# lan James. Duncan

# **Professional Summary**

May 1, 2025

Business address:	The University of Texas at Austin
	Bureau of Economic Geology
	10100 Burnet Rd., Bldg. 130
	Austin, TX 78758
Telephone:	(512) 471-5117
E-mail address:	ian.duncan@beg.utexas.edu

# **Professional Preparation**

# Academic Background

Ph.D. Geology, University of British Columbia, Vancouver, Canada, 1982

B.A., Honors I, Earth Sciences, Macquarie University, Sydney, Australia, 1974

# **Professional Appointments**

Present Position: Associate Director and Research Scientist, Bureau of Economic Geology, The University of Texas at Austin (July 2004 - Present). Acting manager of BEG's Gulf Coast Carbon Center, agency expert on clean coal technologies and integrating carbon capture into enhanced oil recovery (EOR) projects.

Principal investigator for multiple water resources, environmental geology, and natural resource investigations.

Geologist Consultant (Scientist Manager II), Virginia Department of mines, Minerals, and Energy (2001 - June 2004). Management and writing of grants and contracts (including in 2003, writing grant applications for DMME and DMR); team leader for DMR State Map funded project focusing on stratigraphic, structural, and Quaternary surficial geological mapping in the Valley and Ridge; team leader of DMME Information Technology Task Force (including oversight of DMME's Electronic Permitting Initiative, GIS data development for abandoned coal mine maps, long range IT planning).

Geologist Supervisor (Grade 13) Eastern Geology and Spatial Data Section Manager, Virginia Department of Mines, Minerals, and Energy (1996 - 2001). Responsible for Divisions GIS data development; direct supervisor for 7 staff, 4 working on GIS and Remote Sensing projects; developing metadata and spatial information strategy for Department; Leader DMME Information Technology Task Force, responsible for restructuring Department IT strategy from mainframe to a distributed network (writing DMME IT Plans, writing RFP's for DMME's "Work Flow for Electronic Permitting" (\$230,000) and "Regulatory Data Base Conversion for Division of Gas and Oil" (\$350,000) procurements).

Geologist Supervisor, Virginia Department of Mines, Minerals, and Energy, Division of Mineral Resources (1996 - 2001). Direct supervision of five staff members, two working on GIS projects and two working on OSM funded digital compilation of abandoned coal mine maps in SW Virginia and one working on karst mapping/ Quaternary Geology and environmental /engineering geology.

Associate Professor of Earth and Planetary Sciences; faculty associate in the McDonald Center for Earth and Planetary Remote Sensing, Washington University (1986 - 1993). Remote sensing (Landsat TM-based mapping of the Najd shear zone in Saudi Arabia; remote sensing study of faults in Madagascar, remote sensing interpretation of laboratory measurement of spectral signatures of fresh and weathered rock surfaces, geologic interpretation of synthetic aperture radar imagery from Space Shuttle SIR-B and SIR-C data from Sudan, statistical analysis and inversion of remote sensing image data); geodynamics; structural geology; and finite element modeling.

Assistant Professor, Southern Methodist University (1979 - 1986). Structural geology, and geochronology; field work in New Mexico, Colorado, Canada and Oklahoma; funded and set up a Fission Track dating Laboratory; fission track dating to constrain uplift along Rio Grande Rift; experimental studies of fission track blocking temperatures; compaction and diagenesis of Sligo Formation Texas Gulf Coast; Sr and stable isotope study of Sligo Formation (in collaboration with ARCO Research Labs); study of relationship between porosity evolution and compaction in grainstones; study of compaction in the Smackover Formation using strain analysis techniques. Supervised 3 PhD dissertations and 4 MSc Theses.

Teaching Assistant; Instructor in Charge of Field Camp section, summers of 1973-77, University of British Columbia (1973 - 1979). Geologic mapping in Monashee Range of the Rocky Mtns; Rb/Sr and Pb/Pb Geochronology; structural geology of Big Ledge Lead-Zinc Prospect; experimental phase equilibrium studies.

# Theses

Petrological evolution of the Ok Tedi Skarn deposit, Papua New Guinea

#### Dissertations

Structural evolution of the Thor Odin Gneiss Dome

#### Areas of Expertise

# Areas of Expertise

Carbon management based on geologic CO2 sequestration, development and management of large-scale pilot projects for carbon capture and long-term storage, and implementation of clean oil technologies

Conceiving, designing, implementing, and managing multidisciplinary geologic information management projects

Managing integrated grant/contract-based multidisciplinary research projects in a nonprofit organization

Modern geologic mapping, remote sensing, structural geology, knowledge management in the earth sciences, digital mapping/ enterprise GIS, and geochronology

#### Awards

# Awards and Honorary Societies

Canadian Pacific Graduate Travel Fellowship

Commonwealth of Australia University Scholarship

DMME Outstanding Contribution Award

GSA Penrose Grant Outstanding Proposal

James Coates Graduate Scholarship

Killam Predoctoral Fellowship

UBC Geological Sciences Outstanding Teaching Assistant Award

University of British Columbia Graduate Fellowship

# Service

**External Committees Participation** 

Leader, Performance Measures Task Force, DMME, 0

Leader, Information Technology Task Force, DMME, 0

Leader, State Map Mapping Team, DMR, 0

Member, Virginia State Agency Technical Remote Sensing Data Needs Advisory Committee, George Mason University and Virginia Economic Development Partnership, 2001 - 2004

Member, Digital Geologic Mapping Committee, Data Information Exchange and Data Capture Work Groups, AASG, 1996 - 2004

Member, Technical Advisory Committee, Virginia GIS Network State Agency, 1996 - 2004

Member, Virginia Gap Analysis (Remote Sensing) Advisory Committee, Virginia Tech, 1996 - 2004

Technical Advisor, Virginia GIS Coordinator, Statewide purchase of SPOT imagery, 1996 - 2001

#### **Teaching and Advising**

#### Continuing Education Courses Taught

Digital Mapping Techniques: presented at Martha Washington College, Abingdon, Virginia,

Four 1-day short courses on Introduction to Geographic Information Systems: presented to Virginia Department of Transportation, Richmond, Virginia,

Thermodynamics and Phase Equilibrium: presented at Australian National University, Canberra, Australia,

Thermodynamics and Phase Equilibrium: presented at The University of Texas at Dallas, Dallas, Texas,

Using comprehensive planning to preserve industrial mineral and aggregate reserve: DMR Short Course for Regional Planners,

#### Presentations

## Presentations

Analysis of Vertical Permeability and Its Influence on CO2 EOR and Storage In A Carbonate Reservoir: presented to Society of Petroleum Engineers, presented at 2021 SPE Annual Technical Conference and Exhibition (ATCE), Dubai, United Arab Emirates, September 21-23, 2021.

Evaluating risks of CO2 transportation: potential impacts of CO2 on human health: poster presented at 11th Annual Carbon Capture, Utilization, and Sequestration Conference, Pittsburgh, Pennsylvania, May 2, 2012.

The nature of methane leakage from natural gas wells as an analogue for shallow CO2 migration: does bubble transport and slug flow in fractures dominate?: presented at 11th Annual Carbon Capture, Utilization, and Sequestration Conference, Pittsburgh, Pennsylvania, May 1, 2012.

Introduction to the carbon landscape: research, funding, staffing, sustaining across cycles: presented at Bureau of Economic Geology Visiting Committee meeting, Austin, Texas, August 2, 2010.

Risks and benefits of geologic sequestration of carbon dioxide--how do the pieces fit together?: presented at Pacific Sections AAPG-SEPM-SEG Convention, 100th Anniversary of The Texas Bureau of Economic Geology Session, Ventura, California, May 5, 2009.

Risk assessment for future CO2 sequestration projects based CO2 enhanced oil recovery in the U.S: presented at the GHGT-9 (Green House Gas Technology) Conference, Washington, D.C.,

November 16-20, 2008.

Addressing public policy issues facing long term CO2 storage in Texas: presented at Fifth Annual Conference on Carbon Capture & Sequestration, Alexandria, Virginia, May 8-11, 2006.

Numerical modeling of role of faults in understanding long-term CO2 storage: the upscaling dilemma: presented at Fifth Annual Conference on Carbon Capture & Sequestration, Alexandria, Virginia, May 8-11, 2006.

Texas FutureGen: a win for the region: invited opening address presented at CO2 Workshop, Midland, Texas, December 6, 2005.

The Gulf Coast Carbon Center: enabling development of a carbon sequestration industry in the Gulf Coast: presented to the Houston Geological Society, Houston, Texas, November 15, 2005.

Reliability in geoinformatics: theory and practical applications in digital geologic map compilation: presented at Geological Society of America Annual Meeting, Salt Lake City, Utah, October 16, 2005.

Getting more oil recovery and reducing global warming at the same time: a cross border win-win?: invited lecture presented at Cross Border Energy Forum, Santa Fe, New Mexico, October 13, 2005.

The Gulf Coast Carbon Center: exploring synergies between gasification and CO2 sequestration: invited lecture presented at Gasification 2005, San Francisco, California, October 11, 2005.

The Gulf Coast Carbon Center: CO2 sequestration research objectives: presented to Virginia Geologic Survey, Charlottesville, Virginia, September 22, 2005.

CO2 EOR: new economic drivers and new strategies: luncheon speech presented at AAPG Eastern Section Annual Meeting, Morgantown, Virginia, September 19, 2005.

Elevation data sets for GIS in Virginia: presented at Virginia GIS Meeting, Roanoke, Virginia, 2000.

Absolute and relative accuracy in GIS datasets: presented at Virginia GIS Conference, 1999.

Geology and Reservoir Properties of the Residual Oil Zone (ROZ) of the San Andres Seminole Unit, West Texas: presented to AAPG, presented at SWS AAPG Conference, Houston, June 23, 2021-Present.

A remote sensing approach to estimating runoff from impervious surfaces: presented at Virginia Tech University, Blacksburg, Virginia,

Biodiversity in Virginia: the role of geology: presented to Ivy Creek Natural Foundation, Charlottesville, Virginia,

Creating geological databases for engineering and Quaternary Geology: presented to Virginia Department of Transportation Engineering Geology Group, Richmond, Virginia,

Digital databases, digital geologic maps, and highway planning: presented to Virginia Transportation Research Council, Charlottesville, Virginia,

Digital geologic mapping using GIS: presented to Virginia Tech Department of Geological Sciences Colloquium, Blacksburg, Virginia,

Educating regional planners on aggregate resources: presented at National Transportation Research Council Annual Meeting, Washington, D.C.,

Environmental/Quaternary geology and karst mapping: implications for highway planning: presented at Virginia Department of Transportation Environmental Review Bi-Annual Meeting, Richmond, Virginia,

Geologic history of Virginia: presented to Ivy Creek Natural Foundation, Charlottesville, Virginia,

GIS for mapping abandoned coal mines in Virginia: presented to National Research Council Committee on Impoundment Failures, Huntington, West Virginia,

Liability of government agencies for GIS data: presented at Digital Mapping Techniques Symposium, Pennsylvania

New approaches to creating digital geologic maps: presented to U.S. Geological Survey, geology division, Reston, Virginia,

The evolution of the early Earth: presented at the Piedmont Virginia College Annual Endowed Colloquium in the Sciences, Charlottesville, Virginia,

#### Activities of a Professional Nature

#### Professional Societies

Geological Society of America (Structural Geology Division, Coal Division, Hydrogeology Division)

#### **Publications**

# Peer Reviewed Journal Articles

Cherif, A., and Duncan, I. J., 2025, Improvement of hydrogen production during in-situ combustion of hydrocarbons using CaO nanoparticles: enabling subsurface decarbonization and desulfurization: Energy, v. 316, no. 134566, 10 p., http://doi.org/10.1016/j.energy.2025.134566.

Ren, B., Littlefield, J., Jia, C., Ni, H., and Duncan, I., 2024, Impact of pressure-dependent interfacial tension and contact angle on capillary heterogeneity trapping of CO2 in storage aquifers: Society of Petroleum Engineers Journal, v. 29, no. 8, p. 4442-4458, http://doi.org/10.2118/214925-PA.

Cherif, A., Atwair, M., Atsbha, T. A., Zarei, M., Duncan, I. J., Nebbali, R., Sen, F., and Lee, C.-J., 2023, Enabling low-carbon membrane steam methane reforming: comparative analysis and multi-objective NSGA-II-integrated Bayesian optimization: Energy Conversion and Management, v. 297, no. 117718, 12 p., http://doi.org/10.1016/j.enconman.2023.117718.

Ren, B., Jensen, J., Duncan, I., and Lake, L., 2023, Buoyant flow of H2 vs CO2 in storage aquifers: implications to geological screening: Society of Petroleum Engineers Reservoir Evaluation and Engineering, v. 26, no. 3, p. 1048-1058, http://doi.org/10.2118/210327-PA.

Ren, B., Jensen, J. L., Lake, L. W., Duncan, I. J., and Male, F., 2022, Analysis of vertical permeability and its influence on CO2 enhanced oil recovery and storage in a carbonate reservoir: Society of Petroleum Engineers Reservoir Evaluation & Engineering, v. 25, no. 3, p. 414-432, http://doi.org/10.2118/205995-PA.

Abdelaal, M., Zeidouni, M., and Duncan, I. J., 2021, Effects of injection well operation conditions on CO2 storage capacity in deep saline aquifers: Greenhouse Gases: Science and Technology, v. 11, no. 4, p. 734-749, http://doi.org/10.1002/ghg.2076.

Chen, H., Zhang, C., Jia, N., Duncan, I., Yang, S., and Yang, Y. Z., 2021, A machine learning model for predicting the minimum miscibility pressure of CO2 and crude oil system based on a support vector machine algorithm approach: Fuel, v. 290, no. 120048, 13 p., http://doi.org/10.1016/j.fuel.2020.120048.

Ren, B., and Duncan, I. J., 2021, Maximizing oil production from water alternating gas (CO2) injection into residual oil zones: the impact of oil saturation and heterogeneity: Energy, v. 222, no. 119915, 13 p., http://doi.org/10.1016/j.energy.2021.119915.

Chen, H., Li, B., Duncan, I., Elkhider, M., and Liu, X., 2020, Empirical correlations for prediction of minimum miscible pressure and near-miscible pressure interval for oil and CO2 systems: Fuel, v. 278, no. 118272, 13 p., http://doi.org/10.1016/j.fuel.2020.118272.

Chen, H., Liu, X., Jia, N., Tian, X., Duncan, I., Yang, R., and Yang, S., 2020, The impact of the

oil character and quartz sands on the thermal behavior and kinetics of crude oil: Energy, v. 210, no. 118573, 10 p., http://doi.org/10.1016/j.energy.2020.118573.

Male, F., and Duncan, I. J., 2020, Lessons for machine learning from the analysis of porosity-permeability transforms for carbonate reservoirs: Journal of Petroleum Science and Engineering, v. 187, no. 106825, 11 p., http://doi.org/10.1016/j.petrol.2019.106825.

Ren, B., and Duncan, I. J., 2019, Reservoir simulation of carbon storage associated with CO2 EOR in residual oil zones, San Andres formation of West Texas, Permian Basin, USA: Energy, v. 167, p. 391-401, http://doi.org/10.1016/j.energy.2018.11.007.

Ren, B., and Duncan, I., 2019, Modeling oil saturation evolution in residual oil zones: implications for CO2 EOR and sequestration: Journal of Petroleum Science and Engineering, v. 177, p. 528-539, http://doi.org/10.1016/j.petrol.2019.02.072.

Meng, M., Fan, T., Duncan, I. J., Yin, S., Gao, Z., Jiang, L., Yu, C., and Jiang, L. Y., 2018, Characterization of carbonate microfacies and reservoir pore types based on Formation MicroImager logging: a case study from the Ordovician in

the Tahe Oilfield, Tarim Basin, China: Interpretation, v. 6, no. 1, p. T71-T82, http://doi.org/10.1190/INT-2017-0043.1.

Mao, Y., Zeidouni, M., and Duncan, I. J., 2017, Temperature analysis for early detection and rate estimation of CO2 wellbore leakage: International Journal of Greenhouse Gas Control, v. 67, p. 20-30, http://doi.org/10.1016/j.ijggc.2017.09.021.

Zhang, X., Sun, A. Y., Duncan, I. J., and Vesselinov, V. V., 2017, Two-stage fracturing wastewater management in shale gas development: Industrial & Engineering Chemistry Research, v. 56, no. 6, p. 1570-1579, http://doi.org/10.1021/acs.iecr.6b03971.

Jiang, L., Cai, C., Worden, R. H., Crowley, S. F., Jia, L., Zhang, K., and Duncan, I. J., 2016, Multiphase dolomitization of deeply buried Cambrian petroleum reservoirs, Tarim Basin, north-west China: Sedimentology, v. 63, p. 2130-2157, http://doi.org/10.1111/sed.12300.

Zhang, X., Sun, A. Y., and Duncan, I. J., 2016, Shale gas wastewater management under uncertainty: Journal of Environmental Management, v. 165, no. 1, p. 188-198, http://doi.org/10.1016/j.jenvman.2015.09.038.

Duncan, I. J., 2015, Does methane pose significant health and public safety hazards?--a review: Environmental Geosciences, v. 22, no. 3, p. 85-96, http://doi.org/10.1306/eg.06191515005.

Duncan, I. J., and Wang, H., 2014, Estimating the likelihood of pipeline failure in CO2 transmission pipelines: new insights on risks of carbon capture and storage: International Journal of Greenhouse Gas Control, v. 21, p. 49-60., http://doi.org/10.1016/j.ijggc.2013.11.005.

Duncan, I. J., and Wang, H., 2014, Evaluating the likelihood of pipeline failures for future offshore CO2 sequestration projects: International Journal of Greenhouse Gas Control, v. 24, p. 124-138, http://doi.org/10.1016/j.ijggc.2014.02.004.

Wang, H., and Duncan, I. J., 2014, Likelihood, causes, and consequences of focused leakage and rupture of U.S. natural gas transmission pipelines: Journal of Loss Prevention in the Process Industries, v. 30, p. 177-187, http://doi.org/10.1016/j.jlp.2014.05.009.

Wang, H., and Duncan, I. J., 2014, Understanding the nature of risks associated with onshore natural gas gathering pipelines: Journal of Loss Prevention in the Process Industries, v. 29, p. 49-55, http://doi.org/10.1016/j.jlp.2014.01.007.

Zhang, X., Duncan, I. J., Huang, G., and Li, G. C., 2014, Identification of management strategies for CO2 capture and sequestration under uncertainty through inexact modeling: Applied Energy, v. 113, p. 310-317.

Scanlon, B. R., Duncan, I. J., and Reedy, Robert, 2013, Drought and the water-energy nexus in Texas: Environmental Research Letters, v. 8, no. 4, doi:10.1088/1748-9326/8/4/045033.

Scanlon, B. R., Reedy, R. C., Duncan, I. J., Mullican, W. F., III, and Young, M. H., 2013, Controls on water use for thermoelectric generation: Case study Texas, U.S.: Environmental Science & Technology, v. 47, no. 19, p. 11326-11334, http://doi.org/10.1021/es4029183.

Adelman, D. E., and Duncan, I. J., 2012, The limits of liability in promoting safe geologic sequestration of CO2: Duke Environmental Law & Policy Forum, v. 22, no. 1, p. 1-66.

Nicot, J. -P., and Duncan, I. J., 2012, Common attributes of hydraulically fractured oil and gas production and CO2 geological sequestration: Greenhouse Gases Science and Technology, v. 2, p. 352-368.

Ambrose, W. A., Breton, C., Hovorka, S. D., Duncan, I. J., Gülen, G., Holtz, M. H., and Nuñez-López, V., 2011, Geologic and infrastructure factors for delineating areas for clean coal: examples in Texas, USA: Environmental Earth Science, v. 63, p. 513?-532.

Stillwell, A. S., King, Carey, Webber, M. E., Duncan, I. J., and Hardberger, A., 2011, The energy-water nexus in Texas: Ecology and Society, v. 16, no. 1, 20 p.

King, Carey, Webber, M. E., and Duncan, I. J., 2010, The water needs for LDV transportation in the United States: Energy Policy, v. 38, p. 1157-1167.

Ambrose, W. A., Breton, Caroline, Holtz, M. H., Nuñez-López, Vanessa, Hovorka, S. D., and Duncan, I. J., 2009, CO2 source-sink matching in the lower 48 United States, with examples from the Texas Gulf Coast and Permian Basin: Environmental Geology: Environmental Geology, v. 57, p. 1537-1551.

Ambrose, W. A., Lakshminarasimhan, Srivatsan, Nuñez-López, Vanessa, Hovorka, S. D., and Duncan, I. J., 2008, Geologic factors controlling CO2 storage capacity and permanence: case studies based on experience with heterogeneity in oil and gas reservoirs applied to CO2 storage: Environmental Geology, v. 54, p. 1619-1633.

Nicot, J. -P., and Duncan, I. J., 2008, Science-based permitting of geological sequestration of CO2 in brine reservoirs in the U.S.: Environmental Science & Policy, v. 11, p. 14-24.

Duncan, I. J., Rivard, B., and Arvidson, R., 1992, Varnish, soil and rock controls on spectral reflectance of outcrops in the Meatiq Dome area, Egypt: Geology, v. 20, no. 4, p. 295-298.

Duncan, I. J., Rivard, B., Sultan, M., and Arvidson, R., 1990, Structural interpretation and tectonic evolution of part of the Najd shear zone utilizing Landsat Thematic Mapper data: Tectonophysics, v. 178, p. 309-335.

Duncan, I. J., Sultan, M., and Arvidson, R., 1990, Extension of the Najd shear zone to Central Eastern Egypt: Reply: Tectonics, v. 9, p. 539-543.

Duncan, I. J., and Sweetkind, D., 1989, Fission track evidence for Eocene uplift of the Nelson Batholith, Southeastern British Columbia: Canadian Journal of Earth Sciences, v. 16, p. 1944-1952.

Duncan, I. J., Sultan, M., and Arvidson, R., 1988, Extension of the Najd shear system from Saudi Arabia to the Central Eastern Desert of Egypt based on integrated field and Landsat observations: Tectonics, v. 7, no. 6, p. 1291-1306.

Duncan, I. J., 1987, Ability of the Fry Method to characterize pressure solution deformation--discussion: Tectonophysics, v. 138, p. 325-326.

Duncan, I. J., and Kelley, S. A., 1986, Late Cretaceous to middle Tertiary tectonic history of the northern Rio Grande Rift, New Mexico: Journal of Geophysical Research, v. 91, p. 6246-6262.

Duncan, I. J., and Shore, P. J., 1985, Finite strains from non-coaxial strain paths: I. Computational techniques: Tectonophysics, v. 110, p. 127-144.

Duncan, I. J., and Shore, P. J., 1985, Matrix computation of deformed lineation patterns: Tectonophysics (letters section), v. 109, p. 337-344.

Duncan, I. J., Harrison, T. M., and McDougall, I., 1985, Diffusion of 40Ar in biotite: temperature, pressure, and compositional effects: Geochimica et Cosmochimica Acta, v. 49, p. 2461-2468.

Duncan, I. J., 1984, Lead isotope systematics and the evolution of the core, mantle, crust and atmosphere: Journal of Geodynamics, v. 2, p. 1-21.

Duncan, I. J., 1984, Structural evolution of the Thor-Odin gneiss dome: Tectonophysics, v. 101, p. 87-130.

#### Non Peer Reviewed Journal Articles

Shuster, M., Bhattacharya, S., Duncan, I. J., Eichhubl, P., Hosseini, S. A., Javadpour, F., Kipper, J. P., Lin, N., Nicot, J.-P., and Ren, B., 2021, Hydrogen infrastructure expansion requires realistic framework: Oil & Gas Journal.

Duncan, I. J., Anderson, S., and Nicot, J. -P., 2009, Pore space ownership issues for CO2 sequestration in the U.S., in Energy Procedia (v. 1, no.1), Proceedings of 9th International Conference on Greenhouse Gas Control Technologies GHGT9, November 16-20, Washington D.C., p. 4427-4431.

Duncan, I. J., Nicot, J. -P., and Choi, J. -W., 2009, Risk assessment for future CO2 sequestration projects based on CO2 enhanced oil recovery in the U.S., in Energy Procedia (v. 1, no.1), Proceedings of 9th International Conference on Greenhouse Gas Control Technologies GHGT9, November 16-20, Washington D.C., p. 2037-2042.

King, C., Webber, M., and Duncan, I., 2008, Water intensity of transportation fuels: water projections for fuel adoption rates of light duty vehicles, in Proceedings, ASME 2nd International Conference on Energy Sustainability, Jacksonville, Florida, August 10-14.

Ambrose, W. A., Holtz, M. H., Nuñez-Lopez, Vanessa, Breton, C. L., Gülen, Gürcan, Duncan, Ian, Smyth, R. C., Foss, M. M., Lakshminarasimhan, Srivatsan, and Hovorka, S. D., 2006, FutureGen: clean-coal and near-zero-emission power generation technology for the Gulf Coast: Gulf Coast Association of Geological Societies Transactions, v. 56, p. 5-13.

Duncan, I. J., Ambrose, W. A., Holtz, M. H., Hovorka, S. D., Esandoh-Yeddu, Joseph, Nuñez López, Vanessa, Nicot, J. -P., Smyth, R. C., and Lakshminarasimhan, Srivatsan, 2006, The Gulf Coast Carbon Center: developing a carbon sequestration industry in the Gulf Coast region, in 8th International Conference on Greenhouse Gas Control Technologies, Trondheim, Norway, June 19-22, CD-ROM [4 p.].

Campbell, Elizabeth, Duncan, I. J., and Hibbitts, Harry, 2005, Analysis of errors occurring in the transfer of geologic point data from field maps to digital data sets, in Soller, D., Digital mapping techniques 2005: U.S. Geological Survey Open File, p. 61-65.

Duncan, I. J., 2005, Authenticity and long term preservation of digital geologic products in archival geoinformatics, in Proceedings, IAMG '05: GIS and spatial analysis, Annual Conference of the International Association for Mathematical Geology, Toronto, Canada, August 21-26, v. 2, p. 874-879.

Duncan, I. J., 2005, Liability for digital datasets created by government agencies, in Proceedings, IAMG '05: GIS and spatial analysis, Annual Conference of the International Association for Mathematical Geology, Toronto, Canada, August 21-26, v. 2, p. 867-873.

Duncan, I. J., 2005, Negligence and professional malpractice related to GIS datasets: Digital Mapping Techniques 2005, U.S. Geological Survey, USGS Open File, unpaginated

Duncan, I. J., 2004, Serving the environment by turning a waste stream into a profit stream: The University of Texas at Austin, Bureau of Economic Geology Annual Report, p. 15-19.

Duncan, I. J., Soller, D. R., Ellis, R., Giglierano, J., and Hess, R., 1999, Proposed 1999 guidelines for inclusion of digital map products in the National Geologic Map Database, in Digital mapping techniques: U.S. Geological Survey Open File Publication 99-386.

Duncan, I. J., and Kelley, S. A., 1984, Tectonic history of the Rio Grande Rift derived from apatite fission tracks: New Mexico Geological Society Guidebook, v. 2, p. 1-21.

Duncan, I. J., 1978, Structural geology of the Big Ledge area, in Geological field work, 1977: British Columbia Ministry of Mines Petroleum Research Annual Report, p. 80-82.

Duncan, I. J., 1977, The Hawkesbury Sandstone: a critical review of proposed environmental models: Australian Journal of Earth Sciences, v. 24, p. 117-119.

# Contract Reports

Ambrose, W. A., Smith, D. C., Cutright, B. L., Scanlon, B. R., Reedy, R. C., Elliott, B. A., Paine, J. G., Foss, M. M., Tremblay, T. A., Wolaver, B. D., Loucks, R. G., Frébourg, G., Hentz, T. F., Ogiesoba, O. C., Olariu, M. I., Fu, Q., Zeng, H., E. L. Frost, III, Hamlin, H. S., Nance, H. S., Duncan, I. J., Hammes, U., Rogers, H., Clift, S. J., Sivil, J. E., Zhang, T., Reed, R. M., Baumgardner, R. W., Jr., Eastwood, R., Breton, C., Rowe, H. D., Carr, D. L., Dunlap, D. B., Gale, J. F. W., and Peng, S., 2014, State of Texas Advanced Resource Recovery (STARR) progress report: Bureau of Economic Geology, Biennium prepared for Texas State Comptroller of Public Accounts, 90 p.

King, C. W., Duncan, I. J., and Webber, M. E., 2008, Water demand projections for power generation in Texas: The University of Texas at Austin, Bureau of Economic Geology, report prepared for Texas Water Development Board, under contract no. 0704830756. Available at: http://www.seco.cpa.state.tx.us/publications/renewenergy/, unpaginated.

Nicot, J. -P., Choi, Jong-Won, Ghomian, Yousef, and Duncan, I. J., 2008, Impact of mixed gas stream on CO2 plume characteristics during and after carbon storage operations in saline aquifers: The University of Texas at Austin, Bureau of Economic Geology, final report Chevron Energy Technology Company, Houston, Texas, 137 p. + 2 DVD's.

Nicot, J. -P., and Duncan, I. J., 2006, Preliminary CO2 storage outlook in Matagorda and surrounding counties, Texas: The University of Texas at Austin, Bureau of Economic Geology, final report prepared for Sargent & Lundy LLC, 42 p.

Paine, J. G., Ruppel, S. C., Nance, H. S., Smyth, R. C., Breton, Caroline, and Duncan, I. J., 2006, Subsurface data response, Odessa Site, Texas: The University of Texas at Austin, Bureau of Economic Geology, report prepared for the FutureGen Alliance, 113 p.

#### Published Reports

Moscardelli, L., Ambrose, W. A., Young, M. H., Scanlon, B. R., Flaig, P. P., Olariu, M. I., Hattori, K., Ko, L., Loucks, R. G., Radjef, E., Maraggi, L., Schuba, N., Sivil, J. E., Peng, S., Zhang, T., Sun, X., Zeng, H., Ogiesoba, O. C., Fu, Q., Reed, R. M., Rogers, H., Duncan, I. J., Dommisse, R., Jensen, J., Hessler, A., DeJarnett, B. B., and Periwal, P., 2023, State of Texas Advanced Resource Recovery (STARR) 2020-2022 biennium report: The University of Texas at Austin, Bureau of Economic Geology51 p.

Ambrose, W. A., Rogers, H., Smith, D. C., Scanlon, B. R., Paine, J. G., Nicot, J.-P., Young, M. H., Loucks, R. G., Hentz, T. F., Reed, R. M., Ogiesoba, O. C., Olariu, M. I., Fu, Q., Flaig, P. P., Zhang, J., Hattori, K., Roberts, A., Zeng, H., DeJarnett, B. B., Radjef, E., Periwal, P., Peng, S., Duncan, I. J., Ren, B., Jensen, J., Male, F., Dommisse, R., Eastwood, R., Carr, D. L., Zhang, T., Ko, L., Larson, T., Lawton, T., Covault, J., Sylvester, Z., Goodman, E., Calle, A., Smye, K. G., Pelletier, I., Dunlap, D. B., Lambert, J., and Sivil, J. E., 2021, State of Texas Advanced Resource Recovery (STARR) 2018-2020 biennium report: The University of Texas at Austin, Bureau of Economic Geology44 p.

Ambrose, W. A., Smith, D. C., Hentz, T. F., Loucks, R. G., Reed, R. M., Ogiesoba, O. C., Olariu, M. I., Fu, Q., Zeng, H., Hamlin, H. S., Duncan, I. J., Carr, D. L., Ko, L., Peng, S., Jensen, J., Rogers, H., Clift, S. J., Sivil, J. E., Zhang, T., Eastwood, R., and Brooks, D. L., 2019, State of Texas Advanced Resource Recovery (STARR) progress report: The University of Texas at Austin, Bureau of Economic Geology43 p.

Ambrose, W. A., Smith, D. C., Hentz, T. F., Loucks, R. G., Reed, R. M., Ogiesoba, O. C., Olariu, M. I., Fu, Q., Zeng, H., Hamlin, H. S., Duncan, I. J., Carr, D. L., Ko, L., Peng, S., Rogers, H., Clift, S. J., Sivil, J. E., Zhang, T., Eastwood, R., and Brooks, D. L., 2018, State of Texas Advanced Resource Recovery (STARR) interim report: Bureau of Economic Geology, The University of Texas at Austin,26 p.

Ambrose, W. A., Smith, D. C., Young, M. H., Scanlon, B. R., Reedy, R. C., Collins, E. W., Elliott, B. A., Wolaver, B. D., Paine, J. G., Hentz, T. F., Frébourg, G., Loucks, R. G., Reed, R. M., Ogiesoba, O. C., Olariu, M. I., Fu, Q., Zeng, H., Duncan, I. J., Rogers, H., Clift, S. J., Foss, M. M., Sivil, J. E., Zhang, T., Baumgardner, R. W., Jr., Eastwood, R., Breton, C., Brooks, D. L., Rowe, H. D., Carr, D. L., Dunlap, D. B., Gale, J. F. W., He, Y., Ko, L., Phelps, R., and Peng, S., 2016, State of Texas Advanced Resource Recovery (STARR) progress report: Bureau of Economic Geology, Biennium prepared for Texas State Comptroller of Public Accounts: 82 p.

Ambrose, W. A., Smith, D. C., Cutright, B. L., Scanlon, B. R., Reedy, R. C., Elliott, B. A., Paine, J. G., Foss, M. M., Tremblay, T. A., Wolaver, B. D., Loucks, R. G., Frébourg, G., Hentz, T. F., Ogiesoba, O. C., Olariu, M. I., Fu, Q., Zeng, H., Frost, E. L., III, Hamlin, H. S., Nance, H. S., Duncan, I. J., Hammes, U., Rogers, H., III, Clift, S. J., Sivil, J. E., Zhang, X., Reed, R. M., Baumgardner, R. W., Jr., Eastwood, R, Breton, C., Brooks, D. L., Rowe, H. D., Carr, D. L., Dunlap, D. B., Gale, J. F. W., and Peng, S., 2014, State of Texas Advanced Resource Recovery progress report and CD-ROM: Bureau of Economic Geology, The University of Texas at Austin,90 p.

#### Published Abstracts

Scanlon, B. R., Duncan, I. J., and Reedy, R. C., 2013, Drought vulnerability of thermoelectric generation using Texas as a case study (Abstract H11J-1276): AGU Fall Meeting, San Francisco, Calif., 9-13 Dec.

Reedy, R. C., Scanlon, B. R., Duncan, I. J., Young, M. H., and Wolaver, B. D., 2012, Energy reliability related to water availability under climate extremes in Texas (abs.): presented at the Fall AGU Meeting, San Francisco, California, no. GC21C-0989, Control ID: 1502225.

Blackwell, D. D., Moerchen, F., Duncan, I. J., Gosnald, W. D., Kay, M., Nagihara, S., Robinson, C., and Tester, J., 2011, Developing information for the National Geothermal Data System (NGDS) (abs.): American Association of Petroleum Geologists Annual Convention & Exhibition Abstracts Volume, v. 20, p. 20.

Duncan, I. J., and Ambrose, W. A., 2011, An overview of clean coal technologies and carbon capture and storage (CCS) (abs.): American Association of Petroleum Geologists Annual Convention & Exhibition Abstracts Volume, v. 20, p. 49-50.

Scanlon, B. R., Schilling, K., Young, M. H., Duncan, I. J., and Gerbens-Leenes, P. W., 2011, Impacts of past land use changes on water resources: an analog for assessing effects of proposed bioenergy crops (abs.): presented at the Fall AGU Meeting, San Francisco, California, no. H11M-06.

Anderson, A., Duncan, I. J., and Nicot, J. -P., 2008, Innovation at the state level in policy, legal, and regulatory frameworks for geological CO2 sequestration (abs.), in Seventh Annual Conference on Carbon Capture & Sequestration: Addressing the knowledge, policy, regulatory and technology gaps to expedite CCS deployment, Pittsburgh, Pennsylvania, May 5-8, Abstract #1000.

Ambrose, W. A., Breton, C. L., Duncan, Ian, Holtz, M. H., Hovorka, S. D., Nuñez-Lopez, Vanessa, and Lakshminarasimhan, Srivatsan, 2006, Source-sink matching and potential for carbon capture and storage in the Gulf Coast, in Proceedings of the 2006 UIC Conference of the Groundwater Protection Council, Abstract 16.

Ambrose, W. A., Lakshminarasimhan, S., Holtz, M. H., Nuñez-Lopez, V., Hovorka, S. D., and Duncan, I., 2006, Geologic factors controlling CO2 storage capacity and permanence -

techniques and case studies based on experience with heterogeneity in oil and gas reservoirs applied to CO2 storage (ext. abs.), in Proceedings, CO2SC Symposium, Lawrence Berkeley National Laboratory, Berkeley, California, March 20-22, p. 9-11 + CD-ROM.

Campbell, E. V., and Duncan, I. J., 2006, Developing a standard science language for mapping unconsolidated deposits in the central Appalachians (abs.): Geological Society of America Abstracts with Programs, v. 37, no. 7, p. 77.

Duncan, I. J., 2006, Addressing public policy issues facing long term CO2 storage in Texas (abs.), in Fifth Annual Conference on Carbon Capture & Sequestration: Taking steps toward deployment utilizing the accumulated knowledge base, May 8-11, Alexandria, Virginia, unpaginated.

Duncan, I. J., 2006, Numerical modeling of role of faults in understanding long-term CO2 storage: the upscaling dilemma (abs.), in Fifth Annual Conference on Carbon Capture & Sequestration: Taking steps toward deployment utilizing the accumulated knowledge base, May 8-11, Alexandria, Virginia, unpaginated.

Duncan, I. J., and Campbell, E. V., 2006, Reliability in geoinformatics: theory and practical applications in digital geologic map compilations (abs.): Geological Society of America Abstracts with Programs, v. 37, no. 7, p. 146.

Duncan, I. J., Campbell, E. V., and Williams, L. B., 2004, Multiple deformation associated with taconic thrust sheets in the Great Valley of Virginia (abs.): Geological Society of America Abstracts with Programs: v. 36, no. 5, p. 535.

Duncan, I. J., Campbell, Elizabeth, and Garwood, Rochelle, 2002, Use of multispectral and panchromatic imagery to create impermeable surface maps for the Rivanna River watershed: implications for ecology and biodiversity (abs.), in Fourth Annual Virginia Tech Geographic Information System and Remote Sensing Research Symposium.

Duncan, I. J., 2001, Authorship, authenticity, integrity, preservation and liability aspects of digital geologic products (abs.): Geological Society of American Abstracts with Programs.

Duncan, I. J., 1995, Digital geologic maps and digital geologic mapping in Virginia (abs.): Geological Society of American Abstracts with Programs.

Duncan, I. J., and Kidder, J., 1992, The Zagros collision zone: evidence for large scale lithospheric delamination (abs.): Geological Society of America Abstracts with Programs.

Duncan, I. J., and Leith, A., 1992, Viscoelastic relaxation of Venusian coronae and mountain belts: constraints on global heat flow and tectonism (abs.), in International Colloquium on Venus: California Institute of Technology.

Duncan, I. J., 1991, A critical analysis of the stress amplification model for continental scale deformation (abs.): Geological Society of American Abstracts with Programs.

Duncan, I. J., and Leith, A., 1991, Solution of Visco-elastic tectonic problems using the finite element method (abs.): Geological Society of American Abstracts with Programs.

Duncan, I. J., 1990, Direction of tectonic transport in the Caribou Thrust Zone, Thor Odin Gneiss dome (abs.): Tectonics Studies Group, Geological Society of London.

Duncan, I. J., 1989, Dynamic fracture propagation associated with coseismic buckle folding (abs.), in Tectonics Studies Group, Geological Society of London.

Duncan, I. J., 1984, Is pressure solution a major creep mechanism in orogenic belts? (abs.): Geological Society of America, South-Central Section, Abstracts with Programs, p. 83.

Duncan, I. J., 1984, Metal organic interactions in sedimentary basin evolution: evidence from lead isotopes in stratiform lead zinc deposits (abs.): Society of Economic Paleontologists and Mineralogists Annual Midyear Meeting, p. 28.

Duncan, I. J., 1984, Strain paths and strain fields: a new approach to problems in incremental strain analysis (abs.): Geological Society of America Abstracts with Programs.

Duncan, I. J., and Dugan, J. P., Jr., 1984, Oxygen isotope evolution of formation waters and pore fill cements during basin diagenesis (abs.): Society of Economic Paleontologists and Mineralogists Annual Midyear Meeting, p. 28.

Duncan, I. J., and Gwinn, C. J., 1984, Isotopic evolution of deep basinal brines in the Gulf Coast: the role of shale compaction and diagenesis (abs.): Geological Society of America, South Central Section, Abstracts with Programs, p. 83.

Duncan, I. J., and Shore, P. J., 1984, The role of compaction and layer parallel shortening in controlling fabrics in deformed mudrocks (abs.): Geological Society of America Abstracts with Programs.

Duncan, I. J., and Shore, P. J., 1984, The Vadito mélange: a new tectonic interpretation of the New Mexico Precambrian (abs.): Geological Society of America Abstracts with Programs, p. 278.

Duncan, I. J., Gwinn, C. J., and Stern, R. J., 1984, Significance of strontium isotope ratios of diagenetic cements: Sligo formation, Lower Cretaceous, south Texas Gulf Coast (abs.): Society of Economic Paleontologists and Mineralogists Annual Midyear Meeting, p. 36.

Duncan, I. J., 1983, Mantle oxygen fugacities: a re-evaluation of the significance of intrinsic oxygen fugacity data for ultramafic mantle nodules (abs.): Transactions of the American Geophysical Union, v. 64, p. 903.

Duncan, I. J., 1983, Structural geometry and evolution of British Columbia gneiss domes: comparisons with the Moine thrust (abs.): Geological Society of America Abstracts with Programs, v. 16, p. 562.

Duncan, I. J., 1983, The structural geology of basement cored nappes and imbricated basement cover in the Shuswap Complex--a new model for metamorphic core complexes (abs.): Geological Society of America Abstracts with Programs, v. 15, p. 405.

Duncan, I. J., and Kelley, S. A., 1983, Fission track annealing: a new analysis of empirical kinetic models (abs.): Transactions of the American Geophysical Union, v. 64, p. 897.

Duncan, I. J., and Schultz, T. H., 1983, Carbonate cementation in the Sligo Formation, Gulf Coast of southern Texas: trace element and stable isotope constraints on diagenetic history (abs.): Geological Society of America Abstracts with Programs, v. 15, p. 681.

Duncan, I. J., and Shore, P. J., 1983, Calculation of finite strains for simple non-coaxial strain paths: implication for Cordilleran orogenesis (abs.): Geological Society of America Abstracts with Programs, v. 15, p. 438.

Duncan, I. J., and Shore, P. J., 1983, Numerical modeling and decomposition of non-coaxial strain paths: tectonic implications (abs.): Geological Society of America Abstracts with Programs, v. 15, p. 686.

Duncan, I. J., and Shore, P. J., 1983, Strain variation across an imbricated thrust sequence: plane strain distortion and translation strain versus simple shear (abs.): Geological Society of America Abstracts with Programs, v. 15, p. 374.

Duncan, I. J., and Stiff, F. C., 1983, Microfabric, strain and deformation mechanisms in ductilely deformed novaculite and chert from the Ouachita fold and thrust belt (abs.): Geological Society of America Abstracts with Programs, v. 15, p. 698.

Duncan, I. J., Holdaway, M. J., Dutrow, B. L., and Shore, P. J., 1983, Significance of variable water content in staurolite (abs.): Geological Society of America Abstracts with Programs, v. 15, p. 597.

Duncan, I. J., Kelley, S. A., and Blackwell, D. D., 1983, Use of fission track annealing

systematics in constraining the thermal evolution of sedimentary basins (abs.): American Association of Petroleum Geologists Bulletin, v. 67, p. 494.

Duncan, I. J., Kelley, S. A., and Blackwell, D. D., 1983, Use of fission track dates as constraints on the tectonic evolution of the Rio Grande Rift (abs.): Geological Society of America Abstracts with Programs, v. 15. p. 320.

Duncan, I. J., 1982, Strain in polyphase deformed fold belts: the case against constrictional incremental strains, stretching lineations and shear folding (abs.): Geological Society of America Abstracts with Programs, v. 14, p. 479.

Duncan, I. J., and Shore, P. J., 1982, New evidence for Precambrian plate tectonics: a 1.7 Ga mélange unit in the Vadito Group of the Picuris Mountains, New Mexico (abs.): Transactions of the American Geophysical Union, v. 64, p. 844.

Duncan, I. J., and Shore, P. J., 1982, The nature and magnitude of large-scale distortional strain in fold belts (abs.): Transactions of the American Geophysical Union, v. 63, p. 428.

Duncan, I. J., Kelley, S. A., and Blackwell, D. D., 1982, History of uplift in the Rio Grande Rift: Transactions of the American Geophysical Union (abs.), v. 63, p. 1117.

Duncan, I. J., and Parrish, R. R., 1979, Geochronology and Sr isotope geochemistry of the Nelson Batholith: a post-tectonic intrusive complex in southeast British Columbia (abs.): Geological Society of America Abstracts with Programs, v. 11, p. 76.

Duncan, I. J., and Ryan, B. D., 1979, U-Th-Pb systematics: a new interpretation for strata-bound Pb-Zn deposits (abs.): Geological Society of America Abstracts with Programs, v. 11, p. 508.

Duncan, I. J., and Ryan, B. D., 1979, U-Th-Ur whole rock systematics in high-grade metamorphic rocks (abs.): Geological Society of America Abstracts with Programs, v. 11, p. 417.

Duncan, I. J., Parrish, R. R., and Armstrong, R. L., 1979, Geochronology of post-tectonic plutons in the Shuswap Complex (abs.), in Geological Association of Canada Symposium, p. 15.

Duncan, I. J., 1978, Rb/Sr whole rock evidence of three Precambrian events in the Shuswap Complex, southeast British Columbia (abs.): Geological Society of America Abstracts with Programs, v. 10, p. 392.

Duncan, I. J., and Greenwood, H. J., 1977, The effect of molecular water on the thermodynamic properties and stability relations of Mg cordierite (abs.): Geological Association of Canada Annual Meeting, Programs and Abstracts, v. 2, p. 17.

Duncan, I. J., and Nielson, K. C., 1977, Structural and metamorphic constraints for tectonic models of the Shuswap Complex, southern British Columbia (abs.): Geological Society of America Abstracts with Programs, v. 9, p. 1114.

Duncan, I. J., and Nielson, K. C., 1977, Structural and tectonic evolution of the Shuswap Complex (abs.): Geological Association of Canada Annual Meeting, Programs and Abstracts, v. 2 p. 17.