

## **Kuldeep Singh**

Assistant Professor, Department of Geology, Kent State University, Kent, OH  
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Website: <https://www.kent.edu/geology/kuldeep-singh-chaudhary>

### **Research Interests**

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- ❖ Thermo-hydro-mechanical-chemical (THMC) processes of Geosystems
- ❖ Pore-scale fluid mechanics, microfluidics, imaging, digital rock physics: upscaling

### **Education**

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2013 Ph.D. The University of Texas at Austin, Geoscience  
2007 M.S. Indiana University at Bloomington, Geological Science  
2001 M.Sc. University of Delhi, India, Geology  
1998 B.Sc. University of Delhi, India, Geology (Honors)

### **Employment**

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2017 – Assistant Professor, Department of Geology, Kent State University, Kent, OH  
2017 – Geoscience Advisor, [AquaNRG](#) Consulting Services, Houston, TX  
2012 – 2016 Senior Geoscientist, Geoscience Technology (G&RE), ConocoPhillips, Houston, TX  
2013 Visiting Scientist, Department of Physics, University of Bergen, Norway  
2010 – 2012 Research Assistant, Jackson School of Geosciences, The University of Texas at Austin  
2007 – 2008 Geologist, Indiana Geological Survey, Bloomington, Indiana  
2007 Research Assistant, Geological sciences, Indiana University, Bloomington, IN  
2006 – 2007 Geological Consultant, Sierra Resources, LLC, Houston, TX

### **Course Taught**

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Contaminant Hydrogeology (Spring 2021)  
Applied Hydrogeology Laboratory (Spring 2021)  
Physical Hydrogeology (Fall 2020)  
Water and the environment (Fall 2020)  
Advances in Water Resources Seminar (Fall 2020)  
Computational modeling in geosystems  
Applied Hydrogeology Laboratory

### **Patent**

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2016 Measuring Fluid-Solid Contact Angles using X-ray Imaging, PCT/US17/47379 (*pending*)  
**Chaudhary, K.**, M.B. Cardenas, P. Bennett, and R. Ketcham, Jackson School of Geosciences, The University of Texas, Austin

## Publications

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Google Scholar ID: <https://scholar.google.com/citations?user=GbfwWMAAAAJ&hl=en>

ORCID: <https://orcid.org/0000-0003-2366-2480>

**Singh, K. (2020)**. How boundary slip controls emergent Darcy flow of liquids in tortuous and in capillary pores. *Physical Review E*, 102(1), 013101. [doi:10.1103/PhysRevE.102.013101](https://doi.org/10.1103/PhysRevE.102.013101)

Lizhi Zheng, Lichun Wang, Tiejun Wang, **Kuldeep Singh**, Zhong-Liang Wang, Xi Chen (2020), Can homogeneous slip boundary condition affect effective dispersion in single fractures with Poiseuille flow? *Journal of Hydrology*, Volume 581, ISSN 0022-1694, [doi.org/10.1016/j.jhydrol.2019.124385](https://doi.org/10.1016/j.jhydrol.2019.124385)

**Singh, K., (2019)**, How Hydraulic Properties of Organic Matter Control Effective Liquid Permeability of Mudrocks. *Transport in Porous Media*. [doi:10.1007/s11242-019-01305-y](https://doi.org/10.1007/s11242-019-01305-y)

Shafei, Babak, Basagaoglu, Hakan, **Chaudhary, Kuldeep**, DiNenno, Flak, and Leks, Sebastian. (2019), *rtmApp*: A SaaS Application for Reactive Transport Modeling. United States: USDOE Office of Science (SC), [Technical Report](#) # DOE-AquaNRG-0018510

Tenney, C. M., Dewers, T., **Chaudhary, K.**, Matteo, E. N., Cardenas, M. B., & Cygan, R. T (2017) Experimental and simulation study of carbon dioxide, brine, and muscovite surface interactions. *Journal of Petroleum Science and Engineering*, ISSN 0920-4105, 155, 78-88.  
[doi:https://doi.org/10.1016/j.petrol.2016.10.010](https://doi.org/10.1016/j.petrol.2016.10.010)

**Chaudhary, K.**, M. Bayani Cardenas, E. Gultinan, J. A. Maisano, R. A. Ketcham, and P. C. Bennett (2015) Wettability measurement under high P-T conditions using X-ray imaging with application to the brine-supercritical CO<sub>2</sub> system, *Geochemistry, Geophysics, Geosystems (G<sup>3</sup>)*, ISSN 1525-2027, [doi: 10.1002/2015GC005936](https://doi.org/10.1002/2015GC005936)

Gautepllass, J., **K. Chaudhary**, A. R. Kavscek, and M. A. Fernø (2015), Pore-level foam generation and flow for mobility control in fractured systems, *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 468, 184-192, ISSN 0927-7757, <http://dx.doi.org/10.1016/j.colsurfa.2014.12.043>

Altman, S. J., B. Aminzadeh, M. T. Balhoff, P. C. Bennett, S. L. Bryant, M. B. Cardenas, **K. Chaudhary**, et al., (2014), Chemical and hydrodynamic mechanisms for long-term geological carbon storage, *Journal of Physical Chemistry C*, 118(28), 15103-15113. doi: 10.1021/jp5006764

**Chaudhary, K.**, M.B. Cardenas, W. Deng, P. Bennett (2013a), Pore geometry effects on intrapore viscous to inertial flows and on effective hydraulic parameters, *Water Resources Research*, 49(2), 1149-1162,doi: 10.1002/wrcr.20099

**Chaudhary, K.**, M.B. Cardenas, R. Ketcham, J. Massano, W. Wolfe, P.C. Bennett (2013b), Pore-scale trapping of supercritical CO<sub>2</sub> and the role of grain wettability and shape, *Geophysical Research Letters*, 40(15), 3878-3882,doi: 10.1002/grl.50658

**Chaudhary, K.**, M.B. Cardenas, W. Deng, P. Bennett (2011) The role of eddies inside pores in the transition from Darcy to Forchheimer flows. *Geophys. Res. Lett.*, 38, L24405, doi:10.1029/2011GL050214

**Chaudhary, K.**, and B. Scanlon, (2009), Review of the state of art Groundwater Under the Influence of Surface Water (GUWDI) programs, *Special Report July 2009*, [www.beg.utexas.edu/tceq/docs/BEG\\_GWUDI\\_2009.pdf](http://www.beg.utexas.edu/tceq/docs/BEG_GWUDI_2009.pdf), BEG, The University of Texas, Austin

**Chaudhary, K.**, and B. Keith, (2008), Lower Paleozoic Oil and Gas Fields in the Illinois Basin of Indiana, *Special Publication*, Indiana Geological Survey at Indiana University, Bloomington, p. 558.

Bense, V.F., M.A. Person, **K. Chaudhary**, Y. You, N. Cremer, and S. Simon (2008), *Thermal anomalies as indicator of preferential flow along faults in an unconsolidated sedimentary aquifer system*, *Geophys. Res. Lett.*, 35, L24406, doi: 10.1029/2008GL036017

## Abstracts

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Journal Articles (\* = graduate student advisee co-author; \*\* = undergraduate advisee co-author)

\*Hiwiller, Erika and **Kuldeep Singh** (2021) How road salt contaminates aquifers: A guide for policy and management. Northeastern Sec., Geological Society of America meeting, March 14-15, 2021, Vol. 53, No.1, [doi: 10.1130/abs/2021NE-361890](https://doi.org/10.1130/abs/2021NE-361890)

\*Bradley, J., L. Wang, and **K. Singh.**, (2019) Role of pore channel geometry and inertia on length-scales for transition of non-Fickian to Fickian solute transport phenomenon at pore-scale, 2019 AGU Fall Meeting Abstracts, [H21I-1857](https://doi.org/10.1029/2019AGU11857)

**Chaudhary, K.**, Dave Edey, Jessica Maisano., (2019) Dynamic imaging using high resolution X-ray CT at pore-scale of how wettability controls gravity induced drainage-imbibition in bead-pack porous media, *Tomography for Scientific Advancement Symposium*, [ToScA](https://doi.org/10.1029/2019AGU11857), Univ. of Florida, Tallahassee, 6-8 March.

\*Bradley, J., and **K. Chaudhary.**, (2019) Role of pore channel geometry on length scales for transition of non-Fickian to Fickian solute transport, World Environmental and Water Resources Congress (EWRI), May 19-23, Pittsburgh, Pennsylvania

\*\*Kasamias, K., and **K. Chaudhary.**, (2018) How roughness and cleanliness of rock mineral surfaces control its wettability, 130<sup>th</sup> Annual GSA Meeting, Indianapolis, Abstracts, T105, [Session #-34](https://doi.org/10.1029/2018AGU11857)

\*\*Kasamias, K., and **K. Chaudhary.**, (2018) How polishing related surface roughness of rock minerals control its wettability, NEO 61<sup>st</sup> SAS/MSNO/ACS/AVS Annual May Meeting Conference, John Carroll University, University Heights, OH

\*\*Storey, A., and **K. Chaudhary.**, (2018) Anisotropy in element composition and pore-size distribution of Mudstones, 2018 North-Central 52<sup>nd</sup> Annual GSA Meeting [Abstracts, T16, 12-1, 36](https://doi.org/10.1029/2018AGU11857)

\*\*Storey, A., and **K. Chaudhary.**, (2018) Anisotropy in element composition and pore-size distribution of Mudstones, 2018, Kent State University Undergraduate Symposium on Research, Scholarship and Creative Activity, [Poster Presentation](https://doi.org/10.1029/2018AGU11857)

**Chaudhary, K.**, Cardenas, M, Wolfe, WW, Maisano, JA, Ketcham, RA, Bennett, P, (2013) Pore-scale imaging of capillary trapped supercritical CO<sub>2</sub> as controlled by water-wet vs. CO<sub>2</sub>-wet media and grain shapes, 2013 AGU Fall Meeting Abstracts, 1, 02P

- Chaudhary, K.**, Cardenas, MB, Deng, W, Bennett, P, (2012) Role of intra-pore eddies and angularity of diverging-converging pores in Darcy to Forchheimer flow regimes, 2012 AGU Fall Meeting Abstracts,1,,07
- Chaudhary, K.**, M.B. Cardenas, R. Ketcham, J. Massano, W. Wolfe, P.C. Bennett (2012), Pore-scale trapping of supercritical CO<sub>2</sub> and the role of grain wettability and shape, NorTex Conference on CO<sub>2</sub> EOR processes, Rice University, Houston, TX
- Kirk, Matthew Fletcher, Altman, Susan Jeanne, Bennett, Philip, Cardenas, Bayani, Dewers, Thomas A, Delshad, Mojdeh, Santillan, Eugenio Felipe Unson, Deng, Wen, **Chaudhary, Kuldeep**, Yoon, Hongkyu, (2011), The coupled effects of microbial and physico-chemical processes on geological carbon storage., Sandia National Laboratories (SNL-NM), Albuquerque, NM
- Chaudhary, K.**, Cardenas, B, Bennett, P, Ketcham, RA, (2010) The role of different grain shapes in modifying intra-pore flow and transport phenomena, 2010 AGU Fall Meeting Abstracts, 1, 0957
- Chaudhary, K.**, M.B. Cardenas, P. Bennett, and R. Ketcham, (2010) The effects of grain shapes on the intra-pore flow and transport processes and their implication on geological storage of CO<sub>2</sub>, *Gordon Research conference, Flow & Transport in Permeable Media, Bates College, ME*
- Chaudhary, K.**, Sharp, John M. Jr, Holt, 2009, *Multiple Geophysical Methods for Identifying And Mapping Caves In The Recharge Zone Of The Edwards Aquifer, Texas*, Geological Society Of America, *Abstracts with programs*, vol. 41, no. 2, p. 8
- Chaudhary, K.**, and B. D. Keith., Reassessment of Devonian Reservoirs in Green County, Indiana, Abstract, AAPG- SPE Eastern Meeting 2008 October 11-15, Pittsburgh, PA, p. 35.
- Chaudhary, K.**, Person, M.A., and Hanor, J, Late Quaternary Salinization within the Murray Basin, Australia: Abstract, Oct 2007 GSA Denver Annual meeting, Vol. 39, No. 6.
- Bense, V.F., Person, M.A., **Chaudhary, K.**, You, Y., Cremer, N., Simon, S., Thermal Anomalies along fault zones in the lower Rhine embayment as an indicator of preferential flow paths : Abstract, Oct 2007 GSA Denver Annual meeting, Vol. 39, No. 6.

\* Student Author

## **Grants Awarded**

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2019-2022	Proposal title:	PoreStudio: First Cloud-Based Reactive Flow Simulator
	PI:	Babak Shafei
	Sub-awardee:	Kuldeep Chaudhary
	Funding agency:	Department of Energy, DOE-SBIR
	Budget:	\$1.1M
	Sub-award:	\$ 90k
	Date Submitted:	Jan 26 <sup>th</sup> , 2019
	Status:	Awarded

- 2019-2021 Proposal title: ‘Data-Driven Module for Prediction of Materials Physical-Chemical Properties Using Machine Learning’
- PI: Babak Shafei  
 Sub-awardee: Kuldeep Chaudhary  
 Funding agency: National Science Foundation, NSF-SBIR  
 Budget: \$225k  
 Sub-award: \$ 15k  
 Date Submitted: June 8<sup>th</sup>, 2018  
 Status: Awarded
- 2017 -2018 Title: ‘A pilot field test on the osmotic phenomenon of naturally-occurring unconsolidated clay-rich geologic formations’
- PI: Kuldeep Chaudhary  
 Funding agency: Division of Research and Sponsored Programs, Kent State University  
 Budget: \$10,000  
 Status: Awarded
- 2017 -2018 Title: ‘*RtmApp*: A SaaS Application for Multiscale Reactive Transport Modeling’
- PI: Babak Shafei  
 Sub-awardee: Kuldeep Chaudhary  
 Funding agency: Department of Energy, DOE-SBIR  
 Budget Total: \$149k  
 Sub-award \$6k  
 Status: Awarded

### **Grants Submitted or Pending**

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- 2020-2022 Proposal title: ‘How surface roughness contributes to wettability and its alteration for geologic minerals’
- PI: Kuldeep Singh  
 Proposal agency: American Chemical Society, Petroleum Research Fund, ND Grant  
 Budget: \$110,000  
 Date Submitted: October 15<sup>th</sup>, 2020  
 Status: Pending
- 2019-2023 Proposal title: ‘How variations in properties of sedimentary rocks contribute to scaling of two-phase fluid hydraulics, such as trapping or removal of non-aqueous phase contaminants’
- PI: Kuldeep Singh  
 Proposal agency: Farris Family Innovation Awards, KSU  
 Budget: \$24,000  
 Date Submitted: January 31<sup>st</sup>, 2020  
 Status: not awarded

2017 -2018 Proposal title: ‘Lake White Reservoir Water Transfer, DNR180017’

PI: Weber Mitchell, Gannett Fleming Consulting Firm  
CO-PIs: Anne Jefferson, Kuldeep Chaudhary  
Proposal agency: ODNR  
Budget: \$875,000  
Sub-award to KSU: \$55,000  
Date Submitted: February 16<sup>th</sup>, 2018  
Status: Not Awarded

2018 -2018 Proposal title: “Role of media anisotropy on chemical-osmotic efficiency of fine grained hydrocarbon reservoir rocks’

PI: Kuldeep Chaudhary  
Proposal agency: American Chemical Society, Petroleum Research Fund, DNI Grant  
Budget: \$110,000  
Date Submitted: October 20<sup>th</sup>, 2017  
Status: Not Awarded

### **Fellowship and awards**

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- 2016 Center for Frontiers of Subsurface Energy Security (CFSES) research appreciation award, The University of Texas at Austin, Austin, TX
- 2012 Royal Norwegian Consulate and Petroleum Research School (PRS) of Norway research grant award
- 2012 J.A and K.G Jackson Fellowship grant for excellence in Hydrology, The University of Texas at Austin, Austin, TX
- 2012 1<sup>st</sup> prize for best oral presentation at NorTex conference on CO<sub>2</sub>-EOR, Rice University, Houston, TX
- 2012 Petroleum Research School of Norway TSW12 grant
- 2011 Exxon Mobile research fellowship grant
- 2010 Geological Society of America research grant (Outstanding Proposal award)
- 2009 Devon Energy fellowship grant for research in Hydrology
- 2001 CSIR-UGC certificate (NET) for Lectureship in India
- 2000 University of Delhi fellowship for Mine training at Zawar Group of mines, HZL, India
- 1998 ‘College Colors’ award from Hansraj College, University of Delhi, India

## Leadership and Service

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- 2019- University Fellowship Award Reviewer, Kent State University
- 2019 Member of the review committee for COMSOL conference 2019, Boston
- 2018- KSU representative for Consortium of Universities for the Advancement of Hydrologic Science (CUAHSI)
- 2017- Grant Proposal Reviewer: National Science Foundation, Ohio Water Resources Center
- 2017- Graduate Studies Committee member, Department of Geology, KSU
- 2014 – 2018 Peer reviewed Journal article reviewer: Water Resources Research, Geophysical Research Letters, International Journal of Greenhouse Gas Control, Computational Geoscience
- 2015 Mentor of an Intern at Geological Technology, ConocoPhillips. Advising on reaction transport simulations for evaluating carbonate diagenesis
- 2014 – 2015 Junior Achievement (JA) volunteer teacher at Houston, TX area middle schools.
- 2012 Session convener (H069), AGU fall 2012 meeting on Theoretical, Numerical and Experimental Advances in Pore Scale Investigation of Porous Media
- 2011 Mentor for an ESL program at UT, Austin
- 2009 – 2015 Mentor for TNT (The NeoGeo Trip), Jackson School of Geosciences, UT-Austin
- 2009 Seminar coordinator in Hydrogeology, Jackson School of Geosciences, UT-Austin
- 2007 Graduate representative: Indiana Geology Club, Indiana University, Bloomington, IN
- 1997 – 1998 President: Hansraj College Student's Union, University of Delhi, India

## Students Supervised – Mentored

**Department of Geology Students, serves as supervisor**

<i>Name</i>	<i>Level</i>	<i>Start Date</i>	<i>Current Status</i>	<i>Completion date</i>	<i>Graduation</i>
Shahidul Muzemder	M.S.	Fall 2018	graduated	August, 2020	Fall 2020
Jacob Bradley	M.S.	Fall 2018	M.S. Candidate	in progress	in progress
Konstantinos Kasamia	Undergrad	Fall 2017	graduated	Summer, 2019	Aug, 2019
Erika Hiwiller	M.S.	Fall 2019	M.S. Student	in progress	in progress
Shahidul Muzemder	Ph.D.	Fall 2020	Ph.D. Student	in progress	-
Alexander Miller	M.S.	Fall 2020	M.S. Student	in progress	-
Eric Lloyd	M.S.	Fall 2020	M.S. Student	in progress	-
Victor Obi	M.S.	Spring 2021	M.S. Student	in progress	-

**Graduate Students thesis/dissertation committee member/Examiner**

<i>Name</i>	<i>Level</i>	<i>Start Date</i>	<i>Current Status</i>	<i>Completion date</i>	<i>Graduation</i>
Nageen Farooq	Ph.D.	Fall 2020	Ph.D. Student	-	in progress
Bill Simco	Ph.D.	Fall 2019	Ph.D. Student	-	in progress
Zia ul Hassan	Ph.D.	Fall 2019	Ph.D. Student	-	in progress
Scarlett Henson	Masters	Fall 2018	M.S. Candidate	-	in progress
Edgar Ferguson	Masters	Fall 2018	M.S. Candidate	-	in progress
Jeffery Timmons	Masters	Fall 2017	M.S. Candidate	-	Dec, 2020
Lindsey Yazbek	Masters	Fall 2017	graduated	Jun-19	Jun, 2019
Taylor Judice	Masters	Fall 2017	graduated	Aug, 2019	Aug, 2019
Mary Plauche	Masters	Fall 2017	graduated	Jun-19	Jun, 2019
Rahian Chowdhury	Ph.D.	Fall 2017	Ph.D. Candidate	-	in progress
Maximilian Barczok	Ph.D.	Fall 2017	Ph.D. Candidate	-	in progress