

CURRICULUM VITAE: MARC ANDRE HESSE

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PROFESSIONAL APPOINTMENTS

2016 – current Associate professor of Geological Sciences, University of Texas at Austin
2009 – 2016 Assistant professor of Geological Sciences, University of Texas at Austin
2008 – 2009 Postdoctoral scholar in Geological Sciences, Brown University
2006 & 2007 Reservoir simulation research team, Chevron Energy Technology Company
1999 Summer intern, Hawaii Scientific Drilling Project

PROFESSIONAL PREPARATION

2009 Postdoc Geological Sciences Brown University
Advisors: **Y. Liang & E. M. Parmentier**
Topic: *Multiscale modeling of the physics and chemistry of melting and melt migration.*

2008 Ph.D. Petroleum Engineering Stanford University
Advisors: **H. Tchelepi & F. M. Orr Jr.**
Thesis: *Mathematical modeling and multiscale simulation of CO₂ storage in saline aquifers.*

2003 M.Phil. Fluid Flow University of Cambridge
Advisor: **J. Lie**
Thesis: *Numerical simulation of axis-symmetric rising bubbles.*

2002 M.S. Oceanography M.I.T. - W.H.O.I. Joint Program
Advisors: **T. Grove & N. Shimizu**
Thesis: *Absarokites from Western Mexico: Constraints on mantle wedge conditions.*

2000 Hon. BSc Geology University of Edinburgh
Advisor: **C. Graham**
Thesis: *Metamorphic rocks of the southern Tayvallich peninsula.*

1998 Vordiplom Geologie Technische Universität München

HONOURS AND AWARDS

2015	Outstanding Research Award SSD Appreciation Award	Jackson School of Geosciences UT Services for Students with Disabilities
2014	US Junior Oberwolfach Fellowship	National Science Foundation
2013	Editors' Citation for Excellence in Refereeing Junior Scientist Prize	Geophysical Research Letters Society of Industrial and Applied Mathematics Activity Group on Geosciences University of Texas at Austin
	G. Moses and Carolyn G. Knebel Distinguished Teaching Award	
2011	Jackson Centennial Teaching Fellowship	University of Texas at Austin
2009	David Crighton Fellowship	University of Cambridge
2002	European Trust Bursary EPSRC Studentship	University of Cambridge University of Cambridge
2000	Presidential Graduate Fellowship Edinburgh Geological Society Prize	Massachusetts Institute of Technology University of Edinburgh
1999	Mineralogical Society Student Award Total Oil Marine Prize	University of Edinburgh University of Edinburgh

INVITED LECTURES AND KEYNOTE PRESENTATIONS

2022	Nov	Colorado School of Mines	Petroleum Engineering Seminar
	Oct	UMN Earth and Environment Sciences	Departmental Seminar
		California Institute of Technology	Mechanical Engineering Seminar
	Sep	Cambridge University	Fluid Mechanics Seminar
	Aug	Society of Petroleum Engineers	SPE Live Event
	Jun	Universität Münster	Institut für Planetologie Seminar
	May	NASA Astrobiology Institute - Titan	Annual Team Meeting Honolulu
	Jan	Johns Hopkins University	Habitability Assessment Board
		Applied Physics Laboratory	for Europa Clipper mission
2021	Nov	Free University Berlin	Hydrogeology Seminar
	Oct	Lunar and Planetary Institute	Modern Brines Workshop
	Oct	SERC Carleton	Teaching Computation Workshop
	Oct	SIAM-Geosciences	Webinar
	Jun	University Kiel	Earth System Science Seminar
	Feb	University of Cambridge	BP-Institute Seminar
2019	Nov	Oxford University	Geoscience Seminar
	Aug	Jet Propulsion Laboratory	ICE Seminar
	May	Imperial College London	ES&E Seminar
		Lunar Planetary Institute	Ocean Worlds 4
	Mar	Lunar Planetary Science Conference	Talk
2018	Dec	American Geophysical Union	Fall Meeting
	Nov	American Physical Society	Division of Fluid Dynamics
	Oct	Texas A&M University	Petroleum Engineering Seminar
	Sep	European Planetary Science Conference	Invited lecture
		TU Delft	DARSim Lecture

	Jun	Lunar Planetary Institute	Cryovolcanism Workshop
	Mar	Lunar Planetary Science Conference	Talk
	Mar	Cornell University	EAS Seminar
	Feb	Jet Propulsion Laboratory	Planetary Science Seminar
2017	Dec	American Geophysical Union	Fall Meeting
	Sep	University of Muenster	Geophysics Seminar
	May	University of Munich	Geophysics Seminar
	Mar	Lunar Planetary Science Conference	Talk
	Feb	Colorado School of Mines	Mechanical Engineering Seminar
	Feb	Free University Berlin	Hydrogeology Seminar
	Feb	Duke University	Engineering Mechanics Seminar
2016	Dec	American Geophysical Union	Fall Meeting
	Nov	Ohio State University	Earth Science Seminar
	Sep	7 th US/German Workshop	Salt Repository Research, ... Design and Operation
		Geological Society of America	Annual Meeting
	Jun	Columbia University	Earth and Environmental Sciences
	Apr	Columbia University	Applied Mathematics Colloquium
	Mar	Massachusetts Institute of Technology	Dept. of Civil and Environmental Eng.
		Stevens Institute of Technology	Dept of Civil and Environmental Eng.
	Feb	Cambridge University	Newton Institute, Magma in the mantle
2015	Nov	Stanford University	Orr Retirement Symposium
		University of Texas at Austin	Petroleum & Geosystems Seminar
	Oct	Imperial College	UKCCSRC Specialist Meeting CO2 Storage
		Department of Energy	Energy Frontiers Research Centers PI Meeting
	Sep	Los Alamos National Laboratory	Workshop on Grand Challenges in Geological Fluid Mechanics
	Mar	Stanford University	Energy Resources Engineering Seminar
2014	Oct	Texas A&M University	Departmental Seminar
	Sep	Mathematisches Forschungs- institut Oberwolfach (MFO)	Workshop on Reactive Flows in Deformable, Complex Media
	Apr	Herriot Watt University	Institute of Petroleum Engineering
	Apr	The Geological Society	CCS Workshop, Burlington House
	Apr	Texas Tech University	Geosciences
	Mar	University of Oxford	Mathematical Institute
	Jan	Rice University	Deep Carbon Observatory workshop
2013	Nov	Massachusetts Institute of Technology	Environmental Sciences Seminar Series
	Sep	Swiss Federal Institute of Technology	Department of Earth Sciences
	Jun	SIAM Geosciences	Junior Scientist award lecture
2012	Sep	Tulsa University	School of Petroleum Engineering
	Apr	Stanford University	Energy Resources Engineering Seminar
2011	Jun	Universität Stuttgart	Institut für Wasserbau
	May	Ecole Polytechnique de Lausanne	Civil and Environmental Engineering
2010	Dec	Rice University	Department of Earth Sciences
	Sep	University of Cambridge	BP-Institute for Multiphase Flow

	Jun	XVIII Conference on Computational Methods in Water Resources	Invited lecture
2008	Jun	Woods Hole Oceanographic Institution	G&G Friday Seminar Series
	Mar	Pennsylvania State University	Geosciences Colloquium
	Jan	University of Texas at Austin	Geological Sciences
2007	Oct	Brown University	Geological Sciences Colloquium
	Jun	Massachusetts Institute of Technology	Carbon Sequestration Forum
2006	Nov	University of Texas at Austin	Petroleum Engineering Seminar

TEACHING AND EDUCATION

Sem.	Number	Course title	Units	Type ^c	Size und./grad.	Dept. ^d S/E/M/H	Evaluation Class/Inst.
Fa22	GEO325C	Continuum Mechanics	3	J/G	4/9	10/3/0/0	-/-
Sp22	GEO325M	Numerical Modeling	3	J/G	0/6	4/2/0/0	4.8/4.4
Fa21	GEO391	Continuum Mechanics	3	J/G	0/5	0/4/1/0	4.5/4.8
Sp21	GEO325M	Numerical Modeling	3	J/G	3/6	3/6/0/0	5.0/5.0
Fa20	GEO391	Continuum Mechanics ^a	3	J/G	0/7	7/0/0/0	4.3/4.3
Sp20	GEO325M	Numerical Modeling	3	J/G	3/4	3/4/0/0	5.0/5.0
Fa19	GEO494P	Modeling flow and transport	4	J/G	8/15	8/20/2/0	4.0/4.4
Sp19	GEO325M	Numerical Modeling ^a	3	J/G	3/11	4/9/1/0	4.4/4.7
Fa18	GEO391	Modeling flow and transport	3	G	1/14	12/3/0/0	4.2/4.3
Sp18	GEO325J	Intro. Fortran/Matlab ^a	3	J/G	11/6	15/2/0/0	4.4/4.8
Fa17	GEO391	Modeling flow and transport	3	G	13	2/11/0/0	4.5/4.6
Fa16	GEO346C	Introduction to hydrogeology	3	S	38	31/3/0/5	3.4/3.7
	GEO391	Modeling flow and transport	3	G	26	8/17/1/0	4.4/4.7
Fa15	GEO346C	Introduction to hydrogeology	3	S	38	34/2/0/2	3.6/4.1
	GEO391	Modeling flow and transport	3	G	9	2/6/1/0	4.0/4.1
Sp15	GEO391	Reactive transport	3	G	14	7/7/0/0	3.9/4.0
Fa14	GEO346C	Introduction to hydrogeology	3	S	37	22/7/0/8	3.9/4.1
	GEO391	Modeling flow and transport	3	G	11	7/4/0/0	4.0/4.0
Fa13	GEO346C	Introduction to hydrogeology	3	S	32	28/0/0/4	3.7/3.7
Sp13	GEO391	Modeling flow and transport ^{a,*}	3	G	12	8/4/0/0	4.0/4.2
Fa12	GEO346C	Introduction to hydrogeology	3	S	15	8/0/0/7	3.6/3.9
Sp12	GEO391	Reactive transport	3	G	13	5/6/2/0	4.2/4.7
Fa11	GEO346C	Introduction to hydrogeology	3	S	26	15/0/0/11	3.2/3.4
Fa10	GEO391	Geodynamics ^{a,b}	3	G	6	4/1/1/0	3.8/4.8
Fa10	GEO346C	Introduction to hydrogeology	3	S	43	28/2/0/13	2.8/3.2
Sp10	GEO391	Reactive transport ^a	3	G	21	9/11/1/0	3.6/4.1

* Received graduate teaching award, ^a Newly developed course, ^b Multiple instructors,

^c S = Sophomore, J = Junior, G = Graduate.

^d Student departments: S = Sciences, E = Engineering, M = Mathematics, H = Humanities

Membership on graduate student committees

	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
Geo.	3	4	12	10	14	12	10	11	13	10	9	14
Eng.	2	2	6	6	4	4	4	6	4	2	1	2
Math.	1	1	2	4	2	2	2	2	3	1	1	2
Total	6	8	20	20	21	18	16	19	20	13	11	18

Post-doctoral scholars mentored

Name	Relation	Program	Year	current position
Baole Wen	Mentor	ICES Postdoctoral Fellow	2015-2018	Assistant Prof. NYIT
Nicolar Dygert	Co-Mentor	JSG Postdoctoral Fellow	2014-2017	Assistant Prof. UT Knoxville
Andrew Smye	Co-Mentor	JSG Postdoctoral Fellow	2012-2015	Assistant Prof. Penn State

Doctoral theses advised

Name	Relation	Program	Year	position after graduation
Mohammad Shadab	Advisor	CSEM	2019-	
Jialong Ren	Advisor	Geology	2019-	
Eric Hiatt	Co-Advisor	Geology	2019-	
Molly Zebker	Co-Advisor	Geology	2019-	
Alex Gigliotti	Co-Advisor	Petr. Eng.	2019-	
Natalie Wolfenbarger	Co-Advisor	Geology	2018-	Postdoc with D. Schroeder, Stanford
Amal Alghamdi	Co-Advisor	CSEM	2015-2021	Postdoc DTU, Denmark
Kimberly McCormack	Advisor	Geology	2013-2019	Researcher DOD-NGA, U.S.
Li Zhang	Co-Advisor	Mech. Eng.	2012-2018	Postdoc Wetsus, Netherlands
Daria Akhbari	Advisor	Geology	2013-2018	Eng. Geosyntec
Colin McNeece	Advisor	Geology	2012-2018	Data Scientist at Enthought
Yu Liang	Co-Advisor	Petr. Eng.	2012-2018	Data Scientist at Hilcorp
Jake Jordan	Advisor	Geology	2012-2018	Postdoc with D. Bercovici, Yale
Soheil Ghanbarzadeh	Co-advisor	Petr. Eng.	2011-2017	Reservoir Eng. British Petroleum
Kiran Sathaye	Advisor	Geology	2010-2016	Data Scientist at Snapchat
Abraham Taicher	Co-advisor	CSEM	2009-2014	Applied Underwriters
Ashwin Venkatraman	Co-advisor	Petr. Eng.	2009-2014	Founder & C.E.O. Resermin
Nicolas Huerta	Co-Advisor	Geology	2009-2013	Researcher at NETL
Kyung-won Chan	Advisor	Geology	2009-2013	Postdoc with P. Segall, Stanford

Masters theses advised

Name	Relation	Program	Year
Evan Carnahan	Advisor	Comp. Science Eng. and Math.	2019-2021
Evan Ramos	Co-Advisor	Geology	2015-2018
Amal Alghamdi	Advisor	Comp. Science Eng. and Math.	2012-2015
Jennifer Cessna	Advisor	Geology	2009-2011

Batchelors theses advised

Name	Relation	Program	Year
Jaxon Liebeck	Advisor	ASE - CSE Certificate	2017-2021
Amy De Luna	Advisor	Math - CSE Certificate	2014-2019
Preston Fussee-Durham	Advisor	Geo. & Math - CSE Certificate	2014-2019
Esben Pedersen	Advisor	Geology	2014-2018
Ram Sanchez	Advisor	Geology	2010-2014
Quin Wenning	Advisor	Geology	2008-2012
Michael Tso	Advisor	Geology	2008-2012

PROFESSIONAL ACTIVITIES

Affiliations

American Geophysical Union (AGU), Society for Industrial and Applied Mathematics (SIAM), American Physical Society (APS), Geochemical Society (GS), Interpore, Society of Petroleum Engineers (SPE).

Editor for technical journals

2013-2018	Associate editor	Transport in Porous Media [link]
2020	Editor (individual submission)	Proceedings of the National Academy of Sciences

Reviewer for technical journals, academic publishers, and funding agencies

General:	Nature, Proceedings of the National Academy, Nature Communications Philosophical Transactions A., Scientific Reports
Geoscience:	Geology, Earth and Planetary Science Letters, Geophysical Research Letters ^a , Journal of Geophysical Research, Physics of the Earth and Planetary Interiors, G ³ , International Geology Review, Applied Geochemistry. Geochimica et Cosmochimica Acta.
Environmental Science:	Water Resources Research, Environmental Science and Technology International Journal of Greenhouse Gas Control, Water Research.
Physics & Engineering:	Journal of Fluid Mechanics, Transport in Porous Media, Advances in Water Resources, SPE Journal.
Scientific Computing:	Journal of Computational Physics, Journal of Scientific Computing, International Journal of Numerical Analysis and Modeling, Computational Geoscience, Computers & Geosciences.
Mathematics:	SIAM Journal of Applied Mathematics.
Academic publishers:	Cambridge University Press, John Wiley & Sons Inc.
National Science Foundation:	EAR: Hydrologic Sciences, Geophysics, Marine Geology & Geophysics. CDS&E-ENG: Computational and Data-Enabled Science and Engineering.
American Chemical Soc.:	Petroleum Research Fund
International societies:	Austrian Science Fund, Czech Science Foundation The German Israeli Foundation for Scientific Research and Development
NASA:	Habitable Worlds, Solar Systems Working

^a 2012 Editors' Citation for Excellence in Refereeing for Geophysical Research Letters

Scientific outreach activities

Explore UT: I have initiated and run a large-scale demonstration of non-Newtonian fluid behavior for Explore UT the annual UT open house. Each year approximately 700 children aged 4-12 participate.

Service to scientific community

Leadership in Sci. Societies:	2019-2020 Vice-Chair SIAM Activity Group on Geosciences
Conference chairs:	2024 Gordon Research Conference (Chair) 2022 Gordon Research Conference (Vice-chair) 2010 Gordon-Keenan Graduate Research Seminar Flow and Transport in Permeable Media
Organizing committees:	2015 SIAM Computational Geosciences 2008 & 2010 Gordon Research Conference Flow and Transport in Permeable Media
Mini-symposia organizer:	European Fluid Mechanics Conference 9, 2012, Italy MS_C: CO ₂ sequestration SIAM Mathematical and Computational Geosciences 2017 MS21: Modeling and simulation of melt in the mantle SIAM Mathematical and Computational Geosciences 2009 MS53 & 60: Geological CO ₂ storage MS38: Dynamics of partially molten rocks SIAM Mathematical and Computational Geosciences 2007 MS43: Self-similar solutions in porous media flow
Convener:	American Geophysical Union Fall Meeting 2015 H21: Energy Development and Storage in the Subsurface: Modeling and Monitoring Challenges and Solution Strategies American Geophysical Union Fall Meeting 2013 V26. Melting and Melt-Rock Reaction from Source to Surface American Geophysical Union Fall Meeting 2012 H21: Reactive Transport in Porous Media American Geophysical Union Fall Meeting 2009 V41: Geochemical consequences of melt migration

Committee service to department, school and university

2023- DGS/JSG? Workplace Committee
2023- DGS ExCom LDE Co-chair
2023- QR Flag Faculty Committee
2022- JSG Endowment Committee
2022 Provost Early Career Cohort (PEC3) Search Committee
2020/21 GSC ad hoc committee: Grad Curriculum / Course Requirements
ad-hoc committee DGS mentoring policy/strategy
2019/20 Search committee Petrology faculty position
Geophysics curriculum review committee
Theme leader: Planetary Science and Geobiology
2018/19 Search committee for the UTIG Director
2018 Core team for Planetary Habitability Pop-Up Institute
2016/17 JSG undergraduate program and curriculum review committee
2015-18 IT steering committee
2014/15 Search committee Geophysics faculty position
Solid Earth & Structure Tectonics executive committee
2013/14 Search committee Geophysics faculty position
2012/13 Search committee ICES Moncrief faculty position
Search committee Associate dean of research
2010/11 Strategic planning committee
Search committee Hydrogeology faculty position
Graduate Studies Council curricular subcommittee
2009-20 Departmental IT committee

CITATION METRICS

Source:	ISI-Web of Science	Scopus	Google Scholar
Date:	05/29/2023	05/29/2023	05/29/2023
Website:	Researcher ID	Author ID	Profile page
Total number of articles:	88	94	261
Sum of the times cited:	2721	3096	4402
h-index:	28	28	30

PUBLICATIONS

Names marked with * indicate graduate students I supervise, names marked with ** indicate graduate students I co-supervise.

- [77] Shadab, Luo, Shen, Hiatt, **Hesse** (2023) Investigating Steady Unconfined Groundwater Flow using Physics Informed Neural Networks, *Adv. Water Resour.*, **177**, 104445, doi:10.1016/j.advwatres.2023.104445, [\[link\]](#)
- [76] Carnahan*, Vance, Cox, **Hesse** (2022), Surface-to-ocean exchange by the sinking of impact generated melt chambers on icy ocean worlds, *Geophys. Res. Lett.*, **49**(24), 1-12, doi:10.1029/2022GL100287, [\[link\]](#)
- [75] Lucas, Dygert, Ran*, **Hesse**, Miller, McSween (2022) Thermochemical evolution of the acapulcoite-lodranite parent body: Evidence for fragmentation-disrupted partial differentiation, in press *Meteorit. Planet. Sci.*, **57**(12), 2248-2275, doi:10.1111/maps.13930, [\[link\]](#)
- [74] Shadab and **Hesse** (2022) Analysis of gravity-driven infiltration with the development of a saturated region, *Water Resour. Res.*, **58**(11), doi:10.1029/2022WR032963, [\[link\]](#)
- [73] Marusiak, Vance, Panning, Bryant, Hesse, Carnahan*, Journaux (2022) The Effects of Methane Clathrates on the Thermal and Seismic Profile of Titan's Icy Lithosphere, *Planet. Sci. J.*, **3**(7), 167, 1-8, [\[link\]](#)
- [72] Santos, Gigliotti**, Bihani, Landry, Hesse, Pyrcza, Prodanovic (2022) MPLBM-UT: Multi-phase LBM library for permeable media analysis, *SoftwareX*, **18**, 1-7 101097, doi:10.1016/j.softx.2022.101097, [\[link\]](#)
- [71] Carnahan*, Vance, Journeux, Hesse, Sotin (2022) Dynamics of mixed clathrate-ice shells on icy ocean worlds, *Geophys. Res. Lett.*, **49**(8), 1-11, 2021GL097602 [\[link\]](#)
- [70] Hesse, Jordan*, Vance, Oza (2022) Downward oxidant transport through Europa's ice shell by density-driven brine percolation, *Geophys. Res. Lett.*, **49**(5), 1-9, doi:10.1029/2021GL095416, [\[link\]](#)
- [69] Ren*, Hesse, Lucas, Dygert (2022) On the cooling rate evolution of asteroid fragments, *Icarus*, **379**, 114905, 1-6, doi:10.1016/j.icarus.2022.114905 [\[link\]](#)
- [68] Alghamdi**, Hesse, Chen, Ghattas (2021) Bayesian Poroelastic Aquifer Characterization from InSAR Surface Deformation Data – Part II: Quantifying the Uncertainty, *Water Resour. Res.*, **57**(11), e2021WR029775, 1-23, doi:10.1029/2021WR029775 [\[link\]](#)

- [67] Wolfenbarger**, Carnahan*, Jordan, Hesse (2021) A Comprehensive Dataset for the Thermal Conductivity of Ice Ih for Application to Planetary Ice Shells, *Data in Brief*, **36**, 1-5, 107079, doi:10.1016/j.dib.2021.10707, [\[link\]](#)
- [66] Wen, Shi, Jessen, Hesse, Totsis (2021) Convective carbon dioxide dissolution in a closed porous medium at high-pressure real-gas conditions, *Adv. Water Resour.*, **154**, 103950, 1-10, doi:10.1016/j.advwatres.2021.103950 [\[link\]](#)
- [65] Kardell, Zhao, Ramos, Estep, Christenson, Reece, Hesse (2021) Permeability-constrained fluid flow models confirm hydrothermal cooling of 7-63 Ma South Atlantic crust, *J. Geophys. Res.*, **126**(6), e2020JB021612, 1-22, doi:10.1029/2020JB021612 [\[link\]](#)
- [64] Carnahan*, Wolfenbarger**, Jordan, Hesse (2021) Ice shell convection in icy ocean worlds with temperature-dependent physical properties, *Earth Planet. Sci. Lett.*, **563**, 116886, 1-10, doi:10.1016/j.epsl.2021.116886, [\[link\]](#)
- [63] Vance, Journaux, Hesse, Steinbrügge (2021) The Salty Secrets of Icy Ocean Worlds, *J. Geophys. Res.-Planets*, **126**(1), 1-5, doi:10.1029/2020JE006736 [\[link\]](#)
- [62] Lukas, Dygert, Ren*, Hesse, Miller, McSween (2020) Evidence for early fragmentation-reassembly of ordinary chondrite (H, L, and LL) parent bodies from REE-in-two-pyroxene thermometry, *Geochim. Cosmochim. Acta*, 290(1), 366-390, doi:10.1016/j.gca.2020.09.010, [\[link\]](#)
- [61] Alghamdi**, Hesse, Chen, Ghattas (2020) Bayesian Poroelastic Aquifer Characterization from InSAR Surface Deformation Data. Part 1: Maximum A Posteriori Estimate, *Water Resour. Res.*, **56**(10), 1-25, doi:10.1029/2020WR027391, [\[link\]](#)
- [60] Raymond, Ermakov, Castillo-Rogez, Marchi, Johnson, Hesse, Scully, Buczkowski, Sizemore, Schenk, Nathues, Park, Prettyman, Rayman, Russell (2020) Impact-Driven Mobilization of Deep Crustal Brines on Dwarf Planet Ceres, *Nat. Astron.*, **4**, 741–747, doi:10.1038/s41550-020-1168-2, [\[link\]](#)
- [59] McCormack*, Hesse, Dixon, Malservisi (2020) Modeling the contribution of poroelastic deformation to postseismic geodetic signals, *Geophys. Res. Lett.*, **46**(4), 1963-1972, doi:10.1029/2020GL086945, [\[link\]](#)
- [58] Castillo-Rogez, Hesse, Formisano, Sizemore, Bland, Ermakov, Fu (2019) Conditions for the Long-Term Preservation of a Deep Brine Reservoir in Ceres, *Geophys. Res. Lett.*, **46**, 1-9, doi:10.1029/2018GL081473 [\[link\]](#).
- [57] Zefreh**, Doster, Hesse (2019) Theory of dissolution and precipitation waves - redux, *AIChE J.*, **65**, 1-17, doi:10.1002/aic.16573, [\[link\]](#)
- [56] Hesse, Castillo-Rogez (2018) Thermal evolution of the impact-induced cryomagma chamber beneath Occator Crater on Ceres, *Geophys. Res. Lett.*, **45**, 1-9, doi: 10.1029/2018gl080327, [\[link\]](#).

- [55] Wen, Chang*, Hesse (2018) Rayleigh-Darcy convection with hydrodynamic dispersion, *Phys. Rev. Fluids*, **3**, 1-18, 123801, doi:10.1103/PhysRevFluids.3.123801, [\[link\]](#).
- [54] Zhang**, Hesse, Wang (2018) Dispersion of Charged Solute in Charged Micro- and Nanochannel with Reversible Sorption, *Electrophoresis*, **40**, 838–844 doi:10.1002/elps.201800334, [\[link\]](#)
- [53] Liang**, Wen, DiCarlo, Hesse (2018) Scaling of solutal convection in porous media, *Geophys. Res. Lett.*, **45**(18), 9690-9698, doi:10.1029/2018GL079849, [\[link\]](#)
- [52] Zhang**, McNeece*, Hesse, Wang (2018) Reactive Transport of Protons in Electro-osmotic Displacements with Electrolyte Concentration Difference in a Microcapillary, *Anal. Chem.*, **90** (20), 11802-11811, doi:doi:10.1021/acs.analchem.8b00349, [\[link\]](#)
- [51] Ramos*, Hesse (2018) Re-evaluating fluid sources during skarn formation: an assessment of the Empire Mountain skarn, Sierra Nevada, USA, *Geochem. Geophys. Geosy.*, **19**(10), 3657-3672, doi:10.1029/2018gc007611, [\[link\]](#)
- [50] McNeece*, Lützenkirchen, Hesse (2018) Chromatographic analysis of the acidity-salinity transport system, *J. Contam. Hydrol.*, **216**, 27-37, doi:10.1016/j.jconhyd.2018.08.001, [\[link\]](#)
- [49] Wen, Akhbari*, Zhang**, Hesse (2018) Convective carbon dioxide dissolution in a closed porous medium at low pressure, *J. Fluid Mech.*, **854**, 56-87, doi:10.1017/jfm.2018.622, [\[link\]](#)
- [48] Dygert, Jackson, Hesse, Tremblay, Shuster, Gu (2018) Plate tectonic cycling modulates Earth's $^3\text{He}/^{22}\text{Ne}$ ratio, *Earth Planet. Sci. Lett.*, **498**, 309-321, doi:10.1016/j.epsl.2018.06.044 [\[link\]](#)
- [47] McCormack*, Hesse (2018) Hydrologic Response to Megathrust Earthquake: A look at the 2012 Mw 7.6 Costa Rican Event, *Adv. Water Resour.*, **114**, 236-248 [\[link\]](#)
- [46] Jordan*, Hesse, Rudge (2018) On mass transport in porosity waves, *Earth Planet. Sci. Lett.*, **485**, 65-78, doi:10.1016/j.epsl.2017.12.024, [\[link\]](#)
- [45] Ghanbarzadeh*, Hesse, Prodanovic (2017) Percolative core formation in planetesimals enabled by hysteresis in melt connectivity, *P. Natl. Acad. Sci. USA*, **114**(51), 13406-13411, doi:10.1073/pnas.1707580114, [\[link\]](#)
- [44] Shi, Wen, Hesse, Tsotsis and Jessen (2017) Measurement and Modeling of CO₂ Mass Transfer in Brine at Reservoir Conditions, published online in *Adv. Water Resour.*, **113**, 100-111, doi:10.1016/j.advwatres.2017.11.002, [\[link\]](#)
- [43] McNeece*, Hesse (2017) Challenges in coupling acidity and salinity transport, *Environ. Sci. Technol.*, **51**(20), 11799-11808, doi:10.1021/acs.est.7b02318, [\[link\]](#)
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Submitted for publication:

- Shadab, Adhikari, Rutishauser, Grima, Hesse (202X) On the formation of ice layers in glacial firn, submitted to *Science*
- Alghamdi, Hesse, Chen, Ghattas (202X) Aquifer characterization through recent advances in satellite geodesy, geomechanics, and Bayesian inference, submitted to *P. Natl. Acad. Sci. USA*
- Ren, Hesse, Dygert, Lucas (202X) Deterministic model for asteroid thermal evolution with fragmentation and reassembly into a rubble pile, submitted to *J. Geophys. Res. Planets*
- Shadab, Hiatt, Hesse (202X) Kochina (1962) solutions for steady unconfined groundwater flow: a free tool and its applicability, submitted to *Groundwater*
- Shadab and Hesse (202X) A hyperbolic-elliptic PDE model and conservative numerical method for gravity-dominated variably-saturated groundwater flow, in revision for *J. Comp. Phys.*
- Hiatt, Shadab, Gulick, Goudge, Hesse (202X) Limited Recharge of the Southern Highlands Aquifer on Early Mars, in revision for *Icarus*
- Wen, Liang**, DiCarlo, Hesse (202X) Scaling of solutal convection with mechanical dispersion in porous media, in revision for *J. Fluid Mech.*

PATENTS

Title:	Iterative multi-scale method for flow in porous media
Inventors:	Hadjibeygi, Bonfigli, Hesse , Jenny
Application number:	20100094605

CURRENT EXTERNALLY SUPPORTED RESEARCH PROJECTS

Principal investigator

Title: **Multi-phase melt percolation during core formation**

Agency: NASA – Emerging Worlds: 18-EW18_2-0027

Amount: \$635,443

Duration: 01/09/2018-31/08/2023 (no-cost extension)

Title: **Carbon cycle in small ocean worlds**

Agency: Jet Propulsion Laboratory – Strategic Research and Technology Development

Amount: \$126,750

Duration: 01/10/2019-30/09/2022

Co-investigator

Title: **Assessing the habitability of post-impact hydrothermal systems using the Chicxulub crater as a natural laboratory**

Agency: NASA – Habitable Worlds: - 19-HW19_2-0055

PI: Sonia Tikoo (Stanford Iniversity)
Sean Gulick (Institutional PI)

Amount: \$234,945

Duration: 09/01/2020-5/31/23

Title: **New constraints on thermal evolution, thermal structure and magmatism on asteroids: Application of a REE-in-two pyroxene thermometer to meteorites and development of next- generation thermal models**

Agency: NASA – Solar Systems Workings: - 17-SSW17-0192

PI: Nicolas Dygert (University of Tennessee at Knoxville)

Amount: \$74,885

Duration: 01/07/18-5/31/23 (no-cost extension)

PAST EXTERNALLY SUPPORTED RESEARCH PROJECTS

Principal investigator

Title:	2020 Flow and Transport in Permeable Media GRC/GRS
Agency:	National Science Foundation EAR-HS-2016009
Amount:	\$41,885
Duration:	07/01/2020 - 02/01/2021
Title:	Simulation of Multiphase Flow and Transport in the Partially Molten Mantle
Agency:	National Science Foundation - DMS 1720349
Amount:	\$250,000
Duration:	01/08/2018 - 31/07/2021
Title:	Center for Frontiers of Subsurface Energy Security (CFSES II) [link] UT Theme lead: Multi-fluid geochemistry
Agency:	Department of Energy - # DE-SC0001114
Amount:	\$240,000.
Duration:	01/08/2014 - 31/07/2018
Title:	Two-Phase Flow and Episodic Pore Fluid Migration through Rock Salt: Control on Sub-Salt Pressure and Seal Capacity
Agency:	American Chemical Society - Petroleum Research Fund - PRF # 57832-ND8
Amount:	\$110,000
Duration:	09/01/2017 - 08/31/2019
Title:	Hydrogeochemical dynamics of natural carbon dioxide fields: Analogs for geological carbon storage and constraints on convective dissolution
Co-PI:	David DiCarlo, Petroleum and Geosystems Engineering, University of Texas at Austin
Collaborator:	Martin Cassidy, Earth and Atmospheric Sciences, University of Houston
Agency:	National Science Foundation - EAR-1215853
Amount:	\$471,471
Duration:	15/08/2012 - 31/07/2015
Title:	Center for Frontiers of Subsurface Energy Security (CFSES I) [link] Co-Investigator and PI of subtask 4.9: Modeling Dispersive and Convective Mixing of CO₂
Agency:	Department of Energy - DE-SC0001114
Amount:	\$305,000.
Duration:	01/08/2009 - 31/07/2014
Title:	The interpretation of geochemical patterns through the theory of hyperbolic conservation laws for reactive transport in porous media
Agency:	American Chemical Society - Petroleum Research Fund - PRF# 51230-DNI8
Amount:	\$100,000
Duration:	07/15/2011 - 07/14/2013
Title:	CMG Research: Robust numerical methods for multi-phase Darcy-Stokes flow in heterogeneous and anisotropic partially molten materials
Co-PI:	Todd Arbogast, Mathematics, University of Texas at Austin

Agency: National Science Foundation EAR - CMG-1025321
Amount: \$324,667
Duration: 09/01/2010 - 08/31/2013

Title: **2010 Flow and Transport in Permeable Media GRC & GRS**
Agency: National Science Foundation EAR-HS-1009435
Amount: \$41,885
Duration: 05/01/2010 - 04/30/2011

Co-Principal investigator or collaborator

Title: **A Bayesian inference/prediction/control framework for optimal management of CO₂ sequestrations**
Agency: National Science Foundation - CDS&E 1508713
Amount: \$329,379
Duration: 01/08/2015 - 31/07/2018

Title: **CSEDI: Constraining the mechanisms of melt transport, storage, and crustal contamination from temporal geochemical variations in monogenetic vents**
Agency: National Science Foundation - EAR 1301621
Amount: \$335,000
Duration: 15/08/2013 - 31/07/2016

Title: **CDI-Type II: Dynamics of Ice Sheets: Advanced Simulation Models**
Agency: National Science Foundation CDI ARC-0941678
Amount: \$2,002,463
Duration: 09/01/2009 - 08/31/2013

Title: **Developing a comprehensive risk assessment framework for geological CO₂ storage**
Agency: US DOE National Energy Technologies Laboratory
Amount: \$1,996,402
Duration: 01/01/2010 - 12/31/2013

INDEPENDENT FUNDING BY GRADUATE STUDENTS

Student: Kimberley McCormack
Title: **Poroelastic modeling of coseismic fluid overpressure**
Agency: National Science Foundation Graduate Research Fellowship
Amount: \$68,000 (per year)
Duration: 07/01/2015 - 06/30/2018

Student: Nicolas Huerta,
Title: **Coupled Phenomena in a Leaky Well**
Agency: National Energy Technology Laboratory (NETL), RES1100389
Amount: \$68,000 (per year)
Duration: 03/01/2011 - 01/01/2014

Student: Soheil Ghanbarzadeh
Title: **Is salt always a hydrocarbon seal?**
Agency: Statoil

Amount: \$58,000 (per year)
Duration: 01/08/2012 - 07/31/2016 (renewed on annual basis)

Student: Kiran Sathaye
Title: **Geochemical reservoir characterization**
Agency: Statoil
Amount: \$58,000 (per year)
Duration: 01/08/2014 - 07/31/2016 (renewed on annual basis)