

# ANDRÁS FALL

## Research Scientist

Bureau of Economic Geology  
Jackson School of Geosciences  
The University of Texas at Austin  
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## Research Interests

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Fall investigates fundamental and applied problems related to structural diagenesis and fluid inclusions, in order to understand the interaction of geochemical and mechanical processes in sedimentary rocks, and the properties, distribution and role of fluids in sedimentary processes. His research combines low- and high temperature geochemistry (fluid inclusions, SEM-CL, Raman spectroscopy, hydrothermal experiments) and fracture analysis addressing fracture formation and cementation mechanisms, fracture timing, and pore-fluid pressure, temperature, and fluid composition evolution in sedimentary basins, and fractured and unconventional reservoirs.

Fall leads the fluid inclusion research and experimental fracture diagenesis efforts of the [Structural Diagenesis Initiative](#) and the [Fracture Research and Application Consortium](#) at the Bureau of Economic Geology. He conducts fluid inclusion studies and trains students and staff in fluid inclusion analytical methods, usage of laboratory equipment, and interpretation of the results. He manages a fluid inclusion lab equipped with gas-flow and programmable heating/cooling stages and full sample preparatory facilities. He designed and directs an experimental hydrothermal facility that uses externally heated cold-sealed pressure vessels to test models of fracture cement precipitation.

## Professional Work Experience

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Research Scientist (September 2019 – Present)

Bureau of Economic Geology, Jackson School of Geosciences  
The University of Texas at Austin

Research Associate (November 2011 – August 2019)

Bureau of Economic Geology, Jackson School of Geosciences  
The University of Texas at Austin

Postdoctoral Fellow (2009-2011)

Bureau of Economic Geology, Jackson School of Geosciences  
The University of Texas at Austin

Graduate Teaching/Research Assistant (2003-2008)  
Department of Geosciences, Virginia Tech

Sample Preparatory and Microtechnical Laboratory Manager (2002-2003)  
Department of Petrology-Geochemistry, Eötvös Loránd University, Budapest, Hungary

## Academic Background

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- Ph.D. Virginia Tech (2005-2008)  
Geosciences; Advisor: Dr. Robert J. Bodnar
- M.S. Virginia Tech (2003-2005)  
Geosciences; Advisors: Dr. Robert J. Bodnar & Dr. Csaba Szabó
- M.S. University of Bucharest, Bucharest, Romania (2001-2002)  
Geology-Petrology-Metallogeny; Advisors: Dr. Marin Şeclăman & Dr. Péter Luffi
- B.S. Babeş-Bolyai University, Cluj-Napoca, Romania (1997-2001)  
Geology-Geography; Advisor: Dr. Csaba Szabó

## Areas of Expertise

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Aqueous geochemistry in diagenetic and hydrothermal systems  
Fluid inclusion techniques  
Structural diagenesis  
Raman spectroscopy  
Experimental fracture diagenesis

## Funding

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As **Research Associate** (Nov 2011 to Dec 2020) Fall is recorded as a 20% contributor within the Fracture Research and Application Consortium at the Bureau of Economic Geology. FRAC's research focuses to understand and successfully predict, characterize, and simulate reservoir-scale structures, and investigate mechanical and chemical processes and interactions over a range of scales to improve prediction of sub-seismic scale heterogeneities that influence fluid flow. Fall's accredited approximate income to the budget of the Consortium for this time period – ~\$960,000

*Senior Researcher* – Predicting fracture porosity evolution in sandstones, Grant No. DE-FG02-03ER15430 Chemical Sciences, Geosciences, and Biosciences Division, Office of Basic Energy Sciences, Office of Science, U.S. Department of Energy (2009-2019) (PI: Laubach) – \$110,244.5

PI – SUTUR II: Multi-faceted study on water cut in the Permian Wolfcamp in the Delaware Basin, West Texas, Task 7: Aqueous and hydrocarbon fluid inclusion geochemistry and implication for charge history, SHELL USA (2016-2019) – \$344,355.73

*Senior Researcher* – Structural-diagenetic characterization of natural fractures in the Lajas Fm., Neuquén Basin, Argentina; fracture cement petrography and fluid inclusion analysis, YPF Argentina (2016-2019) (PI: Ukar) – \$14,843,04

*Senior Researcher* – Formation mechanism of paleokarst in the Ordovician carbonates in the Halahatang area, Tarim Basin, China, China National Petroleum Company (CNPC)-USA and CNPC-Tarim Oilfield Company-China (PI: Fu, Ukar) – \$18,121.42

*Senior Researcher* – Natural Fracture Characterization in the Vaca Muerta Fm., Neuquén Basin, Argentina; fracture cement petrography and fluid inclusion analysis. YPF Argentina (2014-2017) (PI: Gale) – \$9,881.61

PI – Fractures in Devonian sandstone reservoirs, Subandean fold and thrust belt, Northern Bolivia, TOTAL, France (2014-2015) – \$45,470.00

PI – Experimental Fracture Diagenesis Lab, Jackson School of Geosciences Startup Fund (2011) – \$95,000.00

PI – Fluid inclusion mapping of spatial and temporal variations in gas saturation in fractured sandstone reservoirs, Piceance Basin, Colorado. Structural Diagenesis Fellowship – GDL Foundation (2010) – \$9,000.00

## **Awards and Fellowships**

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1<sup>st</sup> Runner Up – Tinker Family BEG Publication Awards (2019)

Bureau of Economic Geology, Jackson School of Geosciences, UT Austin

For publication: Fall A., Bodnar R.J. (2018) How precisely can the temperature of a fluid event be constrained using fluid inclusions? *Economic Geology*, v. 113, no. 8, 1817-1843.

Tinker Family BEG Best Publication Award (2016)

Bureau of Economic Geology, Jackson School of Geosciences, UT Austin

For publication: Fall A., Eichhubl P., Bodnar R.J., Laubach S.E., Davis S.J. (2015) Natural hydraulic fracturing of tight-gas sandstone reservoirs, Piceance Basin, Colorado. *GSA Bulletin*, v. 127, no. 1/2, p. 61-75.

President's Certificate for Excellence in Presentation (co-author) (2011)  
American Association of Petroleum Geologists Energy Minerals Division – AAPG Annual Meeting, Houston

Certificate of Recognition, Excellence in Technical Presentation (co-author) (2011)  
Society for Sedimentary Geology (SEPM) – AAPG Annual Meeting, Houston

Geosciences Graduate Research Fellowship (2008)  
Department of Geosciences, Virginia Tech

C.G. Tillman Teaching Excellence Endowed Award (2006)  
Department of Geosciences, Virginia Tech

Visiting Student Scholarship (September 1, 2000 – January 31, 2001)  
Eötvös Loránd University, Budapest, Hungary, Department of Petrology and Geochemistry  
Sponsored by the Departments of Education of Hungary and Romania

2<sup>nd</sup> place – Second National Scientific Conference for Romanian Geology Students (2001)  
Babeş-Bolyai University, Cluj-Napoca

1<sup>st</sup> place – Annual National Scientific Student Conference for Hungarian Students–  
Transylvanian Regional (2000)  
Babeş-Bolyai University, Cluj-Napoca, Romania.

## Teaching Experience

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Guest lecturer – GEO 391 Sandstone Petrology (2011-2014)  
Department of Geological Sciences, Jackson School of Geosciences, UT Austin  
Physical Geology Lab Instructor (2-3 classes/semester) (2004-2007)  
Department of Geosciences, Virginia Tech [*Student evaluation Scores of 3.2 to 4 are very good to excellent; reference scale ranges from 1 -“poor” to 4 -“excellent”*]

## Mentoring

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### *Research Assistant Supervision*

Stephanie R. Forstner, RSAIL, Bureau of Economic Geology, UT Austin (2016-2018)

### *Student committees*

Stephanie Forstner, Ph.D. student, dissertation committee member (2020-)

Qiqi Wang, Ph.D. student, dissertation committee member (2019-)

Emanuel Mororo, M.Sc. student. Department of Petrology and Geochemistry, Institute of Earth Sciences, Eötvös University, Budapest, Hungary

Colin Sturrock, undergrad senior honors thesis committee member (2014-2015)

### *Training – fluid inclusion petrography and microthermometry*

Stephanie Forstner – RSAll (now Ph.D. student at Jackson School of Geosciences, UT Austin)

Qiqi Wang – Ph.D. student (Jackson School of Geosciences, UT Austin)

Natchanan (Mint) Doungkaew – Ph.D. student (Jackson School of Geosciences, UT Austin)

Autumn Eakin, M.S. student (now at Chevron, Houston, and Ph.D. student at Texas A&M)

Guangjian (Cecilia) Xu – M.S. student (now Ph.D. student at Texas A&M)

John Hooker – RSAll and Ph.D. student (now visiting faculty at Penn State)

## **Service and Outreach**

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*Journal Associate Editor, AAPG Bulletin (2018-2021)*

*Reviewer of research articles for:*

AAPG Bulletin, Central European Journal of Geosciences, Earth Science Reviews, Economic Geology, Földtani Közlöny (in Hungarian), Geochimica et Cosmochimica Acta, Geofluids, Geology, GSA Bulletin, Journal of South American Earth Sciences, Journal of Structural Geology, Marine and Petroleum Geology, Nature Communications, Ore Geology Reviews, Petroleum Geoscience, Terra Nova.

*Reviewer of grant proposals for:*

American Chemical Society, Petroleum Research Fund  
Hungarian Scientific Research Fund (OTKA).

*Committee Chair (2020-present)*

Grants, Appointments and Awards Committee  
Bureau of Economic Geology, Jackson School of Geosciences  
The University of Texas at Austin

*Committee Member*

Grants, Appointments and Awards Committee  
Bureau of Economic Geology, Jackson School of Geosciences  
The University of Texas at Austin (2019-2020)

Graduate Student Liaisons Committee, Department of Geosciences

Virginia Tech, Blacksburg, VA (2004-2005)

*Organizing committee member*

14<sup>th</sup> Pan-American Current Research on Fluid Inclusions Conference, Rice University, Houston, Texas (June 11-15, 2018)

*Technical session advocate and co-chair*

Fluids and melts in geologic systems, Geological Society of America Annual Meeting Seattle, Washington (2017)

*Judge*

2<sup>nd</sup> Annual Jackson School of Geosciences Student Research Symposium (2013)

*Volunteer*

Explore UT Austin (2002)

*Lab Coordinator*

Physical Geology, Department of Geosciences  
Virginia Tech, Blacksburg, VA (2007)

## Publications

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*Google Scholar citations:* **1286**; h-index: **12**

*Google Scholar profile:* <https://scholar.google.com/citations?hl=en&user=PYiU18sAAAAJ>

Orcid ID: <https://orcid.org/0000-0002-3545-5908>

*Peer reviewed journal articles and book chapters*

25. Nicot. J.-P., Darvari R., Eichhubl P., Scanlon B.R., Elliott B.A., Bryndzia L.T., Gale J.F.W., **Fall A.** Origin of low salinity, high volume produced waters in the Wolfcamp Shale (Permian), Delaware Basin, USA. *Applied Geochemistry* 122, 18 p. In press.  
<https://doi.org/10.1016/j.apgeochem.2020.104771>.
24. Ukar E., Lopez R.G., Hryb D., Gale J.F.W., Manceda R., **Fall A.**, Brisson I., Hernandez-Bilbao E., Weger R.J., Marchal D., Zanella A., Cobbold P.R. (2020) Natural fractures in the Vaca Muerta Formation: from core and outcrop observations to subsurface models. *In: Minisini D., Fantin M., Noguera I.L., (Eds.) Integrated Geology of Unconventionals: The case of the Vaca Muerta Play (Argentina), AAPG Memoir Series, v. 121, p. 377-416.*  
<https://doi.org/10.1306/13682234M1203837>.

23. **Fall, A.** (2020) Applications of fluid inclusions in structural diagenesis. *In: Lecumberri-Sanchez, P., Steele-MacInnis, M., Kontak, D. (eds.) Fluid and Melt Inclusions: Applications to Geologic Processes, Topics in Mineral Sciences*, v. 49, p. 17-46. [Link](#)
22. Denny A.C., **Fall A.**, Orland I.J., Valley J.W., Eichhubl P., Laubach S.E., (2020) A prolonged history of pore water  $\delta^{18}\text{O}$  evolution in the cretaceous Travis Peak Formation in East Texas. *GSA Bulletin*, v. 132; no. 7/8; p. 1626–1638, <https://doi.org/10.1130/B35291.1>.
21. Baques, V., Ukar, E., Laubach, S.E., Forstner, S.R., **Fall, A.** (2020) Fracture, dissolution, and cementation events in Ordovician carbonate reservoirs, Tarim Basin, NW China, *Geofluids*, v. 243, p. 1-28, <https://doi.org/10.1155/2020/9037429>.
22. Denny A.C., **Fall A.**, Orland I.J., Valley J.W., Eichhubl P., Laubach S.E., (2020) A prolonged history of pore water  $\delta^{18}\text{O}$  evolution in the cretaceous Travis Peak Formation in East Texas. *GSA Bulletin*, v. 132; no. 7/8; p. 1626–1638, <https://doi.org/10.1130/B35291.1>.
20. Weisenberger T., Eichhubl P., Laubach S.E., **Fall A.** (2019) Degradation of fracture porosity in sandstone by carbonate cement, Piceance basin, Colorado, USA. *Petroleum Geoscience*, v. 25, p. 354-370, <https://doi.org/10.1144/petgeo2018-162>
19. Guzmics T., Berkesi M., Bodnar R.J., **Fall A.**, Bali E., Milke R., Vetlényi E., Szabó Cs. (2019) Natrocarbonatites: a hidden product of three phase immiscibility, *Geology*, v. 47, 527-530. <https://doi.org/10.1130/G46125.1>
18. **Fall A.**, Bodnar R.J. (2018) How precisely can the temperature of a fluid event be constrained using fluid inclusions? *Economic Geology*, v. 113, no. 8, 1817-1843. <http://doi.org/10.5382/econgeo.2018.4614>.
17. Jiang L., Hu S., Zhao W., Xu Z., Shi S., Fu Q., Zeng H., Liu W., **Fall A.** (2018) Diagenesis and its impact on a microbially derived carbonate reservoir from the Middle Triassic Leikoupo Formation, Sichuan Basin, China. *AAPG Bulletin*, v. 102, p. 2599-2628. <http://doi.org/10.1306/05111817021>.
16. Sturrock C.P., Catlos E.J., Miller N.R., Akgun A., **Fall A.**, Gabitov R.I., Yilmaz I.O., Larson T., Black K.N. (2017) Fluids along the North Anatolian Fault, Niszar basin, north central Turkey: Insight from stable isotopic and geochemical analysis of calcite veins. *Journal of Structural Geology*, v. 101, 58-79, <http://doi.org/10.1016/j.jsg.2017.06.004>.
15. **Fall A.**, Ukar E., Laubach S.E. (2016) Origin and timing of Dauphiné twins in quartz cement in fractured sandstones from diagenetic environments: Insight from fluid inclusions. *Tectonophysics*, v. 687, p. 195-209, <http://doi.org/10.1016/j.tecto.2016.08.014>.

14. Laubach S.E., **Fall A.**, Copley L.K., Marrett R., Wilkins S.J. (2016) Fracture porosity creation and persistence in a basement-involved Laramide fold, Upper Cretaceous Frontier Formation, Green River Basin, U.S.A. *Geological Magazine*, v. 153, p. 887-910, <http://doi.org/10.1017/S0016756816000157>.
13. Hooker J.N., Larson T., Eakin A., Laubach S.E., Eichhubl P., **Fall A.**, Marrett R. (2015) Fracturing and fluid-flow in a sub-décollement sandstone; or, a leak in the basement. *Journal of the Geological Society, London*, v. 172, p. 428-442, <http://doi.org/10.1144/jgs2014-128>.
12. **Fall A.**, Eichhubl P., Bodnar R.J., Laubach S.E., Davis S.J. (2015) Natural hydraulic fracturing of tight-gas sandstone reservoirs, Piceance Basin, Colorado. *GSA Bulletin*, v. 127, no. 1/2, p. 61-75, <http://doi.org/10.1130/B31021.1>. [*Tinker Family BEG Best Publication Award (2016); Top 10 most read papers GSA Bulletin (Jan 2015-Feb 2016)*].
11. Gale J.F.W., Laubach S.E., Olson J.E., Eichhubl P., **Fall A.** (2014) Natural fractures in shale: a review and new observations. *AAPG Bulletin*, v. 98, no. 11, p. 2165-2216, <http://doi.org/10.1306/08121413151>.
10. Bodnar R.J., Azbej T., Becker S.P., Cannatelli C., **Fall A.**, Severs M.J. (2013) Whole Earth geohydrologic cycle: From the clouds to the core: The distribution of water in the dynamic Earth system, in Bickford, M.E., ed., *The Web of Geological Sciences: Advances, Impacts, and Interactions: Geological Society of America Special Paper 500*, p. 431-461, [http://doi.org/10.1130/2013.2500\(13\)](http://doi.org/10.1130/2013.2500(13)).
9. **Fall A.**, Eichhubl P., Cumella S.P., Bodnar R.J., Laubach S.E., Becker S.P. (2012) Testing the basin-centered gas accumulation model using fluid inclusion observations: southern Piceance Basin, Colorado. *AAPG Bulletin*, v. 96, no. 12, p. 2297-2318. <http://doi.org/10.1306/05171211149>. [*2<sup>nd</sup> place, Best Paper in AAPG Bulletin, by vote of editorial board*].
8. **Fall A.**, Tattitch B., Bodnar R.J. (2011): Combined microthermometric and Raman spectroscopic technique to determine the salinity of H<sub>2</sub>O-CO<sub>2</sub>-NaCl fluid inclusions based on clathrate melting. *Geochimica et Cosmochimica Acta*, v. 75, p. 951-964. <http://doi.org/10.1016/j.gca.2010.11.021>.
7. **Fall A.**, Rimstidt J.D., Bodnar R.J. (2009): The effect of fluid inclusion size on determination of homogenization temperature and density of liquid-rich aqueous inclusions. *American Mineralogist*, v. 94, p. 1569-1579. <http://doi.org/10.2138/am.2009.3186>.
6. Becker S.P., **Fall A.**, Bodnar R.J. (2008): Synthetic Fluid Inclusions. XIX. PVTX properties of high salinity H<sub>2</sub>O-NaCl solutions (>30 wt% NaCl): Application to fluid inclusions that



homogenize by halite disappearance from porphyry copper and other hydrothermal ore deposits. *Economic Geology*, v. 103, p. 539-554. <http://doi.org/10.2138/am.2009.3186>.

5. **Fall A.**, Bodnar R.J., Szabó Cs., Pál-Molnár E. (2007): Fluid evolution in the nepheline syenites of the Ditrău Alkaline Massif, Transylvania, Romania. *Lithos*, v. 95, p. 331-345. <http://doi.org/10.1016/j.lithos.2006.08.005>

### *Non peer reviewed journal articles*

4. Wang Q., Laubach, S.E., **Fall A.** (2019) Coupled effects of diagenesis and deformation on fracture evolution in deeply buried sandstones, 53<sup>rd</sup> US Rock Mechanics/Geomechanics Symposium, v. 53, 6 p. [link](#)
3. **Fall, A.**, Eichhubl, P., Laubach, S.E. (2013) Timing and processes of fracture formation in tight-gas sandstone reservoirs using fluid inclusions, Proceeding of the Unconventional Resources Technology Conference (URTeC) Denver, Colorado, USA, 12-14 August, [SPE 168833/URTeC 1582124](#), p. 1689-1694.
2. Pommer, L., Gale, J.F.W., Eichhubl, P., **Fall, A.**, Laubach, S.E. (2013) Using structural diagenesis to infer the timing of natural fractures in the Marcellus Shale. Proceedings of the Unconventional Resources Technology Conference (URTeC) Denver, Colorado, USA, 12-14 August, [URTeC Control ID Number: 1580135](#), p. 1639-1644.
1. Hooker J.N., Laubach S.E., Kaylor A., Eichhubl P., **Fall A.** (2011): Size, spacing, and opening history of natural fractures, preliminary results from El Alamar Formation, NE Mexico, Gulf Coast Association of Geological Societies Transactions, v. 61, p. 233-243.

### *Edited abstract volumes*

1. **Fall A.** (2018) Editor – Abstract volume. 14<sup>th</sup> Pan-American Current Research on Fluid Inclusions Conference, Rice University, Houston, Texas, USA. 120 p. [link](#)

### *Peer reviewed extended abstracts*

1. Ukar E., Lopez R.G., **Fall A.**, Manceda R., Gale J.F.W., Laubach S.E. (2017) Vertical fractures and a new type of kinematic indicator in bed-parallel veins (beef) in the Vaca Muerta Formation at Arroyo Mulichinco, Neuquén Basin. *Geologia, Presente y Futuro*, XX Congreso Geológico Argentino, p. 163-165. [link](#)

*Abstracts and extended abstracts*

79. **Fall A.**, Dennis P.F., Gale J.F.W., Ukar E. (2019) Paleotemperature constraints of calcite fracture cementation in shale: a comparison of fluid inclusion and carbonate clumped isotope thermometry. 25<sup>th</sup> European Current Research on Fluid Inclusions, Budapest, Hungary, 23-27 June, Acta Miner.-Petrograph., Abstract Series 10, p. 35.
78. Gale J.F.W., **Fall A.**, Ali W.A., Laubach S.E., Eichhubl P., Bodnar R.J. (2019) Opening-mode fracturing and cementation timing in the Barnett Shale, Delaware Basin, West Texas. AAPG ACE 2019, San Antonio, Abstr. vol.
77. Eichhubl P., Gale, J.F.W., Laubach S.E., **Fall A.**, Ukar E. (2019) What drives the formation of natural fractures in unconventional reservoirs? AAPG ACE 2019, San Antonio, Abstr. vol.
76. Denny A., **Fall A.**, Orland I., Valley J.W., Eichhubl P., Laubach S.E. (2018) Coupling SIMS analyses, fluid inclusions, and 1-D burial modeling to constrain pore water  $\delta^{18}\text{O}$  evolution in sandstones of the Cretaceous Travis Peak Formation in East Texas. Geological Society of America Abstracts with Programs. Vol. 50, No. 6, doi:10.1130/abs/2018AM-323677
75. *Extended:* **Fall A.**, Bodnar R.J. (2018) Constraining the history of fluid events using the fluid inclusion assemblage (FIA) method for collecting, displaying and interpreting microthermometric data. 14<sup>th</sup> Pan-American Current Research on Fluid Inclusions 2018, Houston, Texas, USA. Abstract v., p. 45-46.
74. *Extended:* Forstner S.R., Laubach S.E., **Fall A.** (2018) Evolution of deformation in the Buck Mountain Fault Damage zone, Cambrian Flathead Sandstone, Teton Range, Wyoming. 14<sup>th</sup> Pan-American Current Research on Fluid Inclusions 2018, Houston, Texas, USA. Abstract v., p. 47.48.
73. *Extended:* Wang. Q., Laubach S.E., **Fall A.** (2018) Unraveling the history of ultra-deep fractures in sedimentary basins. 14<sup>th</sup> Pan-American Current Research on Fluid Inclusions 2018, Houston, Texas, USA. Abstract v., p. 103-104.
72. **Fall A.**, Ukar E., Lopez R.G., Gale J.F.W., Manceda R., Laubach S.E. (2017) Combined effects of overpressure and bed-parallel contraction on the formation of bed-parallel and vertical fractures in the Vaca Muerta Formation, Argentina. Geological Society of America, Seattle, Washington, USA. Abstracts with Programs. Vol. 49, No. 6, doi:10.1130/abs/2017AM-301560.
71. Baques V., Ukar E., Zhuang L., Yuan W., Laubach S.E., Forstner S.R., **Fall A.**, Sun C. (2017) Decameter-scale bit drops at 7 km depth in the Yijianfang Formation, Halahatang oilfield, Tarim Basin, China: fault-related dee-seated dissolution. Geological Society of America,

Seattle, Washington, USA. Abstracts with Programs. Vol. 49, No. 6, doi:10.1130/abs/2017AM-3058412017.

70. Forstner S.R., Laubach S.E., **Fall A.** (2017) Regional brittle deformation, strain, and paleostress trajectories, Teton Range, Wyoming. Geological Society of America, Seattle, Washington, USA. Abstracts with Programs. Vol. 49, No. 6, doi: 10.1130/abs/2017AM-308570.
69. **Fall A.**, Ukar E., Lopez R.G., Gale J.F.W., Manceda R., Laubach S.E. (2017) Bed-parallel beef veins and cross-cutting vertical fractures in the Vaca Muerta Formation, Argentina: a fracture opening and cementation history. 24<sup>th</sup> European Current Research on Fluid Inclusions, Nancy, France, 23-29 June.
68. **Fall A.**, Ukar E., Lopez R.G., Gale J.F.W., Manceda R., Laubach S.E. (2017) Timing of opening and cementation of bedding-parallel and vertical fractures, Vaca Muerta Formation, Argentina. AAPG Datapages/Search and Discovery Article #90291, 2017 AAPG Annual Convention and Exhibition, Houston, Texas, 2-5 April.
67. Ukar E., Lopez R.G., **Fall A.**, Manceda R., Gale J.F.W., Laubach S.E. (2017) New type of kinematic indicator in bedding-parallel veins, and vertical fracture abundance and timing in Vaca Muerta Formation, Argentina. AAPG Datapages/Search and Discovery Article #90291, 2017 AAPG Annual Convention and Exhibition, Houston, Texas, 2-5 April.
66. **Fall A.**, Ukar E., Laubach S.E. (2016) Origin and timing of Dauphiné twins using fluid inclusions in quartz-cement fractures in sandstones from diagenetic environments. AGU Fall Meeting, San Francisco, California, 12-16 December, Abstract T21D-2864, 1 p.
65. *Extended*: **Fall A.**, Ukar E., Marrett R., Laubach S. E. (2015) Dauphiné twin planes in quartz trap fluid inclusions and indicate paleostress in deeply buried sandstones, 23<sup>rd</sup> European Current Research on Fluid Inclusions, Leeds, United Kingdom, 27-29 June, Abstract vol., p. 61-61.
64. Eichhubl P., Alzayer Y., Laubach S. E., **Fall A.** (2014) Growth kinematics of opening-mode fractures. AGU Fall Meeting, San Francisco, California, 15-19 December, Abstract H51Q-02, 1 p.
63. **Fall A.**, Eichhubl P., Laubach S.E. (2014) Propagation rate and timing of natural fractures in deep reservoirs. 2014 GSA Annual Meeting in Vancouver, British Columbia, Canada.
62. Bodnar R.J., **Fall A.**, Esposito R., Moore L., Gazel P. (2014) Protocol for collecting, interpreting and reporting fluid and melt inclusion data. 12<sup>th</sup> Pan-American Current Research on Fluid Inclusions 2014, Denver and Pingree Park, Colorado, June 4-6. Abstr. v.

61. Bodnar R.J., **Fall A.**, Esposito R., Moore L., Gazel E. (2014) Protocol for collecting, interpreting and reporting fluid and melt inclusion data. 5<sup>th</sup> Asian Current Research on Fluid Inclusions, Xi'an, China, May 16-18, Abstract volume, 2 pages.
60. Ukar E., Laubach S.E., **Fall A.**, Eichhubl P. (2014) Synkinematic quartz cementation in partially open fractures in sandstones. Geophysical Research Abstracts vol. 16, EGU2014-4545, European Geosciences Union General Assembly, April 27-May 2.
59. Alzayer, Y.A., **Fall A.**, Laubach S.E., Eichhubl P. (2014) Fracture Growth Processes in Sandstone Inferred by Textural and Fluid Inclusion Investigations of Crack-Seal Fracture Cements. AAPG Datapages/Search and Discovery Article # 90189, AAPG Annual Convention and Exhibition, Houston, Texas, April 6-9.
58. Ukar E., Ozkul, C., Eichhubl P., **Fall A.** (2014) Structural-Diagenetic Evolution of Fractures in Folds: Nikanassin and Cardium Fms. Alberta Foothills, Canada. AAPG Datapages/Search and Discovery Article # 90189, AAPG Annual Convention and Exhibition, Houston, Texas, April 6-9.
57. Eichhubl P., **Fall A.**, Laubach S.E., Bodnar R.J., Davis J.S. (2013) Natural hydraulic fracturing of tight-gas sandstone reservoirs, Piceance Basin, Colorado. Geological Society of America Abstracts with programs, v. 45, no.7, p. 448.
56. Bodnar R.J., Azbej T., Becker S.P., Cannatelli C., **Fall A.**, Severs M.J. (2013) Water, water everywhere. Geological Society of America Abstracts with programs, v. 45, no.7, p. 36.
55. **Fall A.**, Eichhubl P., Laubach S.E. (2013) A history of natural fracture propagation in deep gas reservoirs using fluid inclusions, 22<sup>nd</sup> European Current Research on Fluid Inclusions, Antalya, Turkey, 4-9 June, *in* Hanilçi, N., Bozkaya, G., eds., Abstract book, p. 45-46.
54. **Fall A.**, Eichhubl P., Black, K., Laubach S.E. (2013) A 48 m.y. history of fracture propagation. AAPG Annual Convention and Exhibition, Pittsburgh, Pennsylvania. Abstract vol., abs. 1556361, 1 p.
53. Ukar E., Eichhubl P., **Fall A.**, Hooker J.N., (2013) Outcrop to core comparison of natural fractures in a tight-gas sandstone reservoir, Alberta Foothills, Canada. AAPG Annual Convention and Exhibition, Pittsburgh, Pennsylvania. Abstract vol., abs. 1556301, 1 p.
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33. Xu G., **Fall A.**, Eichhubl P., Laubach S.E. (2010): Combined fluid inclusion-SEM-cathodoluminescence analysis of microfracture opening in a tight-gas sandstone outcrop analog: Eriboll Formation, NW Scotland, *in* Denver GSA Annual Meeting, Abstracts with Program, v. 42, No. 5, p. 472.

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28. **Fall A.**, Eichhubl P., Bodnar R.J., Laubach S.E. (2010): Crack-seal cementation of natural fractures recording pore-fluid evolution in tight-gas sandstone reservoirs. 20<sup>th</sup> General Meeting of the International Mineralogical Association, Budapest, Hungary. *Acta Min.-Pet. Abstr. Ser.*, v.6, p. 193.
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19. **Fall A.**, Ziemann M.A., Bodnar R.J. (2008): Combined microthermometric and Raman technique for determination of salinity of H<sub>2</sub>O-CO<sub>2</sub>-NaCl fluid inclusions. 9<sup>th</sup> Pan-American Current Research on Fluid Inclusions 2008, Reston, Virginia, USA. Abstract v., p. 26.
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15. *Extended:* **Fall A.**, Reynolds T.J., Bodnar R.J. (2007) Precision of thermal history reconstruction with fluid inclusions. 19<sup>th</sup> European Current Research on Fluid Inclusions, Bern, Switzerland. Abstract v., p. 136.
14. Bodnar R.J., Azbej T., Becker S. P., Cannatelli C., **Fall A.**, Hole J.A., King S., Severs M.J. (2006): The whole Earth geohydrologic cycle. MSA Short Course on Water in Nominally Anhydrous Minerals, Verbania, Italy, Abstract v.



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10. **Fall A.**, Bodnar R.J., Szabó Cs. (2005): Fluid evolution in the nepheline syenites of the Ditrău Alkaline Massif, Transylvania, Romania. 18<sup>th</sup> European Current Research on Fluid Inclusions, Siena, Italy. Abstract v.
9. **Fall A.**, Bodnar R.J., Szabó Cs. (2004): Fluid evolution in the nepheline syenites of the Ditrău Alkaline Massif, Transylvania, Romania. Eos Trans. AGU, 85(47), Fall Meet. Suppl., Abstract V31A, F1820.
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7. *Extended*: **Fall A.**, Szabó Cs., Török K. (2003): The role of fluids in post-solidus transformation in the nepheline syenites of the Ditrău Alkaline Massif, Transylvania, Romania, 17<sup>th</sup> European Current Research on Fluid Inclusions, Acta Min.-Petrograph., Abstract Series 2, p. 65.
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5. Márton I., Gál J., Benő É., **Fall A.**, Szabó Cs. Török ,K., Gál Á. (2001): Fluid inclusions in apatite, quartz and nepheline of the Ditrău Alkaline Massif, Transylvania, Romania. Mitt. Österr. Miner. Ges. 146, p. 186-188., Vienna, Austria.
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3. **Fall A.**, Benő É., Gál J., Márton I (2001): Fluid inclusion study in apatite, quartz and nepheline from the Ditrău Alkaline Massif (Eastern Carpathians, Transylvania, Romania),

17<sup>th</sup> Hungarian Young Earth Scientists Conference, organized by the Hungarian Geological and the Hungarian Geophysical Societies, Győr, Hungary, Abstract v.

2. Gál J., Márton I., **Fall A.**, Benő É. (2001): Fluid inclusion study from the Ditrău Alkaline Massif (Eastern Carpathians, Transylvania, Romania). 2<sup>nd</sup> National Scientific Conference of Geological Students from Romania, Cluj-Napoca, Romania, Abstract v., p. 28.
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### *Contract reports*

14. Ukar, E., **Fall, A.**, Elliott, S. (2020) Structural-diagenetic and fluid inclusion characterization of tight-gas sandstones, Kuqa foreland basin, China. FRAC-PetroChina Collaboration, 136 p. slides report.
13. **Fall, A.**, Ukar, E. (2020) Sub-salt carbonates and intrusions, offshore Brazil – Fracture cement petrography and fluid inclusion observations, FRAC-Petrobras Collaboration, 28 p.
12. **Fall, A.**, (2019) Fracture cement petrography and fluid inclusion analysis, Boxwood 55-1-12 Unit 5PH, Wolfcamp Formation, Delaware Basin, West Texas, FRAC-Anadarko (Oxy) Collaboration, 19 p.
11. Forstner S., **Fall A.** (2018), Fracture cement petrography and fluid inclusion assessment – Wolfcamp Formation, Delaware Basin, West Texas, FRAC-Devon Energy collaboration, 23 p.
10. Fu Q. Baques V., Ukar E., Forstner S., **Fall A.**, Loucks R., Zeng H., Ning C., Sivila L., Laubach S.E. (2017) Formation mechanism of paleokarst in the Ordovician carbonates in the Halahatang area, Tarim Basin, China, 169 p.
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7. **Fall A.**, Laubach, S.E., Elliott, S. Ukar, E. (2015) Fractures in Devonian sandstone reservoirs, Subandean fold and thrust belt, Northern Bolivia, FRAC-TOTAL collaboration, 57 p.

6. **Fall A.**, Eichhubl P. (2014) Fracture cement petrography and fluid inclusion assessment, Vaca Muerta Formation, Argentina, FRAC-SHELL collaboration, 10 p.
5. **Fall A.**, Eichhubl P. (2014) Fracture cement petrography and fluid inclusion assessment, Niobrara Formation, Colorado, FRAC-SHELL collaboration, 22 p.
4. Eichhubl P., Black K., **Fall A.** (2012) Fracture cement petrography and fluid inclusion analysis, Niobrara Formation, FRAC-Anadarko collaboration, 49 p.
3. **Fall A.**, Eichhubl P., Laubach S.E., Davis J.S. (2011) ExxonMobil—BEG Collaborative on Unconventional Reservoirs, Task 3: Natural fracture opening history in the Piceance Creek Field, Piceance Basin, Colorado: fracture cement petrography and fluid inclusion analysis. Project Year 3, Final Report prepared for ExxonMobil, 90 p.
2. Eichhubl P., **Fall A.**, Davis J. S., Laubach S.E. (2010) ExxonMobil—BEG Collaborative on Unconventional Reservoirs, Task 3: Fracture petrography and fluid inclusion analyses: The University of Texas at Austin, Bureau of Economic Geology, Project Year 2, Report 23 prepared for ExxonMobil, 30 p.
1. Laubach S.E., Eichhubl P., **Fall A.**, Hooker J.N., Davis J.S. (2009) ExxonMobil—BEG Collaborative on Unconventional Reservoirs, Task 3: Understanding the importance of natural fractures, stress sensitivity, and hydraulic/natural fracture interaction, Project Year 1: The University of Texas at Austin, Bureau of Economic Geology, Project Year 1, Report 13 prepared for ExxonMobil, 25 p.

### *Theses and Dissertation*

4. **Fall A.** (2008): Applications of fluid inclusions in geological thermometry, Department of Geosciences, Virginia Tech (Ph.D. dissertation, 109 p.).
3. **Fall A.** (2005): Fluid evolution in the nepheline syenites of the Ditrău Alkaline Massif, Transylvania, Romania. Department of Geosciences, Virginia Tech (M.S. thesis, 39 p.).
2. **Fall A.** (2002): Fluid inclusions in nepheline: the role of the fluids in the petrologic evolution of the nepheline syenites of the Ditrău Alkaline Massif, Romania. Department of Mineralogy, University of Bucharest, Romania (M.S. thesis, in Romanian, 38 p.).
1. **Fall A.** (2001): Genesis of nepheline, cancrinite and sodalite based on microthermometry of fluid inclusions in nepheline from the nepheline syenites of the Ditrău Alkaline Massif, Transylvania, Romania. Department of Geology, Babeş-Bolyai University, Cluj-Napoca, (B.S. thesis, in Hungarian), 48 p.

## Lectures and Addresses

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*Five invited national and international talks*

*Not listed separately:* one or two lectures per year presented at the Fracture Research and Application Consortium's Annual Meetings (since 2009).

42. **Invited:** Using Fluid Inclusions in Structural Diagenesis. Petrobras, Brazil; Virtual Talk. August 2020.
41. **Invited**, department seminar lecture: Unraveling structural diagenetic processes in sedimentary basins using fluid inclusions. Department of Petrology and Geochemistry, Institute of Earth Sciences, Eötvös University, Budapest, Hungary. Virtual Talk, June 2020.
40. Paleotemperature constraints of calcite fracture cementation in shale: a comparison of fluid inclusion and carbonate clumped isotope thermometry. 25<sup>th</sup> European Current Research on Fluid Inclusions, Budapest, Hungary, June 23-27, 2019.
39. Constraining the history of fluid events using the fluid inclusion assemblage (FIA) method for collecting, displaying and interpreting microthermometric data. 14<sup>th</sup> Pan-American Current Research on Fluid Inclusions Conference, Rice University, Houston, Texas, June 12, 2018.
38. Constraining the history of fluid events using the fluid inclusion assemblage (FIA) method for collecting, displaying and interpreting microthermometric data. Bureau of Economic Geology Seminar Series, Jackson School of Geosciences, The University of Texas at Austin, April 6, 2018.
37. Combined effects of overpressure and bed-parallel contraction on the formation of bed-parallel and vertical fractures in the Vaca Muerta formation, Argentina. GSA Annual Meeting, Seattle Washington, October 24, 2017.
36. Bed-parallel beef veins and cross-cutting vertical fractures in the Vaca Muerta Formation, Argentina: a fracture opening and cementation history. 24<sup>th</sup> European Current Research on Fluid Inclusions, Nancy, France, June 29, 2017.
35. **Invited:** Processes and timing of natural hydraulic fracture opening and cementation in deeply buried sandstones, ConocoPhillips, Houston, Texas, May 3, 2016.
34. Dauphiné twin planes in quartz trap fluid inclusions and indicate paleostress in deeply buried sandstones, 23<sup>rd</sup> European Current Research on Fluid Inclusions, Leeds, United Kingdom, 29 June, 2015.

33. **Invited:** Natural hydraulic fracturing: processes and timing of fracture opening and cementation in deeply buried sandstones, Royal School of Mines, Imperial College London, United Kingdom, 25 June, 2015.
32. Propagation rate and timing of natural fractures in deep reservoirs, presented at GSA Annual Meeting, Vancouver, British Columbia, Canada, October 20, 2014.
31. **Invited:** Timing and processes of fracture formation in tight-gas sandstone reservoirs, BHP Billiton, Houston, Texas, 13 May, 2014.
30. **Invited:** Natural hydraulic fracturing of tight-gas sandstone reservoirs, Workshop on Unconventional Energy, The University of Texas at Austin, 4 September, 2013.
29. Timing and processes of fracture formation in tight-gas sandstone reservoirs using fluid inclusions, Unconventional Resources Technology Conference (URTeC) Denver, Colorado, 12-14 August, 2013.
28. A history of natural fracture propagation in deep gas reservoirs using fluid inclusions. 22<sup>nd</sup> European Current Research on Fluid Inclusions, Antalya, Turkey, 4-9 June, 2013.
27. A 48 m.y. history of fracture propagation. AAPG Annual Convention and Exhibition, Pittsburgh, Pennsylvania, 19-22 May, 2013.
26. A chronicle of natural fracture propagation using fluid inclusions. 47<sup>th</sup> South-Central Section Annual GSA Meeting, Austin, Texas, 4-5 April, 2013.
25. Timing and duration of gas charge-driven fracturing in tight-gas sandstone reservoirs based on fluid inclusion observations: Piceance Basin, Colorado. AGU Fall Meeting, San Francisco, 3-7 December, 2012.
24. **Invited:** Opening-mode fracturing and cementation during hydrocarbon generation in mudrocks: an example from the Barnett Shale, West Texas. Goldschmidt Conference, Montréal, Québec, Canada, 24-29 June, 2012.
23. Diagenetic controls on carbonate fracture cementation in tight-gas sandstones. 11<sup>th</sup> Pan-American Current Research on Fluid Inclusions 2012, Windsor, Ontario, Canada, 18-20 June, 2012.
22. Assessment of pore fluid pressure history in basin-centered gas accumulations using fluid inclusions, presented at the Goldschmidt Conference, Prague, Czech Republic, 14-19 August, 2011.

21. Coupled pore fluid pressure oscillation and natural fracture opening in tight-gas sandstone reservoirs: Piceance Basin, Colorado, USA, presented at the 21<sup>st</sup> European Current Research on Fluid Inclusions Conference, Leoben, Austria, 9-11 August, 2011.
20. Natural fracture opening and cementation in tight-gas reservoirs, Unconventional Resources Conference ConocoPhillips-Schlumberger, Houston, Texas, 9 May, 2011.
19. Testing the basin-centered gas model using fluid inclusion observations, AAPG Annual Convention and Exhibition, Houston, Texas, 13 April, 2011.
18. Crack-seal cementation of natural fractures recording pore-fluid evolution in tight-gas sandstones and shales, Fracture Research and Applications Consortium Annual Meeting, Austin, Texas, 23 September, 2010.
17. Crack-seal cementation of natural fractures recording pore-fluid evolution in tight-gas sandstone reservoirs, 20<sup>th</sup> General Meeting of the International Mineralogical Association, Budapest, Hungary, 21-27 August, 2010.
16. Pore fluid evolution in tight-gas sandstone reservoirs based on crack-seal cementation of natural fractures, presented at the 10<sup>th</sup> Pan-America Current Research on Fluid Inclusions, Las Vegas, Nevada, 10 June, 2010.
15. Fluid inclusion insights into the opening history of synkinematically cemented fractures: Mamm Creek results, Piceance Basin, Colorado, presented at EnCana Oil & Gas, Denver, Colorado, 21 January, 2010.
14. Fluid inclusion insights into the opening history of synkinematically cemented fractures: Piceance Basin results, Fracture Research and Applications Consortium Annual Meeting, Austin, Texas, 21 November, 2009.
13. Tracking fluid evolution using fluid inclusions in synkinematic fracture cements: Piceance Basin, Colorado: presented at GSA Annual Meeting, Portland, Oregon, 19 October, 2009.
12. Thermal history reconstruction: How precisely can the temperature of a geological event be constrained using fluid inclusions?: presented at BEG weekly seminar, Austin, Texas, June 2008.
11. Combined microthermometric and Raman technique for determination of salinity of H<sub>2</sub>O-CO<sub>2</sub>-NaCl fluid inclusions: presented at 9<sup>th</sup> Pan-America Current Research on Fluid Inclusions, Reston, Virginia, June 2008.
10. How precisely can the temperature of a geological event be constrained using fluid inclusions?: presented at 9<sup>th</sup> Pan-America Current Research on Fluid Inclusions, Reston, Virginia, June 2008.

9. Precision of thermal history reconstruction with fluid inclusions: presented at 19<sup>th</sup> European Current Research on Fluid Inclusions, Bern, Switzerland, July 2007.
8. Nepheline syenites and related magmatic fluids in the Ditrău Alkaline Massif, Transylvania, Romania, Andover, NH: presented at Gordon Research Conference on Inorganic Geochemistry, Andover, New Hampshire, August 2005.
7. Fluid evolution in the nepheline syenites of the Ditrău Alkaline Massif, Transylvania, Romania: presented at 18<sup>th</sup> European Current Research on Fluid Inclusions, Siena, Italy, July 2005.
6. Fluid evolution in the nepheline syenites of the Ditrău Alkaline Massif, Transylvania, Romania: presented at American Geophysical Union Fall Meeting, San Francisco, California, December 2004.
5. The role of fluids in post-solidus transformation in the nepheline syenites of the Ditrău Alkaline Massif, Transylvania, Romania: presented at 17<sup>th</sup> European Current Research on Fluid Inclusions, Budapest, Hungary, June 2003.
4. Fluid inclusions in nepheline: the role of the fluids in the petrologic evolution of the nepheline syenites of the Ditrău Alkaline Massif: presented at GEO 2002 Conference, The University of Bucharest, Bucharest, Romania, October 2002.
3. The role of Antal Koch in understanding the Ditrău syenite massif: presented at In Memoriam Koch-Szentpétery Conference, organized by the Bolyai-Society, Cluj-Napoca, Romania, February 2002.
2. Fluid inclusions in apatite, quartz and nepheline of the Ditrău Alkaline Massif, Transylvania: presented at MINPET Conference - Annual Meeting of the Austrian Mineralogical Association (ÖMG), Vienna, Austria, September 2001.
1. Fluid inclusion study in apatite, quartz and nepheline from the Ditrău Alkaline Massif (Eastern Carpathians, Transylvania, Romania): presented at 17<sup>th</sup> Hungarian Young Earth Scientists Conference, organized by the Hungarian Geological and the Hungarian Geophysical Societies, Győr, Hungary, April 2001.

## **Continuing Education, Workshops and Short Courses**

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EURISPET (EUROpean Intensive Seminars of PETrology – A Marie Curie Series of Events) – Petrology of the lithosphere in extensional settings – short course, Budapest, Hungary (2008)

Fluid Inclusions Applied in Petroleum Geology – short course, Siena, Italy (2005)

Energy modeling in minerals: 4<sup>th</sup> Summer school of the European Mineralogical Union,  
Budapest, Hungary (2002)

Environmental mineralogy: 2<sup>nd</sup> Summer school of the European Mineralogical Union, Budapest,  
Hungary (2000)

## **Professional Society Memberships**

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American Geophysical Union – since 2004

Society of Economic Geologists – since 2006

Geochemical Society – since 2007

American Association of Petroleum Geologists – since 2009

Geological Society of America – since 2012

## **Language Skills**

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Hungarian (10); English (9); Romanian (9)

Also studied: German (3), Russian (2)

(Minor knowledge in Italian, Spanish, French)