

1 **Kansas State University Department of Geology**  
2 **Summary of Outputs and Achievements**  
3 **Advisory Council Meeting**  
4 **05 November 2021**

5 **Congratulations to Brice Lacroix—promoted to Associate Professor!**



Dr. Brice Lacroix was promoted this year from Assistant to Associate Professor with tenure in recognition of his distinguished reputation in structural geology and outstanding record of contribution to the Department of Geology through teaching, research, and service. Brice joined K-State in 2015, following a research fellowship at the University of Michigan. He is recognized by his colleagues for his strengths in field-based approaches, which he complements with an array of lab-based methodologies. His work on fluid-fault interactions is considered cutting edge and his recent work on clumped isotope systems is described by his colleagues as being at the forefront of his discipline. Dr. Lacroix has significantly expanded the analytical capabilities available to K-State students and faculty, having established the Structural Geology / Metamorphic Petrology research laboratory, which

23

24 includes Raman spectroscopy, fluid inclusion microthermometry, and reflected light microscopy. He is  
25 also responsible for the department's X-Ray Diffraction (XRD) facility. His most recent acquisition for the  
26 department is an NSF-funded Axios automated thin section scanner, which will establish K-State as a  
27 regional hub for the rapid production of thin section photomicrographs. The aim is to help geoscience  
28 faculty at K-State and other universities in our region to respond to the need for online delivery of courses  
29 that are microscopy based during the pandemic. Congratulations, Brice, and well done!

30 **Colleen Gura joins K-State Geology as new instructor and undergraduate advisor**

31 Colleen Gura is a new instructor in our department. She has  
32 been a part of Kansas State University as both a student and  
33 now a faculty member since 2014. She joined the department  
34 as a teaching assistant professor in August of 2021 while she  
35 is finishing her Ph.D. in Geography and Geospatial Science at  
36 K-State where she is researching various aspects of  
37 weathering processes across the Flint Hills. She has a Master's  
38 in Geology (2016) and a B.S. in Secondary Education, Earth  
39 Science (2004) also from K-State. Between her B.S. and



40 Master's, she spent 10 years teaching various science courses at Jack Britt High School in Fayetteville,  
41 NC. At K-State, she teaches the introductory courses Earth in Action and Natural Disasters, is the  
42 undergraduate advisor, and is the GTA instructional mentor. Her main research interests are centered  
43 on weathering processes and how they operate on both rock and soil. She is especially focused on the  
44 impacts of both physical and chemical weathering on hillslope evolution, weathering rates, the  
45 geochemistry of weathered minerals, nutrient cycling, and pedogenesis.

46 **The department welcomes post-doctoral researcher Dr. Morteza Heydari**



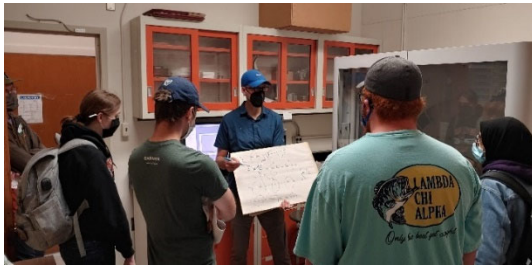
Morteza Heydari, who received his PhD in Mechanical Engineering from University of North Texas, recently joined the Porous Media Research Lab. He works with Dr. Behzad Ghanbarian to model reactive transport in individual fractures. This project, funded by Saudi Aramco, will contribute to better understanding of the effect of hydraulic fracturing treatments on liquid permeability. The study aims to facilitate simulations of fluid flows through unconventional reservoirs and further understand their physics, which will eventually contribute to oil and gas exploration and production industry.

56 **We're sorry to see them go...**

57 Last year we saw the departure of Dr. Aida Farough (Teaching Assistant Professor and Undergraduate  
58 Advisor), Dr. David Pompeani (Instructor) and Ms. Debra Wilcox (Office Specialist). We wish them all the  
59 best in their future endeavors.

60 **Recruitment and Retention**

61 **Introducing undergraduates to Geology labs**



Our department has seen a significant drop in enrollment over the past five years, as have many others nationwide, and the downward trend has only been exacerbated by the COVID-19 pandemic. The number of undergraduate majors has dropped by nearly 50% since 2015. Faculty members—and graduate students—are engaging in a variety of activities to increase outreach to, at least in part, enhance enrollment. Descriptions of outreach plans for graduate students are provided in a separate report, but here we wanted to highlight one recent effort, led by Dr. Matthew Kirk. Students from our intro geology classes were provided with tours of our labs and other analytical facilities to show them that Geology uses cutting edge

*Lab demonstrations for undergraduate students from intro geology classes. Top photo Matt Brueseke describing operation of the XRD lab and bottom photo of Matt Kirk explaining what goes on in the geochemistry lab.*

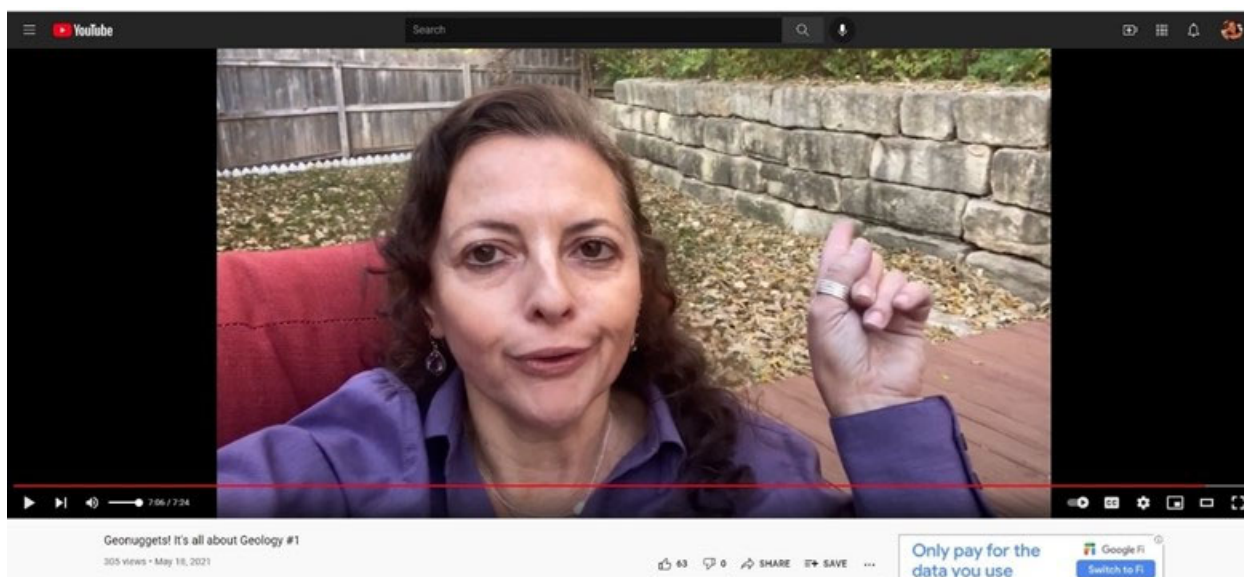
75 technology, just like other science disciplines! The tour also helped the students see the many different  
76 sides of geology. ***Geology rocks but there is more to it than that!***



*Lab demonstrations of the Raman lab by Brice Lacroix (above left), of sedimentary petrology by Karin Goldberg (above middle) and of ground-penetrating radar data acquisition and processing (by Abdelmoneam Raef and Papa Owusu) and seismic reflection data visualization (by Abdelmoneam Raef and Cody Totten) (above right).*

77 **Get your 'Geonuggets' here...**

78 Dr. Goldberg has been using YouTube for science education and promotion of the geosciences. With the  
79 series "Geonuggets", she periodically posts videos that depict and explain geological facts we may  
80 encounter in our daily lives. Her first "Geonugget" video introduces the series and how what we can grasp  
81 about the past environments from looking at limestones in a retaining wall  
82 (<https://www.youtube.com/watch?v=4i4qXSvhNus>). The next Geonugget videos are expected to be  
83 posted in late Fall 2021 (#2 "Caves and Sinkholes") and in Spring 2022 (#3 "Drilling for oil").



84 ***Karin in her garden explaining the geology of the limestones in her garden wall.***



85

## Research and Impact Highlights

86

### Searching the virtual world



#### Grossular garnet (rhomb-dodecahedron crystal)

3D Model



Museum of Mineralogy and Petrography, UAIC PREMIUM

FOLLOW

413

★ 3

87 As part of the NSF funded RAPID proposal “Collaborative Proposal: Development of Digital Models of  
 88 Minerals and Rocks for Online Geoscience Classes”, **Dr. Matt Brueseke** and Univ. West Virginia colleague  
 89 Graham Andrews created a searchable database\* for 3D digital models of rocks and minerals. The  
 90 models are all hosted on Sketchfab.com and the search tool is based on a Google Doc file. Sketchfab is a  
 91 3D- and AR-hosting platform. Thousands of 3D digital models are hosted on the site, including rock,  
 92 minerals, and fossils. As a response to the switch to remote teaching in 2020-21, Brueseke and Andrews  
 93 wrote a successful NSF proposal to develop the database and also promote models via social media  
 94 (e.g., Twitter and Instagram - Rocking3DResources, @Rocking3D is the account name for both).  
 95 Sketchfab models, when carefully rendered, are amazingly accurate examples of rocks and minerals.  
 96 While obviously not the same thing as an actual hand sample, these virtual hand samples provide  
 97 anyone the ability to view, in 3D, an exact depiction of real hand samples (see garnet in the image  
 98 above), thus helping students who do not have access to real mineral and rock samples.

99 \*Searchable Sketchfab.com rock & mineral catalog, 2020, Andrews, G., **Brueseke, M.**, Himelstein, A,  
 100 McFarland, R.I. A searchable catalog of 3D digital models hosted on Sketchfab.com. Rock & mineral  
 101 catalog (Version 1.0) [Data set]. Zenodo. <https://zenodo.org/record/3988525#.YWWzpXIOnBI>

102

103 Fate of CO<sub>2</sub> in a tallgrass prairie watershed at Konza Prairie

104 Groundwater is a major sink for CO<sub>2</sub> generated in soils.  
105 Along groundwater flow, mineral weathering and  
106 microbial reactions consume some portion of the CO<sub>2</sub>,  
107 limiting the amount that can be emitted to the  
108 atmosphere where the groundwater discharges. To better  
109 understand the fate of CO<sub>2</sub> in carbonate terrains, Geology  
110 MS student **Katherine Andrews** and other members of  
111 **Dr. Kirk's** research group have been monitoring the  
112 chemistry of surface water and groundwater at one of the  
113 watersheds within Konza Prairie as part of the Long-Term  
114 Ecological Research (LTER) project funded by NSF. Results  
115 collected over the past year demonstrate that most  
116 recharge occurs in late spring (May) and that  
117 groundwater residence times in the shallow carbonate  
118 aquifers are on the order of a few decades. During that  
119 time, the groundwater equilibrates with carbonate  
120 minerals and an average of 60% of the CO<sub>2</sub> added during  
121 recharge is consumed by mineral weathering. Ongoing  
122 work seeks to better understand the losses of CO<sub>2</sub> from  
123 stream water, transport of CO<sub>2</sub> and bicarbonate into the  
124 subsurface below the watershed base level, and impacts  
125 of woody encroachment on groundwater residence time  
126 and subsurface CO<sub>2</sub> storage.



*Katherine Andrews, Brooklyn Armijo, and Camden Hatley sampling groundwater at Konza Prairie during late summer 2020.*

127 Rock typing using relative permeability data

128 Most rock typing methods available in the literature are based on single-phase measurements of  
129 petrophysical properties of rocks. Among them, porosity and permeability have been widely used to  
130 detect various rock types. However, single-phase experiments do not incorporate the effect of  
131 wettability or contact angle, which plays a key role on multi-phase fluid flow and transport in reservoir  
132 rocks. Under the supervision of **Dr. Behzad Ghanbarian**, MSc student **Brandon Yokeley** developed a  
133 novel theoretical approach using critical path analysis to classify rocks based on their similarities in  
134 critical pore-throat radii. This means rocks with similar critical pore-throat radii at the same effective  
135 water saturation are grouped together. To evaluate the proposed approach, Yokeley et al. (2021)  
136 simulated flow in pore networks with many different pore-scale properties. By varying the pore-throat  
137 size distribution, contact angle, pore coordination number, pore-shape distribution, and clay content,  
138 they generated a wide range of pore networks. Overall, two-phase flow in 240 pore networks were  
139 simulated. In addition to synthetic pore networks, pore networks were generated based on properties  
140 of the Berea, Mt. Simon, and Fontainebleau sandstones. By determining the critical pore-throat radii at  
141 various saturations, Yokeley et al. (2021) identified 12 rock types using the two-phase relative

142 permeability data (Fig. 1). Their work was published in the Society of Petroleum Engineers Journal (SPE  
143 J).

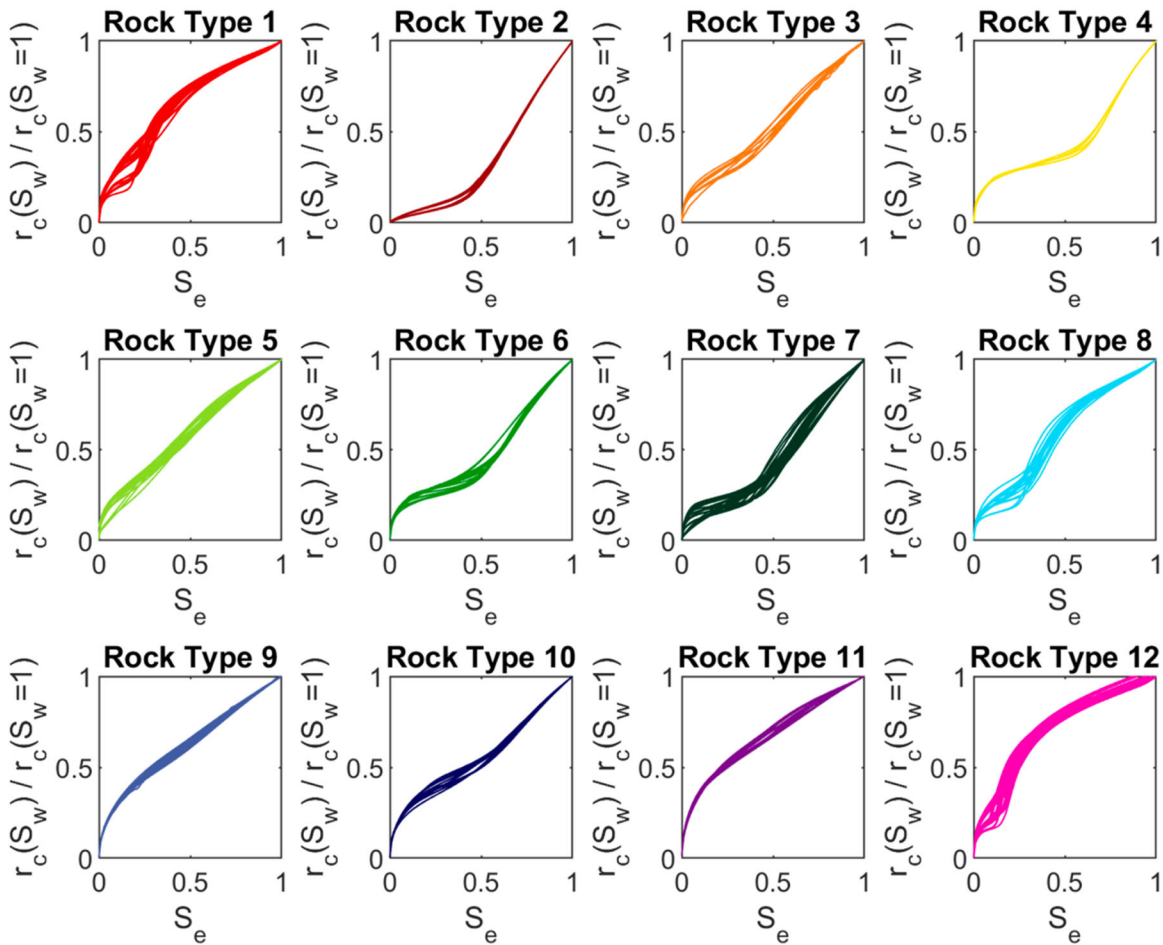


Figure 1. Normalized critical pore-throat radius against effective water saturation for twelve representative rock types within the studied database (after Yokeley et al., 2021; SPE J).

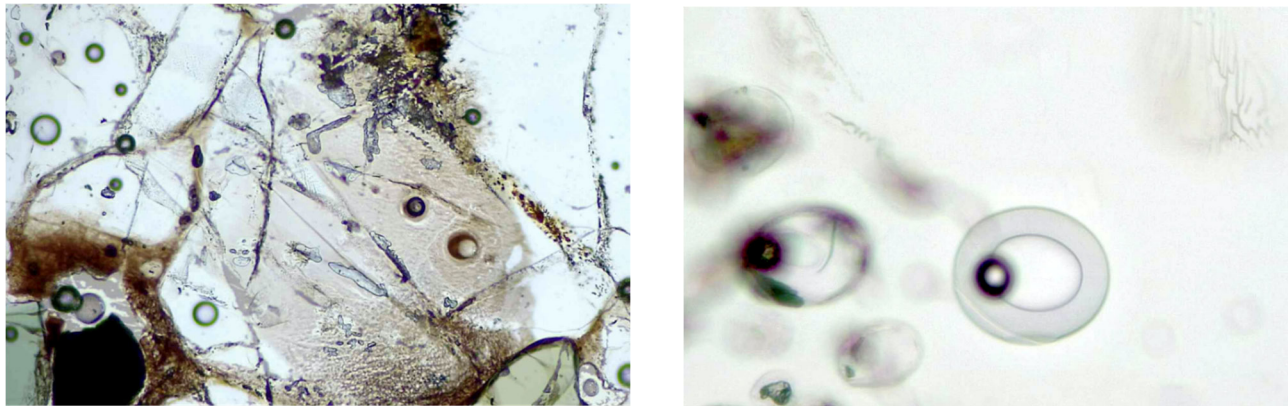
## 144 1.6 billion years of history in the lower crust of SE Arizona.

145 Knowledge of the lower crust is essential for understanding the tectonic evolution of cratons. Yet its  
146 relative inaccessibility makes it the part of the lithospheric column about which we know the least.  
147 Xenoliths brought to the surface in basaltic magmas, therefore, provide valuable insights into the  
148 composition, age, and structure of the deep crust that are otherwise difficult to obtain and provide a link  
149 between surface exposures and geophysical data. **Dr. Pamela Kempton** and graduate students **Mikaela**  
150 **Rader** and **Carrie Brooks** are using xenoliths entrained in Quaternary-age alkaline volcanics from the  
151 Geronimo Volcanic Field (GVF) of SE Arizona to investigate the timing and mechanisms of lower crustal  
152 growth and evolution of the southern Basin and Range. U-Pb zircon geochronology yields three main age  
153 peaks for the granulites at ~1.64-1.65 Ga, ~1.48-1.42 Ga, and ~76-2 Ma (with a peak between 35 – 23 Ma  
154 for the latter). The oldest ages are consistent with the timing of formation of the Mazatzal terrane in which



155 GVF is located. However, metadiorites, previously inferred to be ~1.4 Ga on the basis of whole rock Nd  
156 model ages, yield zircon U-Pb ages ranging from ~76 to 2 Ma, with most concentrated between 35-25 Ma.  
157 These Eo-Oligocene ages indicate substantial reworking of the lower crust in response to Farallon slab  
158 subduction.

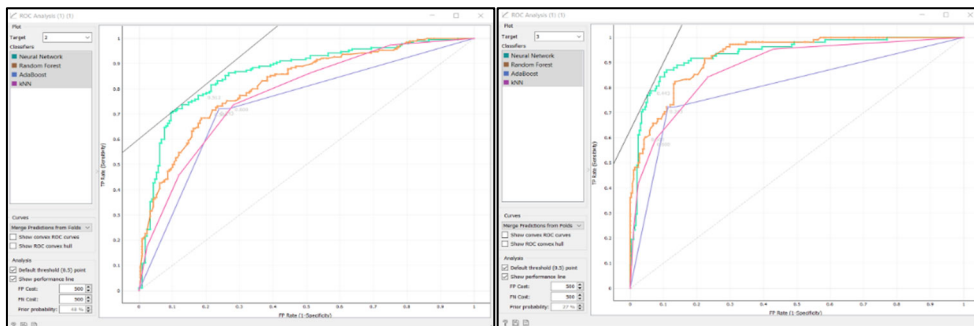
159 **Carrie Brooks** will be following on from this geochronological work by studying rare melt inclusions found  
160 in the granulites. Melt inclusions are rare in rocks of this type, but they are surprisingly abundant in some  
161 GVF granulite xenoliths (see figure below). Moreover, the mid-Tertiary age peak (35-23 Ma) of these  
162 granulites is consistent with the age of rhyolitic ignimbrites in the nearby Chiricahua Mts and the mid-  
163 Tertiary ignimbrite flare-up across western North America in general. Carrie will be testing the hypothesis  
164 that the melt inclusions are related to this major crustal melting event.



*Photomicrograph (left) in plane-polarized light (10X) of a metadiorite xenoliths containing abundant fluid / melt inclusions. Close-up (40X) photo micrograph in plane-polarized light of a melt inclusion with a clear glass rim that contains a vapor bubble. The host mineral in both photos is plagioclase.*

### 165 Machine learning applied to predicting well log lithofacies

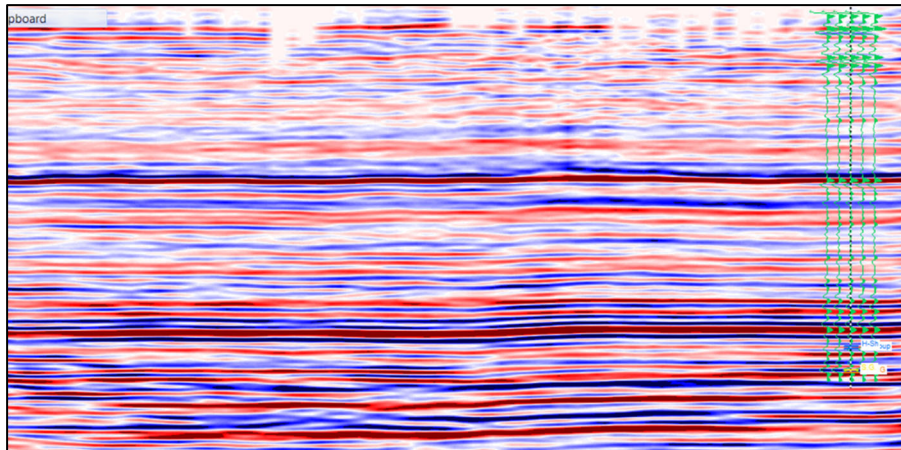
166 **Dr. Abdelmoneam Raef** has been investigating the impact of utilizing multi-resolution analysis based on  
167 discrete wavelet transform analyses of geophysical well-logs (GWL) to boost the accuracy of machine  
168 learning models in predicting well-logs lithofacies. The results of this research pave the way for  
169 generalizing a workflow for improved machine learning models where complex input parameters hinder  
170 prediction accuracy. This research is impactful in transfer learning AI applications to frontier exploration



*The receiver operating characteristic (ROC) curves for four ML models before (left) and after incorporating multi-resolution analysis (MRA) components; improvement after MRA is evident especially for artificial neural networks (ANN) and Random Forest (RF) models*

171 areas, where GWL data are limited and/or noisy, and are potentially beneficial to seismic  
172 stratigraphy/lithofacies analysis based on seismic attributes.

173 Dr. Raef has also been working on improving near-surface statics corrections for improved structural  
174 fidelity of 3D seismic data. This work has resulted in robust estimates of statics corrections that were  
175 applied to interpreted horizons of the Vibroseis land 3D seismic dataset of the Custer Valley survey. This  
176 research is beneficial to legacy data reprocessing and to improving reservoir-properties' effects on  
177 seismic attributes, with particular relevance to amplitude and time attributes.



*A seismic reflection data section from the Custer Valley with a 1D synthetic model overlay; the amplitude modulation is partly caused by residual time statics that has not been corrected before 3D stacking of the common-bin gathers*

## 178 From ice sheets and earthquakes to the Anthropocene

179 Graduate student **Vidhesh Shukla** joined **Dr Joel Spencer**'s luminescence group at the beginning of  
180 Spring 2021 to continue research on our ongoing project to refine the chronology of the southeastern  
181 Flathead Lobe of the Cordilleran Ice Sheet. During summer fieldwork sediment samples were collected  
182 from moraine deposits, glacial lake deposits, glacial lake outwash, and glacial till from localities  
183 consistent with the position of the furthest extent of the Flathead Lobe in northwestern Montana.  
184 Quartz and feldspar grains have been prepared from the sediment samples and luminescence analyses  
185 are currently in progress.

186 A collaborative luminescence dating program has also continued in 2021 with Turkish colleagues from  
187 Dokuz Eylül University (DEU), İzmir and Ankara. Luminescence analyses are providing chronological data  
188 in the following two quite different ways: firstly, to earthquake hazard assessment with application to a  
189 series of paleoseismic projects to constrain Late Pleistocene to Holocene movement of a number of  
190 faults in and around the İzmir region in western Turkey; and, secondly to studies of the timing of the  
191 Anthropocene and anthropogenic pollution in the eastern Black Sea basin. Results from these studies  
192 were presented in a series of talks at the 73<sup>rd</sup> Geologic Congress of Turkey in May 2021. Dr. Mustafa  
193 Softa (DEU) resubmitted a proposal to the Marie Skłodowska-Curie Fellowship program (part of the EU  
194 Horizon 2020 funding initiative) in early October 2021, and we hope to welcome him back to K-State to  
195 develop luminescence dating methods on samples from exposed fault surfaces in the İzmir region.

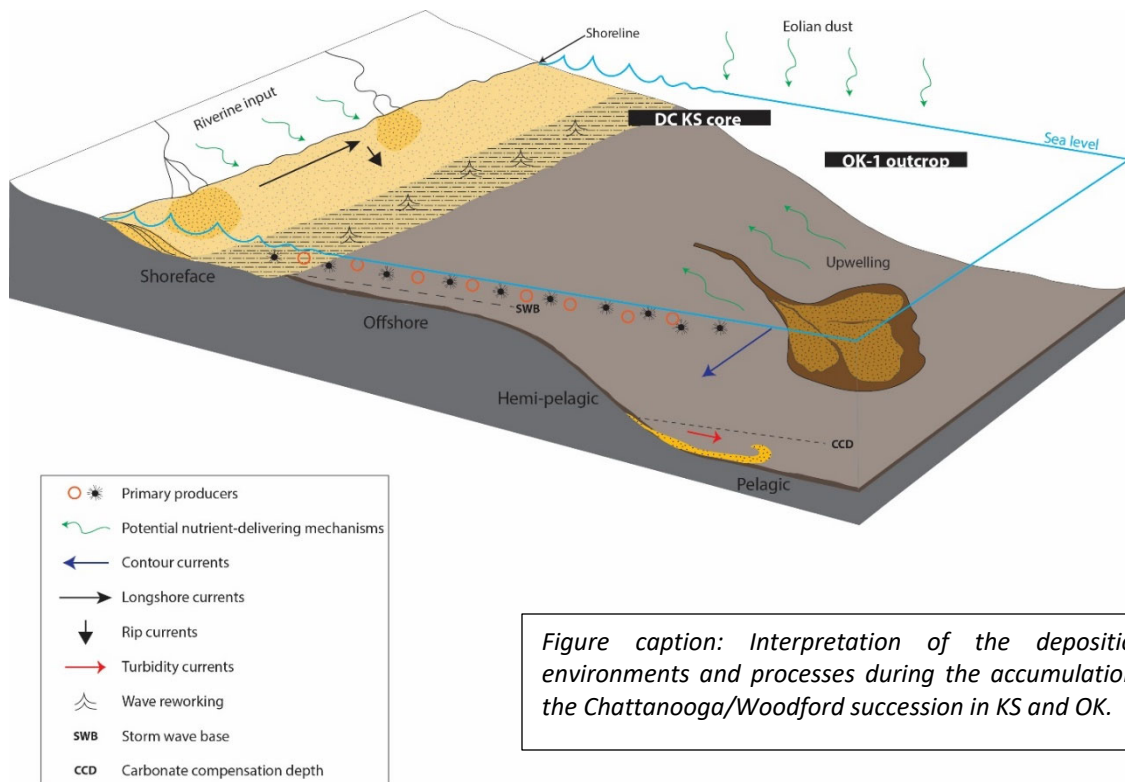


196 **Source rock and reservoir characterization**

197 **Dr. Karin Goldberg's** research continues to focus on the integration between sequence and chemo  
198 stratigraphy in the Woodford/Chattanooga, aiming to understand the primary controls on accumulation  
199 of organic matter in the sediments and establishing a stratigraphic framework that can be used to predict  
200 the occurrence of source rocks. Her project so far has shown that organic flux is more important than  
201 redox conditions for the accumulation of organics. Nutrients brought in by rivers (augmented by other  
202 mechanisms, such as upwelling and/or eolian input) may trigger a bloom of primary producers, which  
203 result in oxygen consumption and anoxia.

204 She has also been working on the characterization of reservoir quality in carbonate rocks. She concluded  
205 a study in Cambrian dolostones of the Tarim Basin in China and another one in Cretaceous carbonates of  
206 the Campos in Brazil. She is currently analyzing the facies and reservoir quality of carbonates in the Atokan  
207 and Cherokee in Scott Co., KS.

208



209 **Modelling the stress field along continental rifts from tomography models**

210 Passive margins created by rifting of the continental lithosphere are economically important, because  
211 they are prolific sources for oil and gas. Better understanding of the tectonic phenomena that have  
212 shaped them is required for conducting broad, integrative thinking in basin analysis. It may therefore  
213 facilitate our efforts to explore for these valuable natural resources. Despite the tremendous progress  
214 that has been made over the last 40 years in data acquisition techniques and the design of complex

215 analogical, analytical and numerical models, some questions remain unanswered. The role of mantle  
216 processes on rift initiation and propagation, for example, is still debated.

217 **Dr. Claudia Adam** has been funded by the American Chemical Society – Petroleum Research Fund to use  
218 highly resolved tomography models to model the instantaneous mantle flow under three regions: the  
219 Baikal rift, the central East African rift, and the Afar triple junction. This modeling allows the  
220 computation of the dynamic topography, the geoid/gravity anomalies, the stresses induced in the  
221 lithosphere, and the inferred tectonic regimes. These model outputs will be compared to surface  
222 observations in order to calibrate the models, and to quantitatively infer the role of the mantle on the  
223 observed surface deformation. Two undergraduate students, **Heath Parmenter** and **Shawn Kennedy** are  
224 working with Dr. Adam on the project.

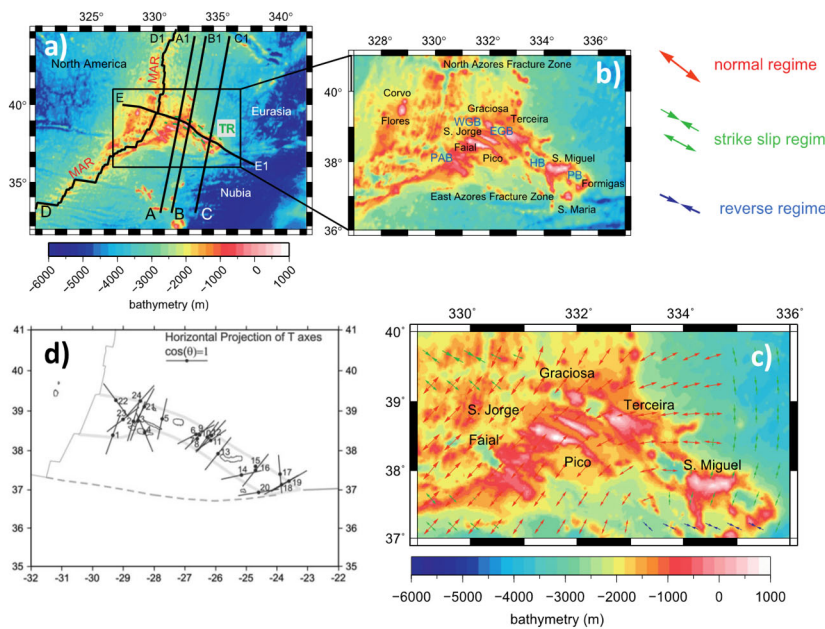


Figure caption: Example of the stresses induced by mantle dynamics in an oceanic rift (Terceira Rift in the Azores) (a) and (b) Bathymetry and names of the bathymetric and topographic features. (c) Tectonic regimes and horizontal shear stress computed from our convection model. (d) T axis computed from focal mechanism (Borges et al., 2007).

## 225 A multidisciplinary approach applied to gold exploration

226 **Dr. Brice Lacroix** has received international recognition for his work  
227 investigating the role of deformation in polyphase orogenic Au-deposits  
228 (Canada, USA, South America, East and North Africa, Europe). This  
229 research integrates field-based structural analysis coupled with airborne  
230 geophysics, petrography and geochemical methods, in order to develop  
231 accurate tectonic and mineralization models for the deposits. The work  
232 is funded predominantly by exploration companies and the South  
233 American Exploration Initiative. Dr. Lacroix is currently co-advising three  
234 international graduate students in association with this work (Alexandre  
235 Gitzhoffer, UQAM, Pierre Jean Hainque, University of Franche Comté,  
236 and Alix Hauterive, GeoRessources).



237 Dr. Lacroix is also investigating the tectonic related diagenetic history of the Arbuckle group, exposed in  
238 the Arbuckle Mountains, OK. His students **Hallie Bruce**, **Madeline Hakers** and **Jayden Payne** are  
239 decrypting the complex tectonic evolution of this uplift using field-based structural geology analysis,  
240 coupled with the novel  $\Delta 47/U$ -Pb thermochronometry approach. Current results indicate that the  
241 Arbuckle orogeny, which started during the Pennsylvanian, lasted until Late-Permian.

#### 242 Sound bites from Dr. B

243 Hi all – just a brief note. Clearly, we are still all hanging in here, re: the COVID-19 pandemic and associated  
244 disruptions. We (my student mentees and I) have continued to work on intraplate volcanism, arc  
245 volcanism, and metal(loid) behavior in epithermal sinter deposits. Colleagues and I just had a paper  
246 accepted in the GSA journal Geosphere that provides constraints on the timing and spatial evolution of  
247 the Alaskan Wrangell arc (home to many of the tallest mountains and largest volcanoes in North America).  
248 Current M.S. students **Alyssa Endrich** and **Alex Karrasch** have been working hard on trying to understand  
249 the petrogenesis of Cenozoic volcanic rocks in southwest MT and northwest WY, and how these  
250 magmatic products are linked to Yellowstone hotspot-induced lithosphere extension (via NSF funding).  
251 Current M.S. student **Alex Bearden** and I have started a new project in south-central Alaska focused on  
252 understanding how magmatism occurs along tears in subducting slabs.

253



254 **Publications (peer reviewed)**

- 255 **Adam C.**, King, S. and Caddick, M. (2021) Mantle temperature and density anomalies: the influence of  
256 thermodynamic formulation, melt, and anelasticity. *Physics of the Earth and Planetary Interiors*  
257 <https://doi.org/10.1016/j.pepi.2021.106772>
- 258 **Adam, C.**, Vidal, V., \*Pandit, B., Davaille, A. and **Kempton, P.D.** (2021) Lithosphere destabilization and  
259 small-scale convection constrained from geophysical data and analogical models. *Geochemistry,*  
260 *Geophysics, Geosystems* e2020GC009462, <https://doi.org/10.1029/2020GC009462>
- 261 Alvarenga, R.S., Kuchle, J., Scherer, C.M.S., **Goldberg, K.**, Iacopini, D., Ene, P., Pantopoulos, G. (2021)  
262 Tectonic and stratigraphic evolution based on seismic sequence stratigraphy: rift section of the  
263 Campos Basin, offshore Brazil. *Geosciences* 11, 338. [https://www.mdpi.com/2076-](https://www.mdpi.com/2076-3263/11/8/338)  
264 [3263/11/8/338](https://www.mdpi.com/2076-3263/11/8/338)
- 265 Armelenti, G., **Goldberg, K.**, Alvarenga, R., Kuchle, J., Amarante, F.B., Scherer, C.M., Conceição, J.C.,  
266 Alves, J.L.D., De Ros, L.F. 2021. Depositional and diagenetic impacts on the porosity of post-salt  
267 carbonate reservoirs of southern Campos Basin, southeastern Brazilian margin. *Journal of South*  
268 *American Earth Sciences* 112: 103566.
- 269 Brookfield, A.E., Hansen, A.T., Sullivan, P.L., Czuba, J., **Kirk, M.F.**, Li, L., Newcomer, M.E., Wilkinson, G.  
270 (2021) Predicting algal blooms: Are we overlooking groundwater? *Science of the Total*  
271 *Environment* 769, 144442.
- 272 Choi, B.Y., Park, J., Ham, B., **Kirk, M.F.**, Kwon, M.J. (accepted) Effect of CO<sub>2</sub> on biogeochemical reactions  
273 and microbial community composition in bioreactors with deep groundwater and basalt. *Science*  
274 *of the Total Environment*
- 275 \*Esmailpour, M., **Ghanbarian, B.**, Liang, F., and Liu, H. H. (2021) Scale-dependent permeability and  
276 formation factor in porous media: Applications of percolation theory. *Fuel* 301, 121090.
- 277 Farrell, U.C., Samawi, R., Anjanappa, S., Klykov, R., Adeboye, O., Agic, H., Ahm, A.-S.C., Boag, T.H.,  
278 Bowyer, F.T., Brocks, J.J., Brunoir, T.N., Canfield, D.E., Chen, X., Cheng, M., Clarkson, M.O.,  
279 Cordie, D., Crockford, P.W., Cui, H., Dahl, T.W., Del Mouro, L., Dewing, K., Dornbos, S., Drabon,  
280 N., Dumoulin, J.A., Emmings, J.F., Endriga, C., Fraser, T., Gaines, R.R., Gaschnig, R., Gibson, T.,  
281 Gilleaudeau, G.J., **Goldberg, K.**, Guilbaud, R., Halverson, G.P., Hammarlund, E.U., Hantsoo, K.G.,  
282 Henderson, M., Hodgskiss, M.S.W., Horner, T.J., Husson, J., Johnson, B.W., Kabanov, P., Keller,  
283 C.B., Kimmig, J., Kipp, M.A., Knoll, A.H., Kreitsmann, T., Kunzmann, M., Kurzweil, F., LeRoy, M.A.,  
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286 A., Paiste, K., Partin, C.A., Peters, S.E., Playter, T., Plaza-Torres, S., Porter, S., Poulton, S.W.,  
287 Pruss, S.B., Richoz, S., Ritzer, S.R., Rooney, A.D., Sahoo, S., Schoepfer, S.D., Scalfani, J.A., Shen, Y.,  
288 Shorttle, O., Slotznick, S., Smith, E., Spinks, S.C., Stockey, R.G., Strauss, J.V., Stüeken, E.E.,  
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290 Wilby, P., Woltz, C., Wood, R.A., Yurchenko, I., Zhang, T., Planavsky, N.J., Lau, K.V., Johnston,  
291 D.T., and Sperling, E.A. (2021) The Sedimentary Geochemistry and Paleoenvironments Project.  
292 *Geobiology* 00: 1-12. <https://doi.org/10.1111/gbi.12462>
- 293 Gaur, A., Xiang, W., Nepal, A., Chen, P., **Lacroix, B.**, Sorensen, C., Das, S. (2021) Graphene Aerosol Gel  
294 Ink for Printing Micro-Supercapacitors. *ACS Nano* 4,8 7632-7641  
295 [doi.org/10.1021/acsaem.1c00919](https://doi.org/10.1021/acsaem.1c00919)
- 296 **Ghanbarian, B.** and \*Yokeley, B. A. (2021) Soil classification: A new approach for grouping soils using  
297 unsaturated hydraulic conductivity data. *Water Resources Research*  
298 [doi.org/10.1029/2021WR030095](https://doi.org/10.1029/2021WR030095).

299 **Ghanbarian, B.** (2021) Unsaturated hydraulic conductivity in dual-porosity soils: Percolation theory. *Soil*  
300 *and Tillage Research* 212, 105061.

301 **Ghanbarian, B.**, and Male, F. (2021) Theoretical power-law relationship between permeability and  
302 formation factor. *Journal of Petroleum Science and Engineering* 198, 108249.

303 **Ghanbarian, B.**, Hunt, A. G., Bittelli, M., Tuller, M. and Arthur, E. (2021) Estimating specific surface area:  
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- 342 Trop, J.M., Benowitz, J.A., Kirby, C. and **Brueseke, M.E.** (2021) Geochronology of the Wrangell Arc:  
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344 transition, Alaska-Yukon: *Geosphere*. [https:// doi.org/10.1130/GES02417.1](https://doi.org/10.1130/GES02417.1).
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347 *29(10)*, 14201-14207. Doi.org/10.1364/OE.419074
- 348 \*Yokeley, B. A., **Ghanbarian, B.**, and Sahimi, M. (2021) Rock typing based on wetting-phase relative  
349 permeability data and critical pore sizes. *SPE Journal* doi.org/10.2118/206715-PA.

350 \* denotes K-State Geology student or post-doc

### 351 **Book chapters**

- 352 **Ghanbarian, B.** (2021) Estimating single-phase permeability of porous media using critical-path analysis.  
353 In *Encyclopedia of Complexity and Systems Science*, Springer, Berlin, Heidelberg.
- 354 **Ghanbarian, B.** and Hunt, A. (2021) Modelling flow and transport in variably saturated porous media:  
355 Applications from percolation theory and effective-medium approximation. In *Modelling of Flow and*  
356 *Transport in Fractal Porous Media* (pp. 79-117), Elsevier, Amsterdam.
- 357 Hunt, A., Yu, F., & **Ghanbarian, B.** (2021). Application of percolation theory to reaction and flow in  
358 geochemical systems in soil and rock. In *Encyclopedia of Complexity and Systems Science* (pp. 289-  
359 321), Springer, Berlin, Heidelberg ([link](#)).

### 360 **Invited Presentations and Lectures**

- 361 **Brueseke, M.E.** (2021) Geoscience research in Mineralogy/Igneous Petrology. Olathe Geoscience  
362 Academy (Olathe North high school, Olathe, KS), October 6th.
- 363 **Ghanbarian, B.** (2020) Advances in modeling soil hydraulic properties, Short course, Tarbiat Modares  
364 University, December
- 365 **Ghanbarian, B.** (2020) Single- and two-phase rock typing, PoreLab Lecture Series, Norwegian University  
366 of Science and Technology, November
- 367 **Ghanbarian, B.** (2021) Non-reactive solute transport and its modeling in porous media, Water and Soil  
368 Environmental Research Institute, University of Tehran, Mar. 2021
- 369 **Ghanbarian, B.** (2021) Modern techniques in geosciences: Applications from statistical physics and data  
370 sciences, South Dakota School of Mines and Technology, March
- 371 **Ghanbarian, B.** (2021) Scale dependence of hydraulic and electrical conductivities in saturated porous  
372 media, UT San Antonio, February
- 373 **Goldberg, K.** (2021) Facies and depositional model of the Midcontinent Rift System (MRS) in Kansas,  
374 USA. Webinar, Post-Graduate Program in Geosciences at Universidade Federal do Rio Grande  
375 do Sul (Brazil), July
- 376 **Kirk, M.F.** (2020) Connections between land use, soil microbiology, and groundwater microbiology in an  
377 agricultural landscape. University of Texas at San Antonio, Department Seminar, October 23<sup>rd</sup>
- 378 **Kirk, M.F.** (2021) Iron reduction: a slippery rung on the thermodynamic ladder. Colorado School of  
379 Mines Department of Environmental Engineering, Department Seminar, March 26<sup>th</sup>.



- 380 **Lacroix, B., Kempton, P. and Brueseke, M.** (2021) PetCAT-Scan: a new tool for quantitative petrography  
381 in the COVID-19 pandemic and beyond: Geological Society of America Abstracts with Programs,  
382 v. 53. (Brueseke invited, Lacroix gave talk - session T67. The Lasting Effects of the 2020–2021  
383 COVID-19 Crisis on Geoscience Education: Insights, Problems, and Unanticipated Benefits I).
- 384 **Spencer, J.Q.G.** (2021) Invited Keynote: Constraining sedimentary dates and rates of the Anthropocene  
385 using OSL geochronology. 73<sup>rd</sup> Geological Congress of Turkey, Online, May 24-28, 2021.

386 \* denotes K-State Geology student or post-doc

## 387 **Conferences: Presentations, Abstracts, Session Chairs, and Field Trip Leaders**

- 388 \*Adeyemi, B., **Ghanbarian, B.** and Winter, C. L. (2020). Determining effective permeability at the  
389 reservoir scale: Numerical simulations compared with critical path analysis. *American*  
390 *Geophysical Union Fall Meeting*, San Francisco CA, December 1-17.
- 391 Andrews, G., **Brueseke, M.**, Himelstein, A, McFarland, R.I. (2020) A searchable catalog of 3D digital  
392 models hosted on Sketchfab.com. Rock & mineral catalog (Version 1.0) [Data set]. Zenodo.  
393 <https://zenodo.org/record/3988525#.YWWzpXlOnBI>
- 394 Andrews, G., Isom, S., **Brueseke, M.**, Labishak, G., Pettus, H., and Gunzelman, C. (2021) Getting to grips  
395 with untouchable samples: online 3D geological specimen models on Sketchfab.com: *Geological*  
396 *Society of America Abstracts with Programs*, v. 53.
- 397 \*Andrews, K., **Kirk, M.F.**, Happell, J.D., Hatley, C., Sandwick, M., Nippert, J. (2021) Fate of CO<sub>2</sub> in tallgrass  
398 prairie watershed underlain by merokarst bedrock, Konza Prairie, Kansas, USA. *Geological*  
399 *Society of America South-Central-North-Central Combined Regional Meeting*. Virtual event, April  
400 19.
- 401 \*Armijo, B., Dotson, A., Randel, E.J., Hansen, J., Hathcock, K., **Kirk, M.F.** (2021) Quality of Groundwater  
402 from Domestic Wells in the High Plains Aquifer, South-Central Kansas, USA. *Society for*  
403 *Advancement of Chicanos/Hispanics and Native Americans in Science*. Virtual event, October 25.
- 404 \*Armijo, B., Matanis, A., Armijo, J., Cauley, S., Dotson, A., Randel, E.J., Hansen, J., Hathcock, K., **Kirk, M.F.**  
405 (2021) Quality of Groundwater from Domestic Wells in the High Plains Aquifer, South-Central  
406 Kansas, USA. *Kansas Governor's Water Conference*. Virtual event.
- 407 **Brueseke, M.** (2020) Session Co-Convener, Granites and Rhyolites as a Record of Crustal Magmatic  
408 Processes T15 (2020 GSA combined South-Central and North-Central sections meeting, virtual).
- 409 **Brueseke, M.** (2020) Session Co-Convener, Ultramafic and mafic magmatism T16 (2020 GSA combined  
410 South-Central and North-Central sections meeting, virtual).
- 411 **Brueseke, M.** (2021) Session Co-Convener, From the Afar Rift to Alaskan Arcs (and the Oregon Plateau in  
412 between): Honoring the Career and Contributions of William K. Hart T21 (2021 GSA Annual  
413 Meeting, Portland, OR)
- 414 **Brueseke, M.** (2021) Contribution to National Academies of Sciences, Engineering, and Medicine. 2021.  
415 *America's Geoheritage II: Identifying, Developing, and Preserving America's Natural Legacy:*  
416 *Proceedings of a Workshop*. Washington, DC: The National Academies Press., 47p.  
417 <https://doi.org/10.17226/26316>

418 **Brueseke, M.**, Benowitz, J. and Miggins, D.P. (2021) Newly recognized monogenetic volcanism in south-  
419 central Alaska (U.S.A.): the Maclaren River volcanic field and implications for the architecture of  
420 the subducting Yakutat slab: *Geological Society of America Abstracts with Programs*, v. 53.

421 **Brueseke, M.E.**, \*Green, S.M., \*Endrich, A., \*Walters, B.J., \*Fenner, E.R., \*Karrasch, A.K. and Benowitz,  
422 J.A. (2021) Off-track Yellowstone hotspot basalt volcanism north of the eastern Snake River  
423 plain: physical and chemical constraints on a monogenetic volcano in the Centennial Valley,  
424 Montana: *Geological Society of America Abstracts with Programs*, v. 53.

425 **Brueseke, M.E.**, \*Manselle, P., Trop, J.M., Benowitz, J.A., Snyder, D.C. and Hart, W.K. (2020)  
426 Geochemical and stratigraphic analysis of the Chisana formation, Insular terranes, eastern  
427 Alaska: early Cretaceous magmatism and tectonics along the northern Cordilleran margin:  
428 *Geological Society of America Abstracts with Programs*, v. 52.

429 Datta, S. and **Ghanbarian, B.** (2020). Dioxane degradation in an oil chemical waste landfill: Lessons from  
430 eight-year site remediation. *SERDP and ESTCP Symposium*, Nov. 30-Dec. 4.

431 Dimapilis, J., Hanschu, J., Pruitt, A., Thomas, S., \*VanderPutten, M., Burgin, A., **Kirk, M.**, and Zeglin, L.H.  
432 (2021) Watershed row-crop agriculture does not correlate with microbial nitrogen-cycling  
433 genetic potential across a gradient of eastern Kansas streams. *Society for Freshwater Science*.

434 \*Endrich, A., **Brueseke, M.**, \*Walters, B.J. and \*Karrasch, A. (2021) Petrogenesis of Cenozoic basalts in  
435 the Centennial Valley and vicinity in SW Montana: Out-of-sequence Snake River plain basalt  
436 eruptions north of the eastern Snake River plain? *Geological Society of America Abstracts with  
437 Programs*, v. 53.

438 \*Esmailpour, M., and **Ghanbarian, B.** (2020). Estimating the scale dependence of permeability and  
439 formation factor in heterogeneous porous media. *American Geophysical Union Fall Meeting*, San  
440 Francisco CA, Dec. 1-17.

441 Geçkin, B., Sözbilir, H., Özkaymak, Ç., Softa, M., **Spencer, J.Q.G.**, Şahiner, E., Meriç, N. (2021) First  
442 paleoseismological findings from N-S trending strike slip faults segments of Izmir-Balikesir  
443 Transfer Zone: Gülbahçe Fault as an example. *73rd Geological Congress of Turkey*, Online, May  
444 24-28, 2021.

445 **Ghanbarian, B.** (2020). Upscaling fluid flow in reservoir rocks: Applications from critical path analysis.  
446 *American Geophysical Union Fall Meeting*, San Francisco CA, Dec. 1-17.

447 **Ghanbarian, B.**, Hunt, A. G. and Faybishenko, B. (2020). Principles governing the Food-Energy-Water  
448 Nexus as revealed by accurate prediction of the water balance. *American Geophysical Union Fall  
449 Meeting*, San Francisco CA, Dec. 1-17.

450 **Ghanbarian, B.**, Hunt, A. G. and Kabala, Z. J. (2020) The future of hydrology education: Opportunities for  
451 state-of-the-art colloquium. *American Geophysical Union Fall Meeting*, San Francisco CA, Dec. 1-  
452 17.

453 \*Jarvis, W., \*Walters, B. and **Lacroix, B.** (2021) Geologic map of a portion of Cape San Martin / Alder  
454 Peak / Villa Creek / Burro Mountain 7.5' quadrangles. *Geological Society of America Abstracts  
455 with Programs*, v. 53, Portland, OR

456 \*Karrasch, A., **Brueseke, M.** and Adams, D.C. (2021) New bulk rock geochemical data for <10 Ma  
457 volcanism in Jackson Hols and the upper Wind River basin, WY: comparative geochemistry to  
458 Snake River plain-Yellowstone basalts and petrogenetic implications: *Geological Society of  
459 America Abstracts with Programs*, v. 53.

460 **Lacroix, B., Kempton, P.D. and Brueseke, M.** (2021). PetCat-Scan: a new tool for quantitative  
461 petrography in the COVID-19 pandemic and beyond. *Geological Society of America Abstracts*  
462 *with Programs*, v. 53, Portland, OR

463 **Lacroix, B., \*Ward, C., Lahfid, A., Niemi, N., Chapman, A., Kempton, P.D.** (2021). RAMAN thermometry  
464 reveals transpressional vertical uplift in the Nacimiento Block of central California. *Geological*  
465 *Society of America Abstracts with Programs*, v. 53, Portland, OR

466 \*Lamm, S., **Lacroix, B.,** Marshall, C., Lahfid, A., Gasda, P., **Kempton, P.D.** (2021). RAMAN spectral  
467 features of chlorite: a new calibration. *Geological Society of America Abstracts with Programs*,  
468 v. 53, Portland, OR

469 \*Pandit B. and Adam, C. (2021) Characterization of secondary mantle convection from geophysical data  
470 and models. *Tenth Nepal Geological Congress (NGC-X)*, Kathmandu, Nepal, March 7-8

471 \*Roustazadeh, A., **Ghanbarian, B.,** Shadmand, M., Taslimitehrani, V. and Lake, L. W. (2020) Application  
472 of machine learning for predicting gas reservoir recovery factor. *American Geophysical Union*  
473 *Fall Meeting*, San Francisco CA, Dec. 1-17.

474 Sharpe, J., Price, D., Davis, C., Sheppard, C., Tesauro, J., Adams, T., Altine, D., Lehrmann, D., Suarez, M.,  
475 **Lacroix, B.,** Godet, A. (2021) Paleoenvironmental reconstruction of lower Cretaceous dinosaur  
476 trackways Central Texas. *Geological Society of America Abstracts with Programs*, v. 53, Portland,  
477 OR

478 \*Shukla, V., **Spencer, J.Q.G.** (2021) Extent and glacial history of the Cordilleran Ice Sheet in NW  
479 Montana: using OSL to date glacial sediments from the southeastern Flathead Lobe of the  
480 Cordilleran Ice Sheet. *Geological Society of America Abstracts with Programs*, v. 53, no. 6, 2021.  
481 doi: 10.1130/abs/2021AM-370000.

482 \*Shodunke, G.O., Raef, A.E., and Totten, M. (2021) S25D-0270 - Attenuation in Viola Formation  
483 Limestone due to Pore-Fluid Composition Effects" *American Geophysical Union Fall Meeting*,  
484 New Orleans, 13-17 December,

485 Softa, M., **Spencer, J.Q.G.,** Alak, A., Yerli, B., and Sümer, Ö. (2021). First study to define Anthropocene  
486 boundary with combination of optically stimulated luminescence and radiocarbon dating  
487 techniques. *73rd Geological Congress of Turkey*, Online, May 24-28, 2021.

488 Sözbilir, H., Özkaymak, Ç., Sümer, Ö., Softa, M., **Spencer, J.Q.G.,** Eski, S., Tepe, Ç., Geçkin, B.Ş., Öncü, U.,  
489 Şahiner, E., Yüksel, M., Meriç, N., Topaksu, M. (2021) Active tectonics and paleoseismology of  
490 seismic sources located on land in the vicinity of the city of İzmir, western Anatolia, Turkey.  
491 *ASASE2021, International Workshop on Active Tectonics and Seismicity of the Aegean Region*  
492 *with Special Emphasis on the 30 October 2020 Samos Earthquake, Turkey*, May 20-21, 2021.

493 Sözbilir, H., Özkaymak, Ç., Sümer, Ö., Uzel, B., Softa, M., Eski, S., **Spencer, J.Q.G.,** Şahiner, E., Meriç, N.  
494 (2021) First paleoseismological findings from northeast trending strike slip faults segments of  
495 Izmir-Balikesir Transfer Zone: an example of Seferihisar Fault. *73rd Geological Congress of*  
496 *Turkey*, Online, May 24-28, 2021.

497 Sümer, Ö., Softa, M., Alak, A., **Spencer, J.Q.G.,** Yerli, B. (2021) A new method to determine background  
498 value in anthropogenic pollution studies: Geogenic Effect Indice (GEI), an example from eastern  
499 Black Sea basin. *73rd Geological Congress of Turkey*, Online, May 24-28, 2021.



500 Tepe, Ç., Sözbilir, H., Softa, M., Özkaymak, Ç., Sümer, Ö., Eski, S., **Spencer, J.Q.G.**, Şahiner, E., Meriç, N.  
501 (2021) Paleoseismological evidence for late Pleistocene landslide triggered by an earthquake on  
502 Izmir Fault, western Anatolia. *73rd Geological Congress of Turkey*, Online, May 24-28, 2021.

503 \*Totten, C., **Raef, A.** (2021) Applications of first-arrivals travel time tomography on improving static  
504 errors corrections in 3-D land seismic processing, *AAPG Mid-continent Meeting*, Tulsa, October  
505 3-5.

506 \*Waterman, B.R., Alcantar, G., Thomas, S.G., Kirk, M.F. (2020) Impacts of precipitation rate and land use  
507 on the contribution of groundwater discharge to streamflow under current and past conditions.  
508 *Kansas Governor's Water Conference*. Virtual event, October 11.

509 \*Waterman, B.R., Alcantar, G., Thomas, S.G., Kirk, M.F. (2020) Impacts of precipitation rate and land use  
510 on the contribution of groundwater discharge to streamflow under current and past conditions.  
511 *American Geophysical Union Fall Meeting*, San Francisco CA, Dec. 1-17

512 \*Yokeley, B. A., **Ghanbarian, B.** and Sahimi, M. (2020) A new approach for two-phase rock typing:  
513 Evaluation with pore network simulations. *American Geophysical Union Fall Meeting*, San  
514 Francisco CA, Dec. 1-17.

515 Zeglin, L.H., Burgin, A.J., Cochran, K., Hanschu, J., Hiripitiyage, Y., Kirk, M.F., Nave, B., Overstreet, E.,  
516 Sturm, B., Thomas, S., \*VanderPutten, M. (2021) Whole-microbial community (Bacteria,  
517 Archaea, and Eukarya) assembly across the river continuum. *Society for Freshwater Science*.

518 Trop, J., **Brueseke, M.**, Benowitz, J.A. and Kirby, C.S. (2021) Evolution of magmatism along a flat-slab  
519 subduction-transform transition, Wrangell Arc, Alaska-Yukon: *Geological Society of America*  
520 *Abstracts with Programs*, v. 53.

## 521 **Grants and Contracts**

### 522 ***New***

523 **Ghanbarian, B.** (PI) Reactive transport simulations in rough-walled fractures, Saudi Aramco, 2021-2021  
524 (\$90,000). 10/17/2021-10/16/2022

525 **Kirk, M.** (Co-PI), Charles Rice (PI), Lydia Zeglin (Co-PI) Kansas EPSCoR REI program: Synthesis of the soil  
526 physical and chemical and plant drivers of the soil microbiome across land use and precipitation.  
527 2021-2022, \$109,500.

528 **Kirk, M.** (funded personnel) NSF LTER: Manipulating drivers to assess grassland resilience. Total funding  
529 \$7,122,000, M. Kirk leads the long-term groundwater monitoring effort, 2020-2025.

530 **Kirk, M.** (PI) Kansas EPSCoR REI program: Camden Hatley graduate support Kirk lab, 2021-2022, \$48,500  
531 plus overhead.

532 **Kirk, M.** (PI). Kansas EPSCoR REI program: funding for undergraduate field/lab technician, 2021-2022.  
533 \$5,000 plus overhead.

534 **Lacroix, B.** USGS EDMAP Fund: "Continuation of Bedrock Mapping of the Cape San Martin/Alder  
535 Peak/Villa Creek/Burro Mountain Quadrangles, Monterey and San Luis Obispo Counties,  
536 California" 2021-2022

### 537 ***Active***

538 **Adam, C.** (PI) *American Chemical Society Petroleum Research Fund*, Modelling the stress field along  
539 continental rifts from tomography models, 2020 – 2023, \$70,000

540 **Brueseke, M. (PI)** *Kansas State University Small Research Grant*, Investigating links between <5 million yr.  
541 old basaltic volcanism in the Centennial Valley Region and the Yellowstone hotspot. 5/1/2020-  
542 4/30/2021, **\$4,428.**

543 **Brueseke, M.** (co-PI) *National Science Foundation RAPID: Collaborative Proposal: Development of Digital*  
544 *Models of Minerals and Rocks for Online Geoscience Classes.* G. Andrews (PI, West Virginia U.),  
545 8/1/2020-7/31/2021. **\$16,864.**

546 **Brueseke, M. (PI)** *National Science Foundation*, Collaborative Research: Investigating out-of-sequence  
547 magmatism and mantle plume-lithosphere interactions adjacent to the Snake River plain (U.S.A.).  
548 J. Benowitz (co-PI, UA-Fairbanks) 9/1/2020 – 8/31/2023, **\$240,385**

549 **Ghanbarian, B.** (co-PI) National Science Foundation of China, *Multi-scale and mechanistic studies of*  
550 *fracture-matrix interaction and hydrocarbon movement in lacustrine tight oil.* 2019-2023,  
551 \$433,000.

552 **Ghanbarian, B.** (PI) Real-time measurement of sap-flow dynamics in sunflower via nuclear magnetic  
553 resonance, National Science Foundation, 2019 - 2022, **\$78,000**

554 **Goldberg, K.** (PI). *American Chemical Society, Petroleum Research Fund (PRF), High-Resolution Sequence*  
555 *Stratigraphy in Mudrock-Dominated Successions: The Chattanooga/Woodford Shale (Late*  
556 *Devonian, Midcontinent Basin),* 2019-2022, \$70,000

557 **Goldberg, K.** (PI), **Kempton, P.D.** (co-PI), Spears, J. (co-PI). *GP-IMPACT: GeoCAT Workshop: Geoscience*  
558 *Careers Ambassador Training Workshop,* NSF- IUSE-Geopaths, 2019-2022, \$153,000.

559 **Kirk, M.** (PI), Lydia Zeglin (Co-PI), Qusheng Jin (Co-PI) *National Science Foundation* Geobiology and Low-  
560 Temperature Geochemistry Program. Title: Collaborative Research: Biogeochemical drivers of  
561 interspecies electron transfer from iron reducers to methanogens. Total funding \$310,748 with  
562 \$196,330 to K-State.

563 **Kirk, M.** *National Science Foundation RII Track-1 EPSCoR: Microbiomes of Aquatic, Plant and Soil*  
564 *Systems (MAPS) Mediating Sustainability: An Observational and Experimental Network across*  
565 *Kansas (\$20 million, \$2.65 million to KSU, M. Kirk is one of the group leaders in the project*  
566 *team)*

567 **Lacroix, B.** *USGS EDMAP* Detailed Bedrock Mapping and dating in the Cape San Martin/Alder Peak/Villa  
568 Creek/Burro Mountain Quadrangles, Monterey and San Luis Obispo Counties, California, 2020,  
569 \$17,500.

570 **Lacroix, B.** (PI), **Kempton, P.D.** and **Brueseke, M.** (co-PIs) *National Science Foundation – RAPIDPetCAT-*  
571 *Scan: A high-definition scanning tool for geoscientists in the COVID-19 pandemic and beyond,*  
572 2020-2021, \$169,220

573 **Lacroix, B.** *American Chemical Society Petroleum Research Fund* Refining Syn-Tectonic Diagenetic History  
574 of Carbonates from the Arbuckle Mountains using delta47/(U-Pb) Thermochronometry, a new  
575 and Emerging Geochemical Technique, 2020-2023, \$70,000

576 **Spencer, J.Q.G.** USGS-STATEMAP/KGS, 2018-2022, “Geologic mapping in Kansas”; Role: Collaborator  
577 with Tony Layzell (KGS) and others, \$21,600

- 578 **Spencer, J.Q.G.** UWM/Harvard, 2019-2022, “Luminescence dating of Bronze Age terraces, Sardis,  
579 Turkey”, \$9,900
- 580 **Spencer, J.Q.G.** UMKC, 2018-2022, “Luminescence dating of loess samples from Kansas”; Role: Co-I with  
581 Caroline Davies, UMKC, \$1,648
- 582 **Spencer, J.Q.G.** UMKC, 2018-2022, “Luminescence dating of dune samples from Jordan”; Role: Co-I with  
583 Caroline Davies, UMKC, \$2,884

#### 584 **Faculty Awards and Recognition**

- 585 **Brueseke, M.** Special Review Editor, *Frontiers in Earth Science – Petrology*
- 586 **Ghanbarian, B.** 2020 Outstanding Associate Editor Award, *Vadose Zone Journal*
- 587 **Ghanbarian, B.** Three-dimensional numerical simulations of flow in geological formations, University  
588 Small Research Grant (\$3,500)
- 589 **Pompeani, D.** Research featured in *Science / AAAS* article March 2021 ([https://www.science.org/content](https://www.science.org/content/article/ancient-native-americans-were-among-world-s-first-coppersmiths)  
590 [/article/ancient-native-americans-were-among-world-s-first-coppersmiths](https://www.science.org/content/article/ancient-native-americans-were-among-world-s-first-coppersmiths))
- 591 **Spencer, J.Q.G.** Judge in student prize competition for best poster presentation, 16<sup>th</sup> International  
592 Luminescence and ESR dating conference, online, September 13-17, 2021.
- 593 **Spencer, J.Q.G.** Member of international working group to establish an academic association for  
594 luminescence and ESR dating

#### 595 **Student Grants, Awards and Recognition:**

- 596 **Alex Karrasch** (M. Brueseke, advisor) KSU College of Arts and Sciences Research Travel Award, **\$400**
- 597 **Alex Karrasch** (M. Brueseke, advisor) KSU Graduate Student Council Travel Award, **\$400**
- 598 **Alireza Roustazadeh** (B. Ghanbarian, advisor) Inducted into Phi Kappa Phi Honor Society, 2021 – present
- 599 **Alireza Roustazadeh** (B. Ghanbarian, advisor) Kansas Geological Foundation Robert Cowdery Fall 2020  
600 Scholarship **\$1000**
- 601 **Alireza Roustazadeh** (B. Ghanbarian, advisor) Kansas Geological Foundation Spring 2021 scholarship  
602 **\$500**
- 603 **Alyssa Endrich** (M. Brueseke, advisor) Geological Society of America Student Research Grant – Lipman  
604 Student Research grant, **\$2500**
- 605 **Alyssa Endrich** (M. Brueseke, advisor) awarded the Sibayne-Stillwater/Wheaton Precious Metals  
606 Scholarship (2021)
- 607 **Alyssa Endrich** (M. Brueseke, advisor) Tobacco Root Geological Society Field Scholarship, **\$1000**
- 608 **Alyssa Endrich** (M. Brueseke, advisor) KSU Graduate student council travel award, **\$400**
- 609 **Alyssa Endrich** (M. Brueseke, advisor) KSU College of Arts and Sciences Research Travel Award, **\$400**
- 610 **Alyssa Endrich** (M. Brueseke, advisor) South Central GSA section travel grant, **\$300**
- 611 **Barnabas Adeyemi** (B. Ghanbarian, advisor) Kansas Geological Foundation Fall 2020 scholarship **\$500**
- 612 **Ben Walters** (A. Farough, advisor) Kansas Geological Foundation Fall 2020 scholarship **\$500**
- 613 **Ben Walters** (B. Lacroix, advisor) College of Arts & Sciences Undergraduate Research scholarship, Fall  
614 2021, **\$1000**



615 **Blake Meis** (A. Farough, advisor) K-State Office of Undergraduate Research and Creative Inquiry small  
616 grant \$500

617 **Brandon Yokely** (B. Ghanbarian, advisor) National Association of Geoscience Teachers Outstanding TA  
618 Award

619 **Camden Hatley** (M. Kirk, advisor) GSA Graduate Student Research Grants, Stream Microbiome Stability  
620 in the Face of Hydrologic Disturbances, **\$2,200**

621 **Carrie Brooks** (P. Kempton, advisor) Kansas Geological Foundation Scholarship, Fall 2021 **\$500**

622 **Carrie Brooks** (P. Kempton, advisor) KSU Graduate Student Council Travel Award, **\$400**

623 **Carrie Brooks** (P. Kempton, advisor) awarded a summer internship with NASA Jet Propulsion Lab,  
624 working in the advanced laboratory for landing site terrain analysis and reconnaissance

625 **Jade Mountain** Undergrad student awarded a summer internship with KDHE (2021)

626 **Katie Andrews** (M. Kirk, advisor) National Association of Geoscience Teachers Outstanding TA Award

627 **Luke Rijfkogel** (A Raef, advisor) Roger N. Planalp Award for the best poster presentation at the 2019  
628 AAPG mid-continent meeting, Wichita, KS. Award was postponed because of the pandemic and  
629 awarded during the 2021 AAPG mid-continent meeting.

630 **S. Jace Kaminski** (B. Ghanbarian, advisor) Kansas Water and Environment Association Scholarship **\$750**

631 **S. Jace Kaminski** (B. Ghanbarian, advisor) Kansas Geological Foundation, Robert Cowdery Fall 2021  
632 Scholarship **\$1,000**

633 **Sarah Lamm** (B. Lacroix, advisor) Kansas Geological Foundation Fall 2020 scholarship **\$500**

634 **Sarah Lamm** (B. Lacroix, advisor) Kansas Geological Foundation Spring 2021 scholarship **\$500**

635 **Sarah Lamm** (B. Lacroix, advisor) Kansas Science Communication Initiative 2020 Science Communication  
636 Award

637 **Sarah Lamm** (B. Lacroix, advisor) KSU Graduate Student Council Travel Award, **\$400**

638 **Sarah Lamm** (P. Kempton, faculty collaborator) Geological Society of America E-an Zen grant for  
639 Outreach in the Geosciences **\$1500**

640 **Sarah Lamm** (B. Lacroix, advisor) awarded the 2021 GSA Planetary Travel Award from the GSA Planetary  
641 Geology Division (2021)

642 **Sarah Lamm** (B. Lacroix, advisor) Awarded internship with NASA's Jet Propulsion Laboratory (2021)

643 **Vidhesh Shukla** (J. Spencer, advisor) KSU College of Arts and Sciences Travel Scholarship **\$400**

644 **Vidhesh Shukla** (J. Spencer, advisor) KSU Graduate Student Council Travel Award **\$200**

645 **Vidhesh Shukla** (J. Spencer, advisor) Geological Society of America Cordilleran Section Student Travel  
646 Grant **\$350**

647 **Vidhesh Shukla** (J. Spencer, advisor) KSU College of Arts and Sciences Travel Award **\$400**

648 **Vidhesh Shukla** (J. Spencer, advisor) Registration waived for Geological Society of America annual  
649 meeting for volunteer services **\$100**

650 **Vidhesh Shukla** (J. Spencer, advisor) KSU Graduate Student Council Travel Award) **\$300**

651 **Vidhesh Shukla** (J. Spencer, advisor) Kansas Geological Foundation Grant **\$1000**

652 **William Jarvis** (B. Lacroix, advisor) KSU Graduate Student Council Travel Award, **\$400**

653

654 **Public Outreach**

655 **Ghanbarian, B.** Presentation entitled “Oil and gas in Kansas” at the GROW workshop, a program for  
656 women in STEM, Oct. 2021

657 **Ghanbarian, B.** Booth Representative at the 2021 Summer Virtual Graduate Student Recruitment Fair,  
658 Department of Energy (DOE), Jul. 2021

659 **Ghanbarian, B.** Presentation entitled “Water consumptions by plants” at the GROW workshop, a  
660 program for women in STEM, Jun. 2021

661 **Ghanbarian, B.** Booth Representative at the 2021 Conference for Undergraduate Women in Physics,  
662 American Society of Physics (APS), Jan. 2021

663 **Goldberg, K.** PI on GeoCATs, an NSF-funded project that aims at increasing participation and diversity in  
664 geosciences. Through workshops, webinars and other experiential learning activities, a cohort of  
665 educators from minority-serving high schools, community colleges and 4H groups will gain a better  
666 understanding of career options in geoscience and develop materials to incorporate in their  
667 curricula thus becoming geoscience “ambassadors”. In the Spring of 2022, three webinars will kick-  
668 off the events that will culminate with a workshop in Summer 2022.

669 **Totten, M.** Welcome to K-State promotional video (<https://www.k-state.edu/geology/>)