paris, France, July 9-13. P. 952-960.
10. Alzate Espinosa, G., Arias Buitrago, J.A., Morales Monsalve, C.B., Arbelaez Londoño, A., Naranjo Agudelo, A., Chalaturnyk, R., Zambrano-Narvaez, G. (2017) “Permeability and porosity changes in unconsolidated porous media due to variations of confining stress

- and temperature – An experimental study". Boletín de Ciencias de la Tierra, Vol 41 - July 2017.
11. Primkulov, B. Chalaturnyk, J., Chalaturnyk, R., Zambrano-Narvaez, G. (2017) "3D Printed Sandstone Strength: Curing of Furfuryl Alcohol Resin Based Sandstones" 3D Printing and Additive Manufacturing, Vol 4. No 3.

### Conferences

12. Zambrano-Narvaez, G. and Chalaturnyk, R. (2007). "Design and Deployment of an Integrated Instrumentation System in a Monitoring Well at the Penn West CO<sub>2</sub>-EOR Pilot, Alberta, Canada". 7th International Symposium on Field Measurements in Geomechanics. Boston, Massachusetts, Sept. 23-27.
13. Samsonov, S., Craymer, M., Murnaghan, K., Chalaturnyk, R. and Zambrano-Narvaez, G. (2013) "Monitoring Ground Deformation at Aquistore CO<sub>2</sub> Storage Site en SE Saskatchewan, Canada. Eos Transactions, AGU, 92(51), Fall Meeting Supplement, Abstract G51B-1113.
14. Elsanabary, M., Chalaturnyk, R., Zambrano-Narvaez, G. (2013) "SAGD Impacts: A Perspective of the Surface Freshwater-Groundwater resources in Athabasca Bitumen Deposits, Alberta". CSCE 2013 General Conference. Montreal, Quebec. May 29 to June 1.
15. Zambrano-Narvaez, G., Scott, J. D. and Chalaturnyk, R. J. (2014). Modeling Tailings Consolidation with the GeoREF Geotechnical Beam Centrifuge. Proceedings of the 7th International Congress on Environmental Geotechnics. Melbourne, Australia, Nov 10-15, 2014, p 163-167.
16. Zambrano-Narvaez, G., Scott, J. D. and Chalaturnyk, R. J. (2014). The new GeoREF geotechnical beam centrifuge modelling tailings consolidation. Proceedings of the 67th Canadian Geotechnical Conference.
17. Wu, J., Zambrano-Narvaez, G. and Chalaturnyk, R., (2015). Centrifuge Modelling Study of SAGD Caprock Integrity. Proceedings of World Heavy Oil Congress 2015, Edmonton, Alberta, Canada. March, 2015.
18. Jia, S., Chalaturnyk, R.J. Zambrano-Narvaez, G. (2016). "Physical Modeling for SAGD Caprock Integrity with the Centrifuge Facility" GeoConvention, Calgary, Canada. March 7-11.

### Professional Affiliations

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Canadian Geotechnical Society  
Society of Petroleum Engineers  
APEGA  
European Association of Geoscientists & Engineers  
American Rock Mechanics Association