

# Roxana Darvari

## Professional Summary

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Business address: The University of Texas at Austin  
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### Areas of Expertise

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Geochemistry and produced water analysis  
Hydrogeological site assessments related to petroleum exploration and production  
Machine learning and data-driven modeling  
Produced water management strategies  
Multidisciplinary research collaboration and technical leadership in environmental and energy-related geoscience projects

### Professional Preparation

#### Academic Background

M.Sc., Environmental and Water Resources Engineering, The University of Texas at Austin, December 2013  
M.Sc., Environmental Engineering, Khaje Nasir Toosi University of Technology, February 2006  
B.S., Civil Engineering, Khaje Nasir Toosi University of Technology, May 2003

#### Professional Appointments

Research Scientist Associate IV, Bureau of Economic Geology, The University of Texas at Austin (September 2020-Present)

- Spearheaded comprehensive field data collection initiatives, ensuring the acquisition of high-quality environmental samples across various U.S. basins, critical for subsequent analysis and research developments.
- Led comprehensive analyses of over 1,000 produced water samples, focusing on lithium concentration, resulting in improved water management strategies for the oil and gas industry.
- Led the development and implementation of advanced data analysis pipelines using Python, significantly enhancing data accuracy and reliability in predicting elemental distributions such as Lithium.
- Designed and executed sophisticated data visualization frameworks to represent complex geochemical data effectively, facilitating clearer understanding and decision-making for stakeholders and regulatory bodies.
- Authored technical reports and presented findings to stakeholders, enhancing understanding of complex geochemical data.

Research Scientist Associate III, Bureau of Economic Geology, The University of Texas at Austin (February 2014-August 2020)

Graduate Research Associate, The University of Texas at Austin (August 2013-January 2014)  
Evaluation of water treatment technologies, environmental assessment, production of water chemical analysis and development of hybrid methods in produced water treatment.

Graduate Research Assistant, The University of Texas at Austin (August 2011-August 2013)  
Assessed water quality impacts of shale gas development, with emphasis on flow-back and produced water management. Evaluated activated carbon for in-situ capping of contaminated sediments

Senior Project Engineer, Pars Oil and Gas Company in Iran (July 2007-January 2010)  
Provided the Environmental Management Plan (EMP) according to project Environmental

Impact Assessment (EIA) for South Pars gas field development project in Iran, financed by Deutsche bank and supported by other European Export Credit Agencies (ECAs) and audited by Fichtner GmbH & Co. KG, a German consulting firm, every six months. Provided the waste-management plan (WMP) of South Pars gas refineries in Iran in compliance with EPA, RCRA, and CWA standards. Developed the project HSE plans, HSE procedures, and practices for the gas refineries. Prepared the Environmental Mitigation Plan for dredging the gas pipeline and seawater intake and outfall in cooperation with SNC.LAVALIN, a Canadian Environmental Consulting Company. Assisted with Preparation of Invitation To Bid (ITB) documents and evaluated the performance of the environmental consultant companies in cooperation with the China National Offshore Oil Company.

Project Engineer, Iranian Offshore Oil Company (September 2006-July 2007)  
Assisted with development of HSE plan related to NGL Recovery Projects. Conducted monthly HSE inspection of construction sites based on HSE-MS, OHSAS 18001, ISO 14001. Investigated accidents/incidents, studied causes and reported to supervisor, recommending corrective preventive measures and following to take action.

Civil Engineer, Barayand Consult Engineers (September 2003-September 2006)  
Collaborated in a group to assess environmental impacts of road and bridge construction. Assisted with hydraulic assessment for transportation projects.

Civil Engineering Intern, Water Research Center (June-October 2002)  
Assisted with the modeling of pollution distribution in rivers using MIKE 11.

### **Professional Registrations and Certificates**

Engineer In Training (EIT), April 2013

Texas Board of Professional Engineers #128917

### **Service**

#### **University Committees**

Member then Chair, Jackson School Equipment Committee, September 2020-August 2023

### **Teaching and Advising**

#### **Courses Taught**

Total Suspended Solids Load Calculator: presented to Texas Commission on Environmental Quality (TCEQ) Edwards Aquifer Protection Program (EAPP), July 2022.

### **Continuing Education**

- Data Analysis and Visualization Bootcamp, The University of Texas at Austin, 2024
- Python for Geoscience Studies, The University of Texas at Austin, Fall 2021
- IBM Data Analyst, Coursera, Spring 2021
- Groundwater Hydrology, The University of Texas at Austin, Fall 2020
- Historical Geology, Austin Community College, Spring 2020

- Physical Geology, Austin Community College, Fall 2019
- Machine Learning, Stanford University (Online Course), Sep–Dec 2018
- Fundamentals of Groundwater Geochemistry, National Groundwater Association, March 19–20, 2015, San Antonio, TX

## Presentations

### Presentations

Lithium Concentration Prediction in the U.S. Gulf Coast Region Using Machine Learning: presented to DOE-NETL, February 3, 2025.

Water Quality Impacts of Shale Gas Development: presented at 2013 Geological Society of America Annual Meeting & Exposition, Denver, Colorado, October 27-30, 2013.

## Publications

### Peer Reviewed Journal Articles

Darvari, R., Nicot, J.-P., Scanlon, B. R., Kyle, J. R., Elliott, B. A., and Uhlman, K., 2024, Controls on lithium content of oilfield waters in Texas and neighboring states (USA): *Journal of Geochemical Exploration*, v. 257, no. 107363, 15 p., <http://doi.org/10.1016/j.gexplo.2023.107363>.

Smye, K. M., Ge, J., Calle, A., Morris, A., Horne, E. A., Eastwood, R. L., Darvari, R., Nicot, J. P., and Hennings, P., 2024, Role of deep fluid injection in induced seismicity in the Delaware Basin, West Texas and southeast New Mexico: *Geochemistry, Geophysics, Geosystems*, v. 25, no. 6, article no. e2023GC011260, 33 p., <http://doi.org/10.1029/2023GC011260>.

Nicot, J.-P., Darvari, R., Smye, K. M., and Goodman, E., 2023, Geochemical insights from formation waters produced from Wolfcampian and Leonardian intervals of the Midland Basin, Texas, USA: *Applied Geochemistry*, v. 150, no. 6, 33 p., <http://doi.org/10.1016/j.apgeochem.2023.105585>.

Nicot, J.-P., Smyth, R. C., Darvari, R., and McKinney, S. T., 2022, New hydrogeochemical insights on a West Texas desert spring cluster: Trans-Pecos Balmorhea-Area Springs: *Applied Geochemistry*, v. 142, no. 105331, 14 p., <http://doi.org/10.1016/j.apgeochem.2022.105331>.

Nicot, J.-P., Darvari, R., Eichhubl, P., Scanlon, B. R., Elliott, B. A., Bryndzia, T. L., Gale, J. F. W., and Fall, A., 2020, Origin of low salinity, high volume produced waters in the Wolfcamp Shale (Permian), Delaware Basin, USA: *Applied Geochemistry*, v. 122, no. 104771, 18 p., <http://doi.org/10.1016/j.apgeochem.2020.104771>.

Darvari, R., Nicot, J.-P., Scanlon, B. R., Mickler, P., and Uhlman, K., 2018, Trace element behavior in methane-rich and methane-free groundwater in north and east Texas: *Groundwater*, v. 56, no. 5, p. 705-718, <http://doi.org/10.1111/gwat.12606>.

Larson, T., Nicot, J.-P., Mickler, P., Castro, M. C., Darvari, R., Wen, T., and Hall, C. M., 2018, Monitoring stray natural gas in groundwater with dissolved nitrogen. An example from Parker County, Texas: *Water Resources Research*, v. 54, no. 9, p. 6024-6041, <http://doi.org/10.1029/2018WR022612>.

Nicot, J.-P., Gherabati, A., Darvari, R., and Mickler, P., 2018, Salinity reversal and water freshening in the Eagle Ford Shale, Texas, USA: *ACS Earth and Space Chemistry*, v. 2, no. 11, p. 1087-1094, <http://doi.org/10.1021/acsearthspacechem.8b00095>.

Lu, J., Darvari, R., Nicot, J.-P., Mickler, P., and Hosseini, S. A., 2017, Geochemical impact of injection of Eagle Ford brine on Hosston sandstone formation--observations of autoclave water-rock interaction experiments: *Applied Geochemistry*, v. 84, p. 26-40, <http://doi.org/10.1016/j.apgeochem.2017.06.002>.

Lu, J., Mickler, P., Nicot, J.-P., Choi, W., Esch, W. L., and Darvari, R., 2017, Geochemical interactions of shale and brine in autoclave experiments--understanding mineral reactions during hydraulic fracturing of Marcellus and Eagle Ford Shales: AAPG Bulletin, v. 101, no. 10, p. 1567-1597, <http://doi.org/10.1306/11101616026>.

Nicot, J.-P., Larson, T., Darvari, R., Mickler, P., Sloten, M., Aldridge, J., Uhlman, K., and Costley, R., 2017, Controls on methane occurrences in shallow aquifers overlying the Haynesville Shale gas field, East Texas: Groundwater, v. 55, no. 4, p. 443-454, <http://doi.org/10.1111/gwat.12500>.

Nicot, J.-P., Larson, T., Darvari, R., Mickler, P., Uhlman, K., and Costley, R., 2017, Controls on methane occurrences in aquifers overlying the Eagle Ford Shale play, South Texas: Groundwater, v. 55, no. 4, p. 455-468, <http://doi.org/10.1111/gwat.12506>.

Nicot, J.-P., Mickler, P., Larson, T., Castro, M. C., Darvari, R., Uhlman, K., and Costley, R., 2017, Methane occurrences in aquifers overlying the Barnett Shale play with a focus on Parker County, Texas: Groundwater, v. 55, no. 4, p. 469-481, <http://doi.org/10.1111/gwat.12508>.

Wen, T., Castro, M. C., Nicot, J.-P., Hall, C. M., Pinti, D. L., Mickler, P., Darvari, R., and Larson, T., 2017, Characterizing the noble gas isotopic composition of the Barnett Shale and Strawn Group and constraining the source of stray gas in the Trinity Aquifer, North-Central Texas: Environmental Science & Technology, v. 51, no. 11, p. 6533-6541, <http://doi.org/10.1021/acs.est.6b06447>.

Lu, J., Mickler, P., Nicot, J.-P., Yang, C., and Darvari, R., 2016, Geochemical impact of O<sub>2</sub> impurity in CO<sub>2</sub> stream on carbonate carbon-storage reservoirs: International Journal of Greenhouse Gas Control, v. 47, p. 159-175, <http://doi.org/10.1016/j.ijggc.2016.01.039>.

Lu, J., Nicot, J.-P., Mickler, P., Ribeiro, L. H., and Darvari, R., 2016, Alteration of Bakken reservoir rock during CO<sub>2</sub>-based fracturing--An autoclave reaction experiment: Journal of Unconventional Oil and Gas Resources, v. 14, p. 72-85, <http://doi.org/10.1016/j.juogr.2016.03.002>.

Wen, T., Castro, M. C., Nicot, J.-P., Hall, C. M., Larson, T., Mickler, P., and Darvari, R., 2016, Methane sources and migration mechanisms in shallow groundwaters in Parker and Hood counties, Texas--A heavy noble gas analysis: Environmental Science & Technology, v. 50, no. 21, p. 12012-12021, <http://doi.org/10.1021/acs.est.6b01494>.

## Peer Reviewed Book Chapters

Williams, J. H., Reible, D., Darvari, R., Vercellino, T., and Morse, A., 2015, Reuse and recycling of flowback and produced waters, in Uddameri, V., Morse, A., and Tindle, K. J., eds., Hydraulic fracturing impacts and technologies--a multidisciplinary perspective: Boca Raton, Fla., CRC Press, p. 157-171, <http://doi.org/10.1201/b18581>.

## Non Peer Reviewed Journal Articles

Darvari, R., Dashtian, H., and Nicot, J.-P., 2025, Evaluating Lithium Concentration Predictions in the U.S. Gulf Coast: Machine Learning Approaches and Outlier Impact Analysis: 28 p., <http://doi.org/10.2139/ssrn.5206334>.

Romanak, K. D., Yang, C., and Darvari, R., 2017, Towards a method for leakage quantification and remediation monitoring in the near-surface at terrestrial CO<sub>2</sub> geologic storage sites: Energy Procedia, 13th International Conference on Greenhouse Gas Control Technologies, GHGT-13, 14-18 November 2016, Lausanne, Switzerland, v. 114, p. 3855-3862, <http://doi.org/10.1016/j.egypro.2017.03.1517>.

## Contract Reports

Nicot, J.-P., Smyth, R. C., and Darvari, R., 2022, Edwards Aquifer Rules Technical Guidance Manual, Permanent Structural Best Management Practices (RG-348d): prepared for Texas Commission on Environmental Quality, 112 p.

Nicot, J.-P., Smyth, R. C., and Darvari, R., 2022, Edwards Aquifer Rules Technical Guidance Manual, Design for TSS Reduction, Management of Karst-Origin and Other Sensitive Features (RG-348g): prepared for Texas Commission on Environmental Quality, 61 p.

Nicot, J.-P., Smyth, R. C., and Darvari, R., 2022, Edwards Aquifer Rules Technical Guidance Manual, Design for TSS Reduction: User Manual for TSS Load Spreadsheet Tool (RG-348f): prepared for Texas Commission on Environmental Quality, 33 p.

Nicot, J.-P., Smyth, R. C., and Darvari, R., 2022, Edwards Aquifer Rules Technical Guidance Manual, Instruction to Add New Manufactured Technology Device to the TSS Load Calculator: prepared for Texas Commission on Environmental Quality, 25 p.

Nicot, J.-P., Smyth, R. C., and Darvari, R., 2022, Edwards Aquifer Rules Technical Guidance Manual, Manufactured Treatment Devices, Use and Evaluation (RG-348e): prepared for Texas Commission on Environmental Quality, 14 p.

Nicot, J.-P., Smyth, R. C., and Darvari, R., 2022, Edwards Aquifer Rules Technical Guidance Manual, References (RG-348h): prepared for Texas Commission on Environmental Quality, 14 p.

Nicot, J.-P., Smyth, R. C., and Darvari, R., 2021, Edwards Aquifer Rules Technical Guidance Manual, Introduction to Series (RG-348a): prepared for Texas Commission on Environmental Quality, 23 p.

Nicot, J.-P., Smyth, R. C., and Darvari, R., 2021, Edwards Aquifer Rules Technical Guidance Manual, Temporary Best Management Practices (RG-348c): prepared for Texas Commission on Environmental Quality, 60 p.

Nicot, J.-P., Smyth, R. C., Darvari, R., Bongiovanni, T., Pierre, J. P., McKinney, S. T., Wolaver, B. D., and Mickler, P., 2021, Revisiting hydrogeology of a West Texas desert spring cluster: a data-rich geochemical and physical study of the Trans-Pecos Balmorhea-Area Springs: The University of Texas at Austin, Bureau of Economic Geology, contract report prepared for Apache Corporation, 234 p.

Gale, J. F. W., Baumgardner, R., Bhandari, A., Darvari, R., Dommissie, R., Eichhubl, P., Elliott, S. J., Fall, A., Flemings, P., Hamlin, H. S., Landry, C. J., Mohanty, K., Nicot, J.-P., Polito, P., Prodanovic, M., Ramiro-Ramirez, S., Reed, R. M., Rowe, H., Ruppel, S. C., and Sivil, J. E., 2019, Multi-faceted study of water cut in the Permian Wolfcamp in the Delaware Basin, West Texas: final report prepared for Shell, under contract no. UT OSP# 201503146-001, 292 p.

Nicot, J.-P., Hosseini, S. A., Dashtian, H., Kamali, A., Romanak, K. D., Darvari, R., and Gil-Egui, R., 2019, Headspace gas monitoring to infer dissolved gas concentrations at the Glenhaven Site (QLD): prepared for Australian National Low Emissions Coal Research & Development (ANLEC R&D), Canberra, Australia, 94 p.

Hosseini, S. A., Nicot, J.-P., Darvari, R., Costley, R., Lu, J., Sava, D., Goudarzi, A., Mickler, P., Banerji, D., Uhlman, K., Walden, S., Hentz, T. F., Hamlin, H. S., Ganjdanesh, R., Sun, A. Y., Hovorka, S. D., and Scanlon, B. R., 2016, Pressure management and plume control strategies through a brine extraction storage test at the Devine Test Site in Texas, Phase I: Bureau of Economic Geology, The University of Texas at Austin, Topical Report prepared for DOE NETL, under contract no. DE-FE0026137, 157 p.

Romanak, K. D., Zhang, T., and Darvari, R., 2016, Practical isotopic analyzer for subsurface gases: DE-FOA-0001366, SBIR/STTR FY 2016 Phase I Release 1 prepared for Mesa Photonics, 28 p.

Nicot, J.-P., Lu, J., Mickler, P., and Darvari, R., 2015, A Study of Rock-Water Interactions during CO<sub>2</sub>-Aided Fracturing (Bakken Formation): Bureau of Economic Geology, The University of Texas at Austin, contract report prepared for Statoil Research and Technology, 45 p.

Nicot, J.-P., Mickler, P., Larson, T., Castro, M. C., Darvari, R., Smyth, R. C., Uhlman, K., and Omelon, C., 2015, Understanding and managing environmental roadblocks to shale gas development: an analysis of shallow gas, NORM, and trace metals: Bureau of Economic Geology, The University of Texas at Austin, Contract Report prepared for RPSEA, under contract no. 11122-56, 272 p.

Nicot, J.-P., Mickler, P., Lu, J., and Darvari, R., 2015, A Study of Rock-Water Interactions During Hydraulic Fracturing (Barnett Shale): Bureau of Economic Geology, The University of Texas at Austin, contract report prepared for ExxonMobil Exploration Company, 114 p.

Nicot, J.-P., Mickler, P., Lu, J., and Darvari, R., 2015, A study of rock-water interactions during hydraulic fracturing (Eagle Ford Shale): Bureau of Economic Geology, The University of Texas at Austin, contract report prepared for ExxonMobil Exploration Company, 100 p.

Nicot, J.-P., Mickler, P., Lu, J., and Darvari, R., 2015, A Study of Rock-Water Interactions during Hydraulic Fracturing (Marcellus Shale): Bureau of Economic Geology, The University of Texas at Austin, contract report prepared for Statoil Research and Technology, 194 p.

Nicot, J.-P., Mickler, P., Lu, J., and Darvari, R., 2014, Optimizing Water-Rock Interactions to Reduce Water Footprint in Unconventional Shale Plays: Bureau of Economic Geology, The University of Texas at Austin, contract report prepared for Shell-UT Unconventional Research (SUTUR), 154 p.

## Published Abstracts

Elliott, B. A., Darvari, R., Nicot, J.-P., and Loewy, S.L., 2024, Lithium Sources of Oilfield Waters in Texas and Neighboring States (abs.): Geological Society of America Abstracts, v. 56.

Nicot, J.-P., and Darvari, R., 2020, Origin of the Low Salinity Produced Waters of the Delaware Basin Wolfcamp Shale (abs.): Geological Society of America Abstracts, v. 52.

Darvari, R., Elliott, B. A., and Nicot, J.-P., 2019, Unconventional play produced water: a geochemical journey across Texas (abs.): Abstract H51L-1641, presented at AGU 2019 Fall Meeting, San Francisco, Calif., December 9-13.

Nicot, J.-P., Darvari, R., and Elliott, B. A., 2019, An analysis of produced water of the Delaware Basin Wolfcamp Formation (abs.): no. H51L-1642, Abstract H51L-1642, presented at AGU 2019 Fall Meeting, San Francisco, Calif., December 9-13.

Nicot, J.-P., Gherabati, A., Darvari, R., and Mickler, P., 2018, Salinity Reversal and Water Freshening in the Eagle Ford Shale (abs.): Abstract H21I-1750, presented at 2018 AGU Fall Meeting, Washington, D.C., 10-14 Dec.

Castro, M. C., Wen, T., Nicot, J.-P., Hall, C. M., Pinti, D. L., Mickler, P., Darvari, R., and Larson, T., 2017, Barnett Shale or Strawn Group: identifying the source of stray gas through noble gases in the Trinity Aquifer, North-Central Texas (abs.): Abstract H51L-05 presented at 2017 Fall Meeting, AGU, New Orleans, La., 11-15 Dec.

Castro, M. C., Wen, T., Nicot, J.-P., Hall, C. M., Mickler, P., and Darvari, R., 2016, Methane sources in shallow groundwaters in Parker and Hood Counties, Texas: a heavy noble gas analysis (abs.): Goldschmidt Conference, June 16 - July 1, Yokohama, Japan, p. 384.

Larson, T. E., Nicot, J.-P., Mickler, P., and Darvari, R., 2016, Attribution of natural gas in shallow groundwater using dissolved nitrogen and alkane chemistry in Parker County, Texas (abs.): Goldschmidt Conference, June 16 - July 1, Yokohama, Japan, p. 1679.

Wen, T., Castro, M. C., Nicot, J.-P., Hall, C. M., Mickler, P., and Darvari, R., 2016, Identifying the sources of methane in shallow groundwaters in South-Central Texas through noble gas signatures (abs.): June 20, AAPG Annual Convention and Exhibition, Calgary, Alberta, Canada.

Wen, T., Castro, M. C., Nicot, J.-P., Hall, C. M., Mickler, P., and Darvari, R., 2016, Methane sources and migration mechanisms in the shallow Trinity Aquifer in Parker and Hood Counties, Texas - a noble gas analysis (abs.): Abstract H31A-1347 presented at 2016 Fall Meeting, AGU, San Francisco, Calif., 12-16 Dec.

Larson, T., Nicot, J.-P., Mickler, P., and Darvari, R., 2015, Tracing natural gas transport into shallow groundwater using dissolved nitrogen and alkane chemistry in Parker County, Texas (abs.): AGU Fall Meeting, December 14-18, San Francisco, Calif., H21E-1423.

Nicot, J.-P., Mickler, P., Larson, T., Darvari, R., and Smyth, R. C., 2015, Dissolved methane occurrences in aquifers in the footprint of Texas shale plays and their controls (abs.): AGU Fall Meeting, December 14-18, San Francisco, Calif., H31E-1456.

Nicot, J. -P., Mickler, P., Hildenbrand, Z. L., Larson, T., Darvari, R., Uhlman, K., Smyth, R. C., and Scanlon, B. R., 2014, Preliminary results of dissolved methane sampling in the footprint of Texas shale plays (abs.): Geological Society of America Abstracts with Programs, v. 46, no. 6, p. 692.

Nicot, J. -P., Mickler, P., Hildenbrand, Z., Larson, T., Darvari, R., Uhlman, K., Smyth, R. C., and Scanlon, B. R., 2014, Screening for dissolved methane in groundwater across Texas shale plays (abs.): 2014 American Geophysical Union Fall Meeting, San Francisco, California, December 15-19, 2014, no. H23C-0895.