Scientific results of the project



Ferenc Fedor[1, 2], PhD, MBA

Hannes Hofmann[3], PhD

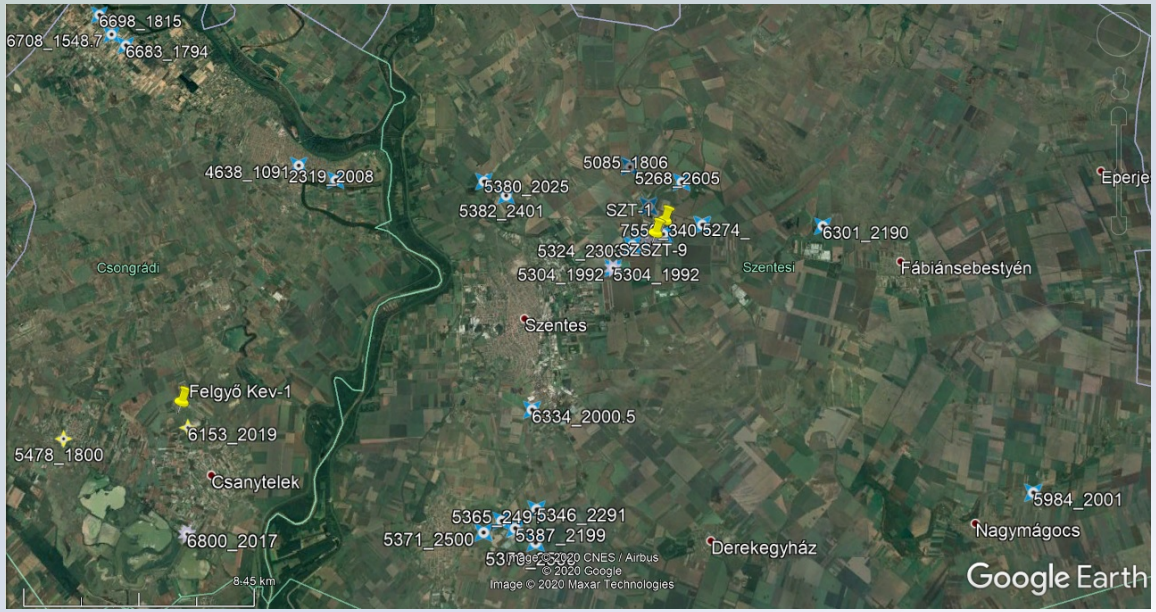
[1]University of Pécs, [2] GEOCHEM
[3]GFZ Potsdam

GINOP-2.2.1-15-2017-00102 "Development of a well completion technology for sustainable and cost-effective reinjection of thermal water"

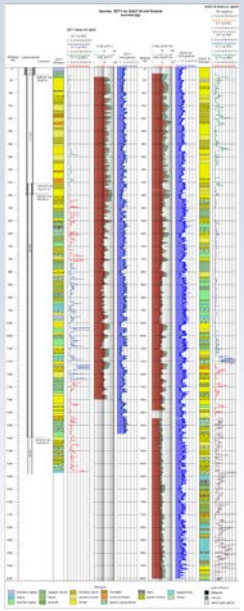
Pécs, 27 October 2022

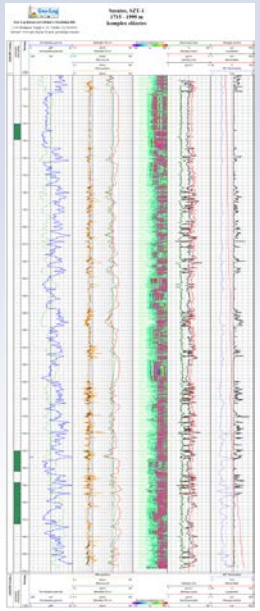
Direct results – basis of scientific works

1. SZSZT-IX and SZT1 boreholes with advanced well logging
2. Core samples for petrophysical and rock mechanical investigation
3. Different laboratory analysis for improving knowledge (water chemistry, petrophysics, rock mechanical data, mineralogy, petrology, etc.)
4. State-of the art reports on different subtopics
5. Gravel packing and frac&pack experiments











Scientific results – artificial cores as a product

GEOCHEM Földtani és Környezetvédelmi Kutató, Tanácsadó és Szolgáltató Kft. ISO 9001, ISO 14001

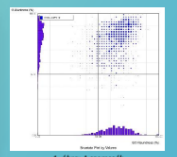
MMF

MŰSZAKI ADATLAP

mesterséges mintatest kalcitos kötőanyaggal



2. ábra: MMF mesterséges mintatest



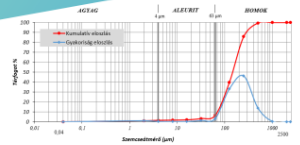
1. ábra: A szemcsék gömbölyűsége (ISO Roundness) és görgetettsége (O. Bluntness)

ALAPADATOK

Mintatest alapja (n=99)	Osztályozott homok (OH 0,1-0,4 mm)		
Mintatest mérete (n=75)	Átmérő (1,5")	36,22 ± 0,68	mm
	Hossz	57,70 ± 4,80	mm
	Térfogat	59,50 ± 5,58	cm³

SZEMCSEMÉRET (n=99)

500-1000 µm	0,43 ± 0,08	v/v%	$x_{átlagos}$ 163,15 ± 10,73	µm
250-500 µm	13,74 ± 2,50	v/v%	x_{10} 75,50 ± 5,94	µm
125-250 µm	46,21 ± 2,94	v/v%	x_{50} 141,82 ± 9,34	µm
63-125 µm	33,16 ± 4,14	v/v%	x_{90} 286,25 ± 21,06	µm
4-63 µm	5,00 ± 1,24	v/v%	modus 112	µm
< 4 µm	1,47 ± 0,12	v/v%		



3. ábra: Szemcseméret-eloszlás

SZEMCSEALAK (n=69)

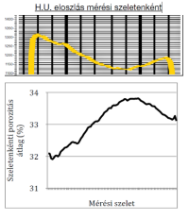
ISO Roundness	0,622 ± 0,008
O. Bluntness	0,824 ± 0,007
ISO Circularity	0,857 ± 0,005
ISO Aspecratio	0,688 ± 0,007

KŐZETFIZIKAI TULAJDONSÁGOK

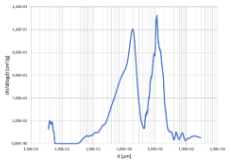
Vázsűrűség (n=75)	2,667 ± 0,006	g/cm³
Fajlagos sűrűség (Bulk sűrűség) (n=75)	1,798 ± 0,028	g/cm³
He-porozitás (n=75)	32,60 ± 1,07	%
Gázpermeabilitás (n=64)		
He-permeabilitás (400 psi, 27 bar)	64,2 ± 16,80	mD
Akusztikus hullámterjedési sebesség (400 psi, 27 bar)		
p-hullám terjedési sebesség (kompressziós) (n=75)	1572 ± 75	m/s
s-hullám terjedési sebesség (nyíró) (n=75)	1034 ± 67	m/s

ÁSVÁNYTANI ÖSSZETÉTEL (n=5)

Kvarc	97,4-97,8	%
Kalcit	2,2-2,6	%



4. ábra: Sűrűség és porozitás heterogenitás vizsgálata CT-vel
Hounsfield-érték (sűrűségtérkép)



5. ábra: Jellemző pórustorokméret eloszlás

A fenti adatok tájékoztató/bemutató jellegűek, egy adott mintacsoportra és recepturára vonatkoznak.
A fenti termék minimális rendelési száma: 50 db
Minden minta esetén átadásra kerül a mintatestre mért He-porozitás és gázpermeabilitás jegyzőkönyv.
Ár: 100 EUR/minta, szállítás 50 minta esetén a megrendeléstől számított két hónap.
Új termék előállítása előzetes egyeztetés alapján, K+F fejlesztési szerződés keretében történhet.

7761 Kozármisleny, Viola u. 55. Fsz. 1. 7673 Kővágószőlős, Hrsz.: 0222/35 +36 72/564 892
geochem@geochem-ltd.eu www.geochem-ltd.eu

GEOCHEM Földtani és Környezetvédelmi Kutató, Tanácsadó és Szolgáltató Kft. ISO 9001, ISO 14001

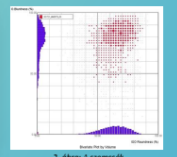
MMDR

MŰSZAKI ADATLAP

mesterséges mintatest kalcitos kötőanyaggal



1. ábra: MMDR mesterséges mintatest



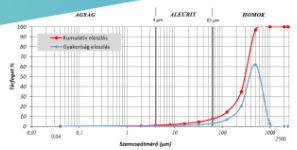
2. ábra: A szemcsék gömbölyűsége (ISO Roundness) és görgetettsége (O. Bluntness)

ALAPADATOK

Mintatest alapja (n=100)	Osztályozott homok (OH 0-1 mm)		
Mintatest mérete (n=80)	Átmérő (1,5")	35,98 ± 0,44	mm
	Hossz	64,81 ± 1,18	mm
	Térfogat	65,91 ± 2,16	cm³

SZEMCSEMÉRET (n=100)

500-1000 µm	2,86 ± 0,07	v/v%	$x_{átlagos}$ 289,20 ± 2,83	µm
250-500 µm	62,26 ± 1,12	v/v%	x_{10} 82,23 ± 3,47	µm
125-250 µm	20,39 ± 1,02	v/v%	x_{50} 302,01 ± 3,51	µm
63-125 µm	6,86 ± 0,29	v/v%	x_{90} 455,85 ± 1,40	µm
4-63 µm	6,56 ± 0,32	v/v%	modus 300	µm
< 4 µm	1,07 ± 0,05	v/v%		



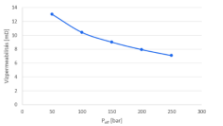
4. ábra: Szemcseméret-eloszlás

SZEMCSEALAK (n=100)

ISO Roundness	0,635 ± 0,008
O. Bluntness	0,754 ± 0,008
ISO Circularity	0,844 ± 0,004
ISO Aspecratio	0,700 ± 0,007

KŐZETFIZIKAI TULAJDONSÁGOK

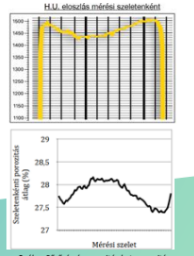
Vázsűrűség (n=80)	2,689 ± 0,008	g/cm³
Fajlagos sűrűség (Bulk sűrűség) (n=80)	1,924 ± 0,017	g/cm³
He-porozitás (n=80)	28,44 ± 0,60	%
Gázpermeabilitás (n=80)		
He-permeabilitás (400 psi, 27 bar)	49,7 ± 11,6	mD
Vízpermeabilitás (n=5)		
Vízpermeabilitás 1. (725 psi, 50 bar)	15,8 ± 4,5	mD
Vízpermeabilitás 2. (1450 psi, 100 bar)	13,7 ± 4,0	mD
Vízpermeabilitás 3. (2176 psi, 150 bar)	12,4 ± 3,5	mD
Vízpermeabilitás 4. (2901 psi, 200 bar)	11,1 ± 3,2	mD
Vízpermeabilitás 5. (3626 psi, 250 bar)	9,9 ± 2,8	mD
Akusztikus hullámterjedési sebesség (400 psi, 27 bar)		
p-hullám terjedési sebesség (kompressziós) (n=80)	1559 ± 26	m/s
s-hullám terjedési sebesség (nyíró) (n=80)	1034 ± 40	m/s



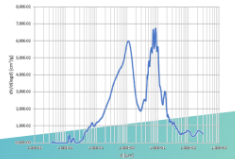
3. ábra: Vízpermeabilitás

ÁSVÁNYTANI ÖSSZETÉTEL (n=4)

Kvarc	75,0-91,0	%
Földpát (albit)	5,5-12,5	%
Muszkovit	0,6-5,7	%
Kaolinit	0,5-4,6	%
Kalcit	0,6-3,2	%
Klorit	0,5-4,1	%



5. ábra Sűrűség és porozitás heterogenitás vizsgálata CT-vel
Hounsfield-érték (sűrűségtérkép)



6. ábra: Jellemző pórustorokméret eloszlás

A fenti adatok tájékoztató/bemutató jellegűek, egy adott mintacsoportra és recepturára vonatkoznak.
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Ár: 100 EUR/minta, szállítás 50 minta esetén a megrendeléstől számított két hónap.
Új termék előállítása előzetes egyeztetés alapján, K+F fejlesztési szerződés keretében történhet.

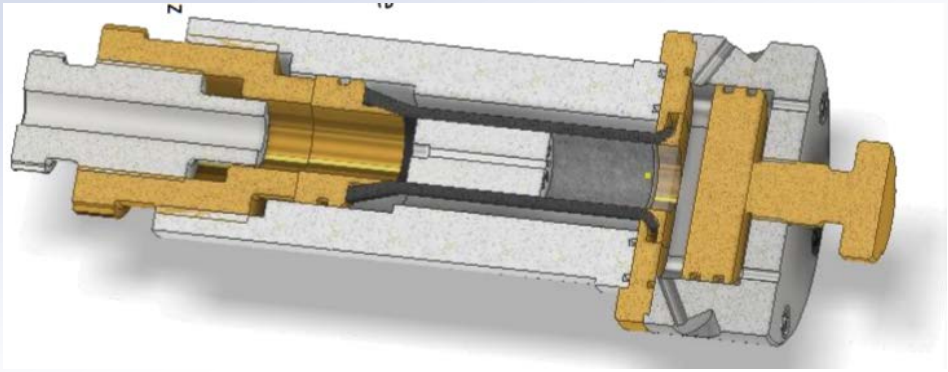
7761 Kozármisleny, Viola u. 55. Fsz. 1. 7673 Kővágószőlős, Hrsz.: 0222/35 +36 72/564 892
geochem@geochem-ltd.eu www.geochem-ltd.eu

Dynamic leak-off experimental tool - prototype

Petroleum and natural gas industries. Completion fluides and materials.
Part 6: Procedure for measuring leakoff of completion fluids under dynamic conditions
(ISO 13503-6:2014)



Max. Pore Pressure	2,000 psi / 14 MPa
Max. Confining Pressure	7,250 psi / 50 MPa
Max. Temperature	300 °F / 150 °C
Shear rate in the cell	40 / sec
Max. shear rate in the shear history simulator	~ 3000 / sec



ROTAQUA

MECSEKÉRC ZRT.

KŐMÉRŐ

PÉCSI TUDOMÁNYEGYETEM
UNIVERSITY OF PÉCS

Well completion technology – joint venture laboratory



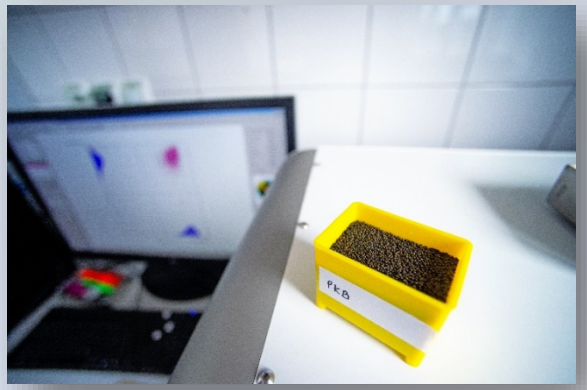


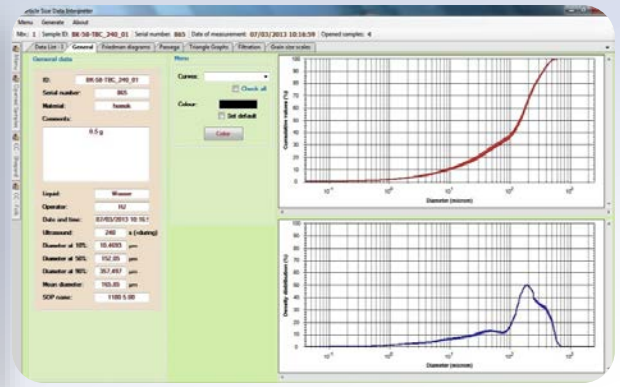


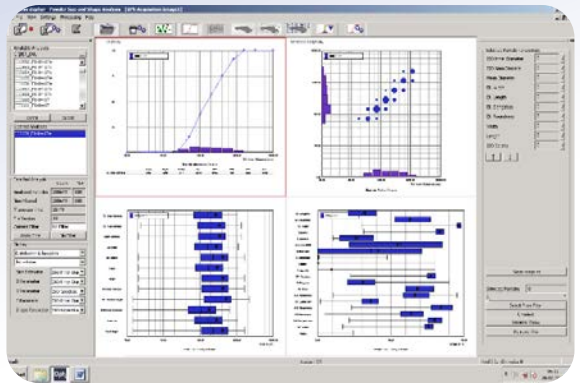












Mobile reinjection unit by Mecsekérc













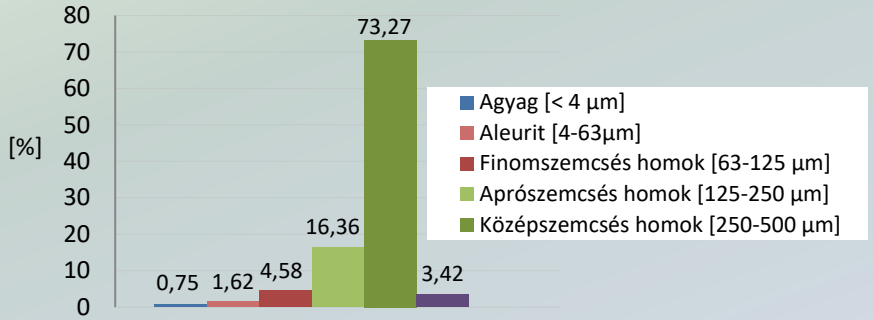


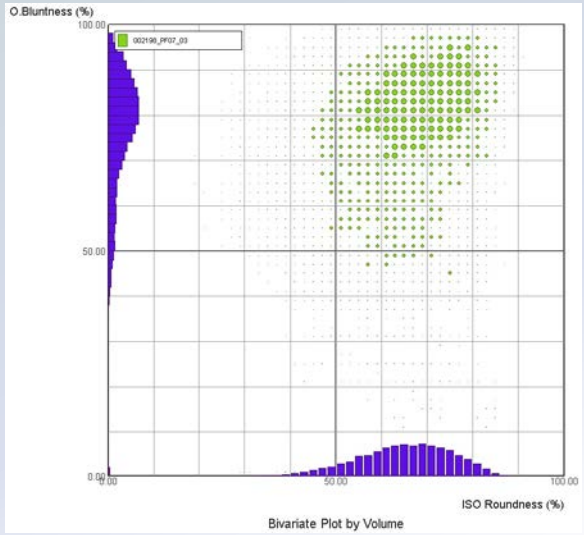
New designed and modified gel for proppant placement by Newpark

No	Materials		Concentration		In lab	
1	KCl	2%	20	[kg/m3]	10	[g]
2	NewStim LpHA	pH: 5.5-6.5				
3	NewStim GS		8	[l/m3]	4	[ml]
4	NewStim GP		9,4	[kg/m3]	4,7	[g]
5	NewStim HPHA	pH: 10.5-11				
6	NewStim IXL 028		0,5	[l/m3]	0,25	[ml]
7	NewStim DXL 450		1,6	[l/m3]	0,8	[ml]
8	NewStim Breaker XT		30	[g/m3]	15	[g]

Viscosity : > 3000 cP to 500 cP, and finally will be broken
Temperature: 110 °C
Pressure: 140 bar,
Confining pressure (leak-off): 300-350 bar (questionable)
Effective pressure: 200 bar

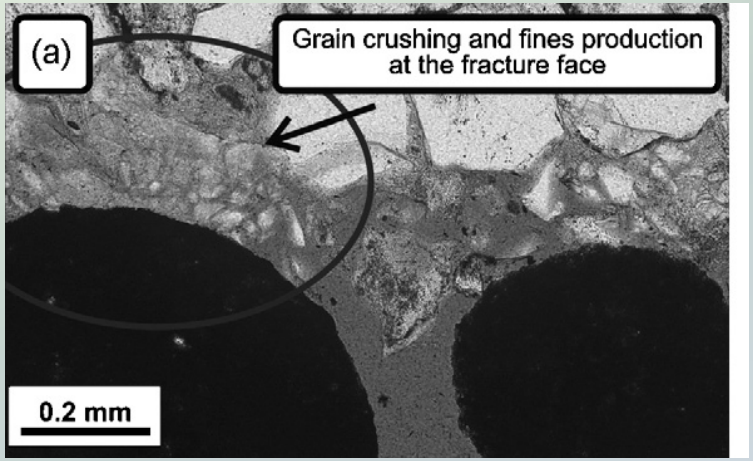
Proppant investigation and applying for gravel packing experiment – Fehérvárcsurgó 0.2/0.6 mm sand

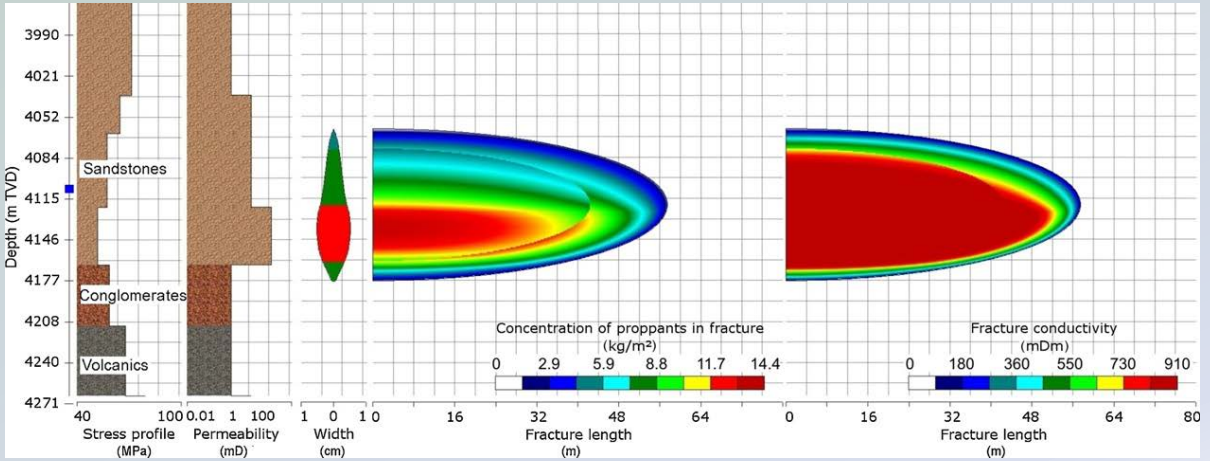


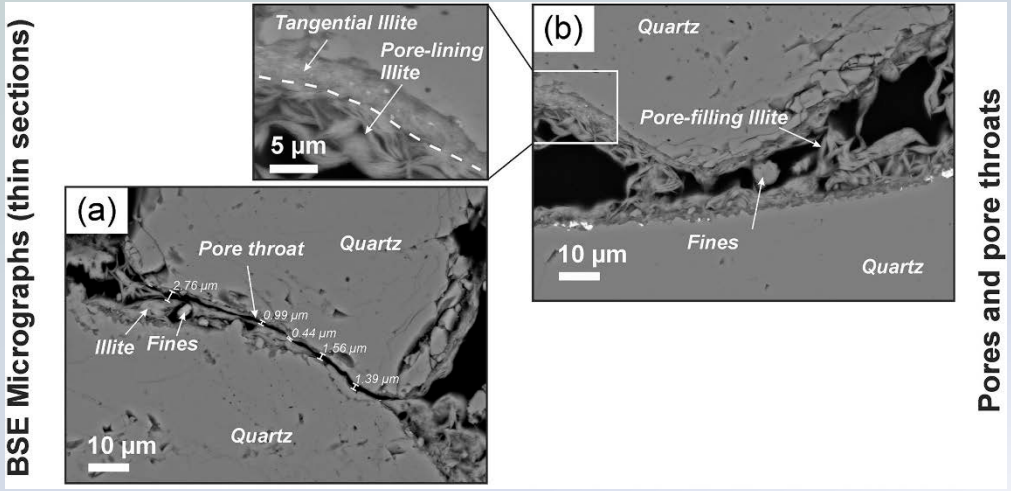


	Mean	Min	X_{10}	X_{50}	X_{84}	X_{90}	X_{99}	Max
ISO Roundness	0,65	0,14	0,50	0,66	0,75	0,78	0,84	1,00
O.Bluntness	0,76	0,00	0,54	0,79	0,90	0,93	1,00	1,00
ISO Circularity	0,85	0,40	0,77	0,86	0,90	0,91	0,93	1,00
ISO AspectRatio	0,72	0,14	0,57	0,73	0,83	0,85	0,91	0,96
Ell. Elongation	0,28	0,00	0,11	0,27	0,42	0,46	0,61	1,00
Ell. Roundness	0,68	0,00	0,46	0,69	0,85	0,88	0,96	1,00
ISO Solidity	0,93	0,49	0,88	0,94	0,96	0,96	0,98	1,00
Convexity	0,92	0,55	0,87	0,93	0,96	0,96	0,98	1,00
Luminance	0,42	0,25	0,36	0,42	0,46	0,47	0,50	0,53
Luminance RSD	0,16	0,00	0,08	0,15	0,22	0,24	0,32	0,52
O.Roughness	0,01	0,00	0,00	0,00	0,01	0,02	0,06	0,26
Satellity	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,50
Outgrowth	0,04	0,00	0,00	0,00	0,00	0,00	0,50	0,67
O.Elongation	0,25	0,00	0,09	0,24	0,38	0,41	0,54	0,81
Ell. Ratio	0,72	0,00	0,54	0,73	0,86	0,89	0,96	1,00
ISO Eccentricity	0,66	0,06	0,34	0,61	1,00	1,00	1,00	1,00
ISO Straightness	0,97	0,40	0,88	1,00	1,00	1,00	1,00	1,00
ISO Compactness	0,80	0,38	0,71	0,81	0,87	0,88	0,92	1,00
ISO Extent	0,71	0,33	0,66	0,71	0,75	0,76	0,79	1,00
Porosity	0,00	0,00	0,00	0,00	0,00	0,00	0,02	0,16

International collaboration – GFZ Potsdam







Previous experiences and collaboration in the topic

Zimmermann & Reinicke (2010)
https://doi.org/10.1016/j.geothermics.2009.12.003

Cheng & Milsch (2020)
https://doi.org/10.1029/2020JB020122

Zimmermann & Reinicke (2010)
https://doi.org/10.1016/j.geothermics.2009.12.003

FracPro simulation of hydraulic fracturing – GFZ Potsdam, Univ. Pécs

Section 1: Summary of Hydraulic Fracture Properties

Fracture Geometry Summary*

Fracture Half-Length (m)	6	Propped Half-Length (m)	6
Total Fracture Height (m)	12	Total Propped Height (m)	12
Depth to Fracture Top (m)	2021	Depth to Propped Fracture Top (m)	2021
Depth to Fracture Bottom (m)	2033	Depth to Propped Fracture Bottom (m)	2033
Equivalent Number of Multiple Fracs	1.0	Max. Fracture Width (cm)	2.59
Fracture Slurry Efficiency**	0.09	Avg. Fracture Width (cm)	1.74
		Avg. Proppant Concentration (kg/m²)	35.56

* All values reported are for the entire fracture system at a model time of 21.70 min (end of Stage 13 Main frac flush)
** Value is reported for the end of the last pumping stage (Stage 13, Main frac flush)

Fracture Conductivity Summary*

Avg. Conductivity** (mD-m)	1261.5	Avg. Frac Width (Closed on prop) (cm)	1.737
Dimensionless Conductivity**	0.43	Ref. Formation Permeability (mD)	500
Proppant Damage Factor	0.52	Undamaged Prop Perm at Stress (mD)	156460
Apparent Damage Factor	0.00	Prop Perm with Prop Damage (mD)	75101
Total Damage Factor	0.52	Prop Perm with Total Damage (mD)	75101
Effective Propped Length (m)	6	Proppant Embedment (mm)	0.372

* All values reported are for the entire fracture system. Actual conductivity could be lower if equivalent multiple fractures have been modeled
** Total Damage Factor and Proppant Embedment have been applied

Fracture Pressure Summary*

Model Net Pressure** (MPa)	5.30	BH Fracture Closure Stress (MPa)	25.03
Observed Net Pressure** (MPa)	0.00	Closure Stress Gradient (MPa/m)	0.0124
Hydrostatic Head*** (MPa)	20.08	Avg. Surface Pressure (MPa)	13.74
Reservoir Pressure (MPa)	20.00	Max. Surface Pressure (MPa)	16.14

* Averages and maxima reported for Main Frac stages.
** Values reported for the end of the last pumping stage (Stage 13, Main frac flush)
*** Value reported for clean fluid

Section 2: Wellbore configuration

- Bottomhole temperature: 105 °C (estimated)
- Deviated hole: no
- Injection down: Tubing
- Flush Volume to 2032 m: 4.548 m³

Casing Data

Length (m)	Top MD (m)	Bot MD (m)	Casing	OD (cm)	ID (cm)
45.5	0	45.5	Cemented Casing	47.3	45
493.0	0	493.0	Cemented Casing	34	31.8
1793	0	1793	Cemented Casing	24.44	22.85
244.5	1793	2037.5	Cemented Casing	17.78	15.94

Tubing Data

Length (m)	Top MD (m)	Bot MD (m)	Tubing	OD (cm)	ID (cm)
1996	0	1996	Tubing	6.604	5.08

Perforation Data

Length (m)	Top MD (m)	Bot MD (m)	Diameter (cm)	Number of Perfs
11	2021.2	2032.2	1.270	100

Section 3: Formation data

- Bottomhole temperature: 106 °C (estimated)
- Deviated hole: no
- Injection down: Tubing
- Borehole flush Volume to 2032 m: 4.548 m³

Formation Transmissibility Properties

Zone name	Top MD (m)	Bot MD (m)	Perm (mD)	Porosity (%)	Res. Pressure (MPa)	Water sat (%)	Pore fluid viscosity (mPa s)
Sandstone	0	3000	500	30	20.0	100	1

Formation Mechanical Properties

Zone name	Top MD (m)	Bot MD (m)	Frac Grad (MPa/km)	Young's Modulus (MPa)	Poisson's Ratio	Toughness (MPa m^0.5)	Total Compress (1/MPa)
Sandstone	0	3000	11.3	3447	0.3	3.8	$9.71\ 10^{-4}$

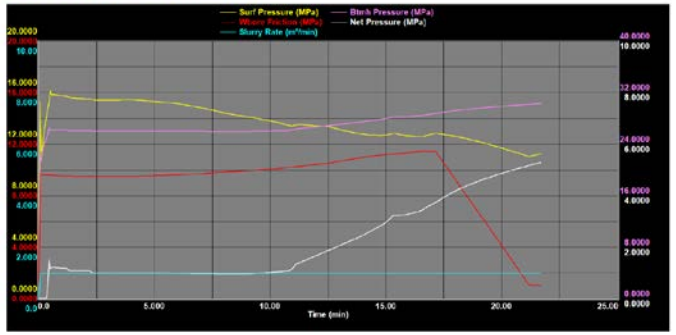
Section 4: Fluid and proppant data

Fluid Name	DynaFrac HT 35	SLICKWATER
Vendor	Weatherford	-
System	DynaFrac HT	-
Description	35# Guar/Delayed Borate XL	10# OF GUAR GEL+WATER
Base Fluid Specific Gravity	1.01	1.01
Spurt Loss (L/m²)	0.0	0.0
Wall Building (m/min½)	6.096e-04	0.0
Flowrate #1 (m³/min)	0.322	1.59
Fric Press #1 (MPa/1000 m)	1.42	0.979
Flowrate #2 (m³/min)	0.644	3.18
Fric Press #2 (MPa/1000 m)	2.84	2.51
Flowrate #3 (m³/min)	1.29	6.36
Fric Press #3 (MPa/1000 m)	6.40	6.42
Wellbore Friction Multiplier	1.000	1.000

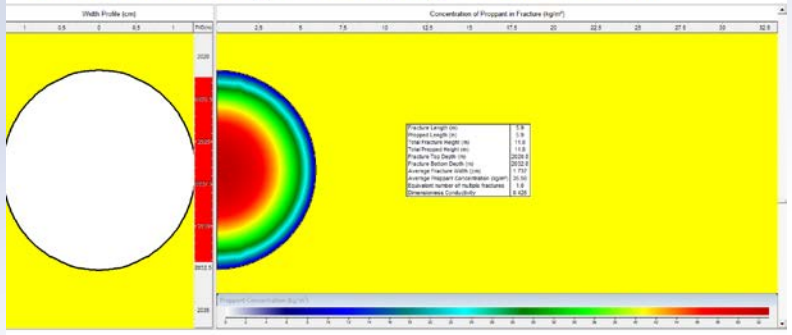
All Fluid info is at a reservoir temperature of 106.0 (°C)
All Viscosities at Shear Rate of 511 (1/sec)
Wellbore Friction pressures shown are the interpolated values multiplied by the Wellbore Friction Multiplier.
Friction is displayed for longest wellbore segment



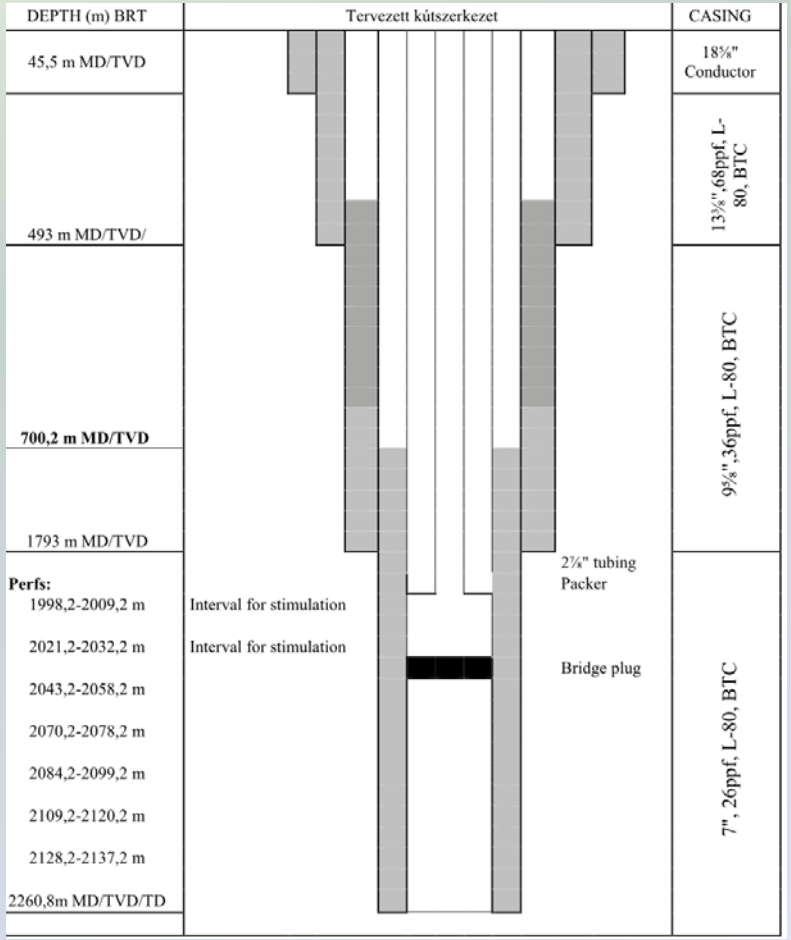
Section 6: Treatment plot

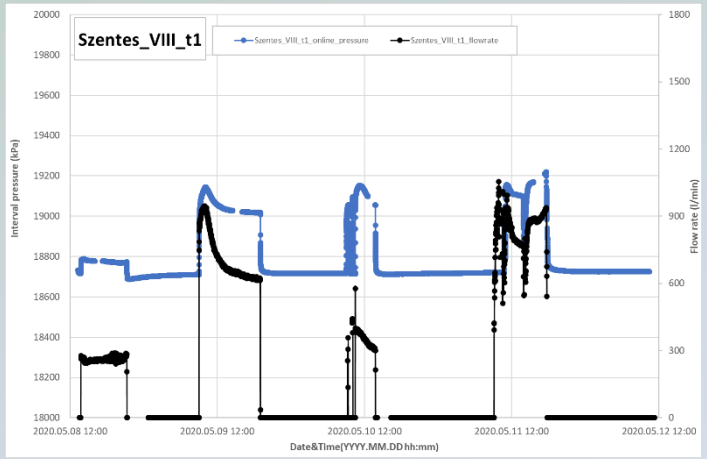


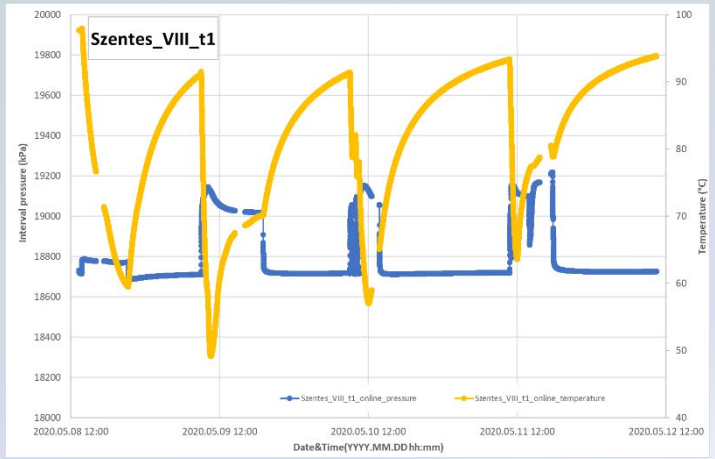
Section 6: Fracture profile and proppant concentration

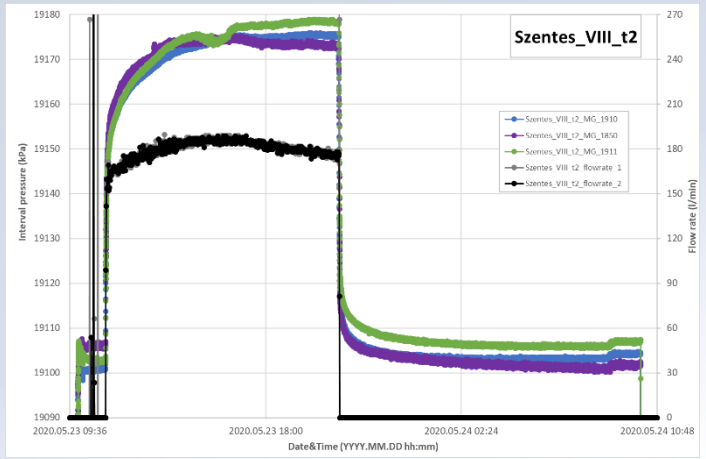


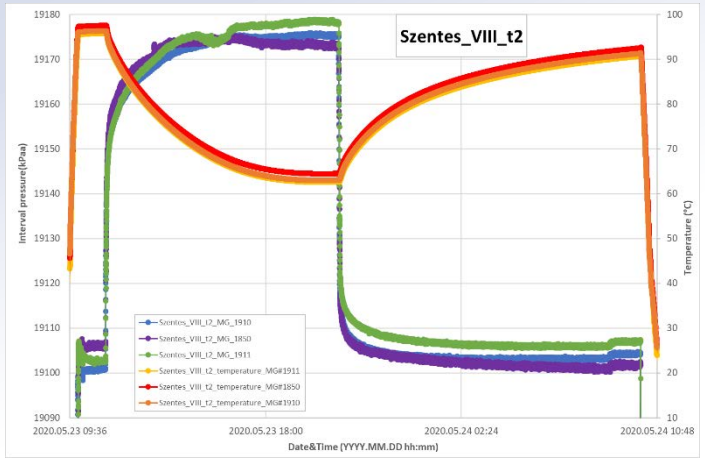
Designed and simulated fracturing – Hydraulic test in well „SZT-VIII”







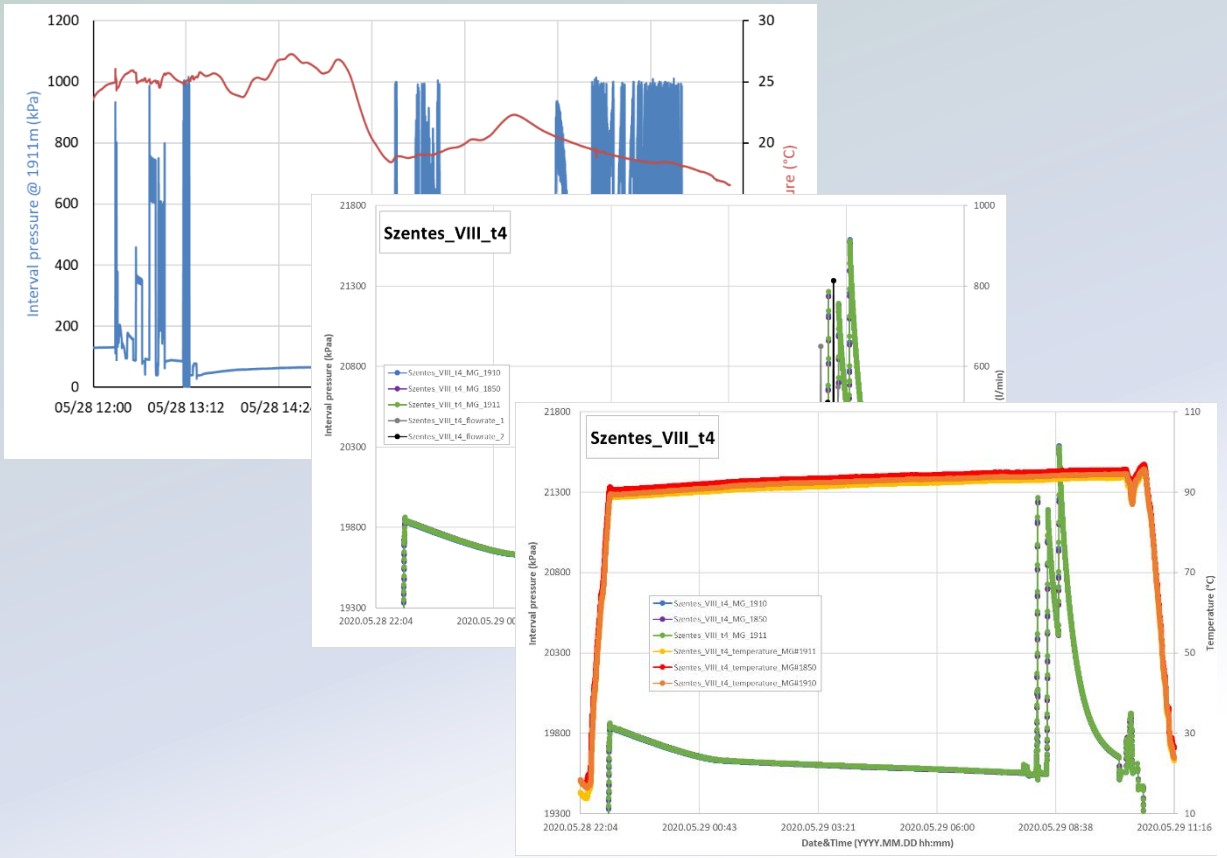




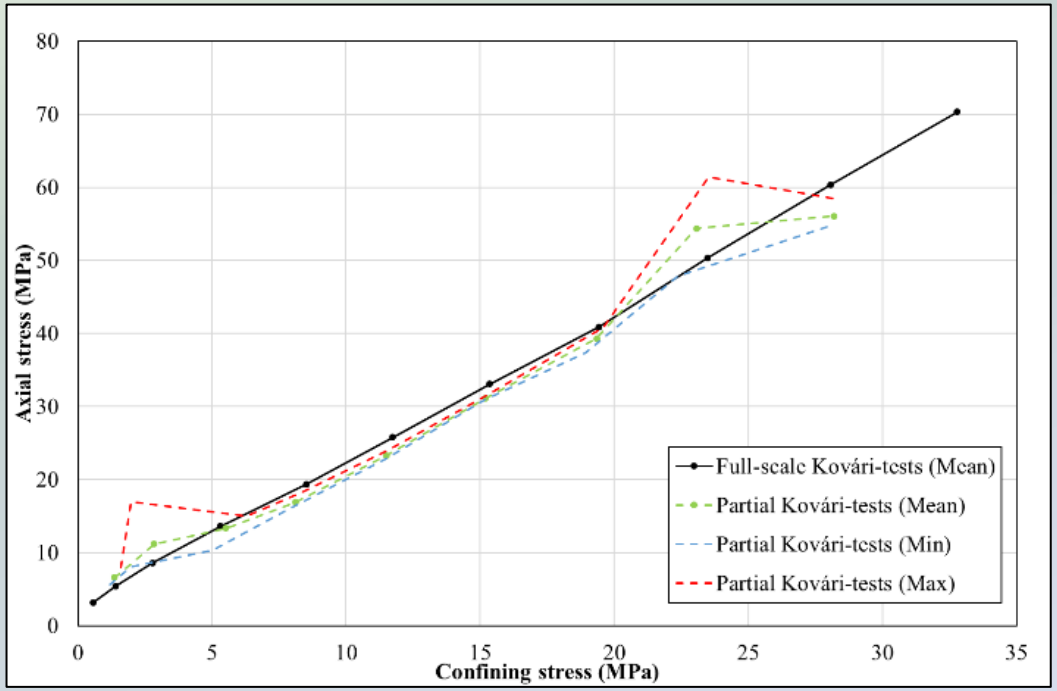
Designed and simulated fracturing – Gel and proppant injection in well „SZT-VIII”

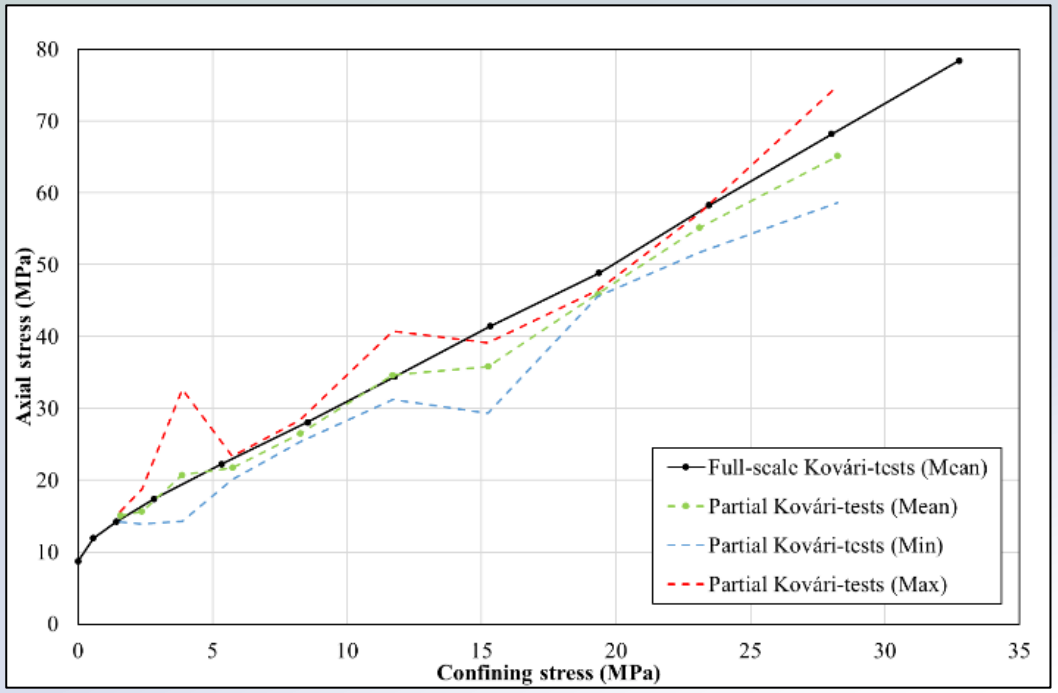
Material	Function	Value
Nalco 73500	Bactericide	40 l
Caustic Soda	pH control	10 kg
Incorr	Corrosion inhibitor	40 l
VISCO XC84	Viscosity enhancer	50 kg
Policell SL	Water loss control	150 kg
Intaflow	Bridge builder	200 kg

Parameter	Value
Specific weight (@ 25°C)	1.01 sg
pH	10.31
Water loss	4.8 ml/30 min
Cl-	2254 mg/l
Marsh viscosity	180 sec/l
R600	139
R300	100
R200	79
R100	55
R60	43
R30	31
R6	15
R3	11
Gel 0’	11
Gel 10’	14



Kovári (Multiple Failure State) Triaxial Testing Method



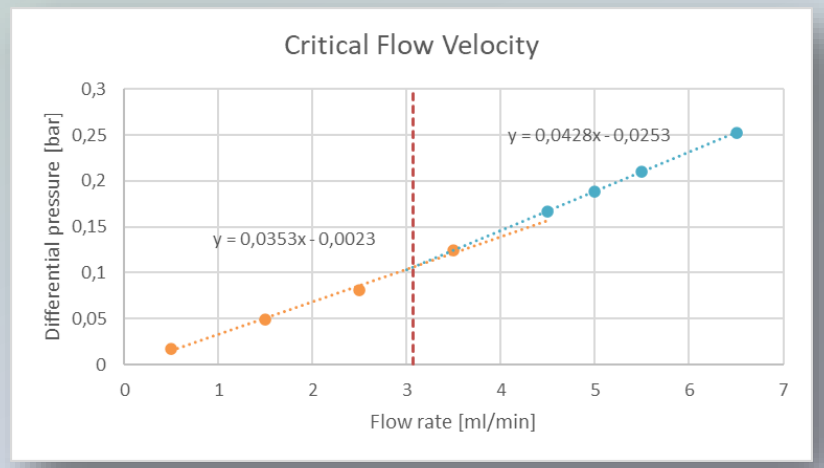


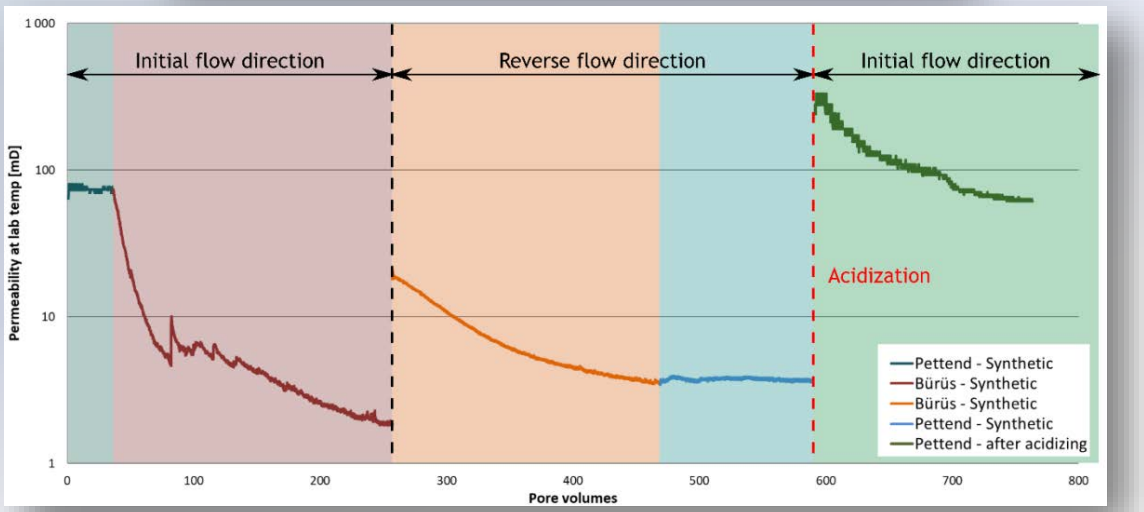
The optimised failure envelopes resulted by the partial and full-scale Kovári-tests of the MMDR artificial group (left: traditional; right: inflexion point interpretation) (Gál et al., in press)

Well technology – advanced measurements

1. Critical flow velocity
2. Water-rock compatibility
3. Gel flooding experiments
4. Acidification

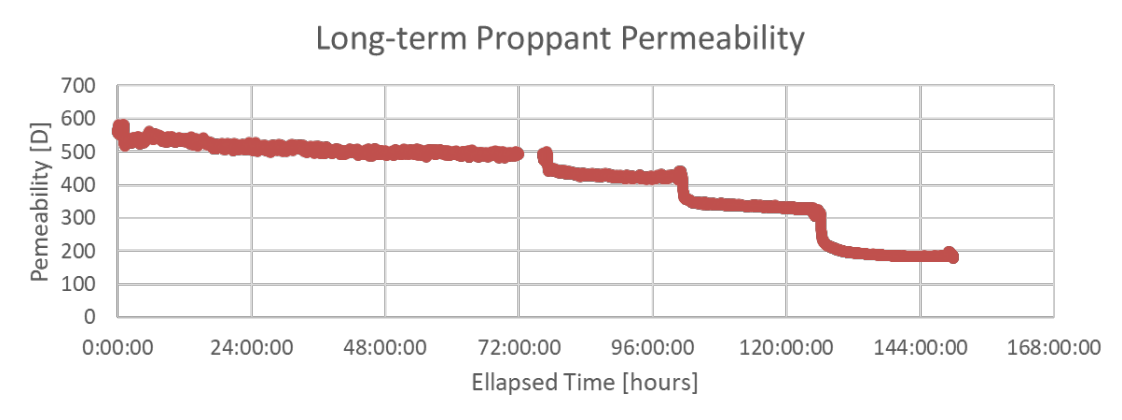


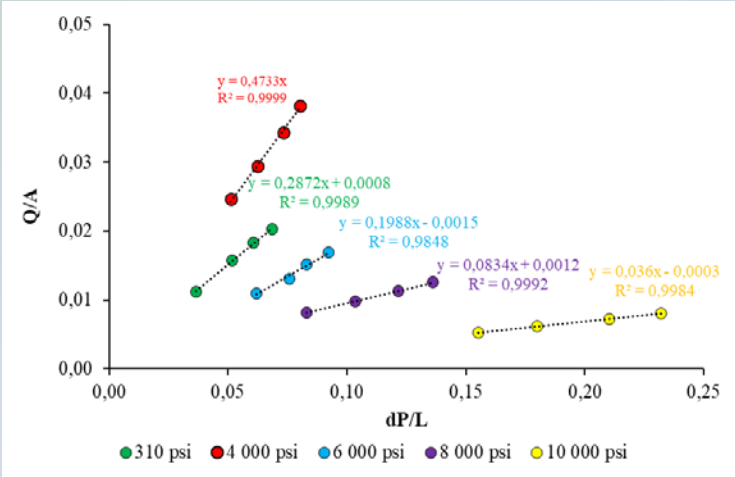


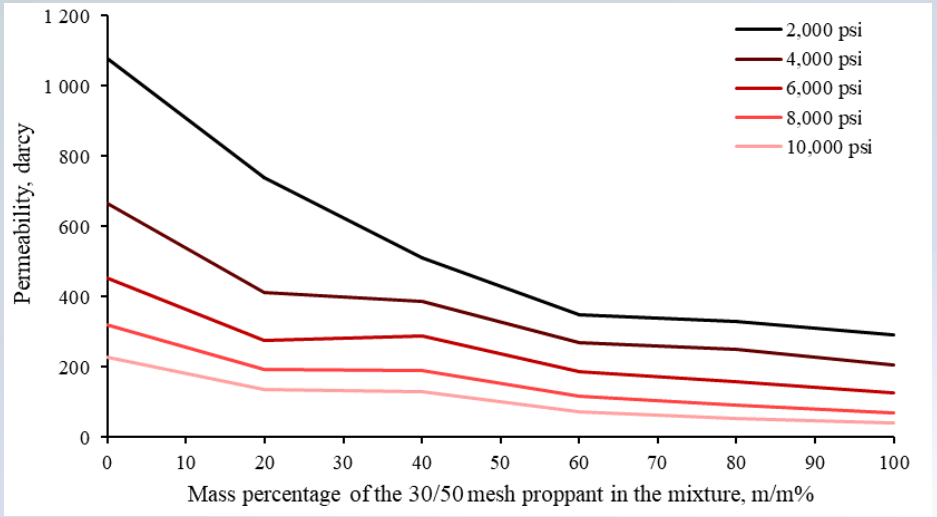


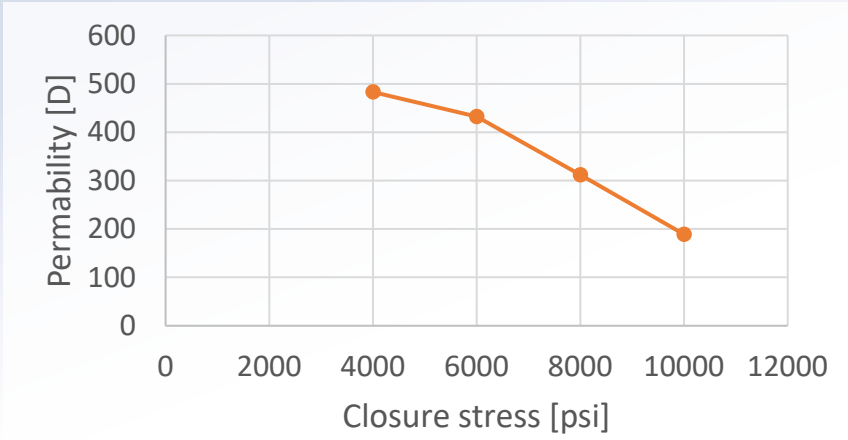
Proppant investigation – fracture conductivity

ISO 13503-5: Procedures for measuring the long-term conductivity of proppants









ROTAQUA

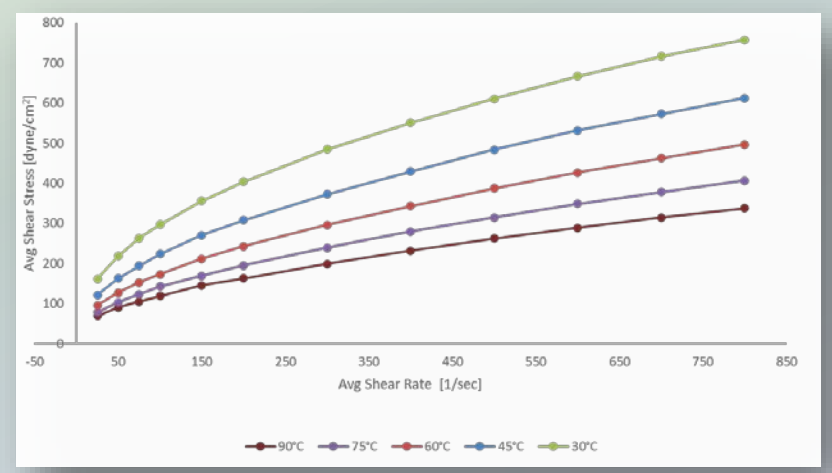
MECSEKÉRC ZRT.

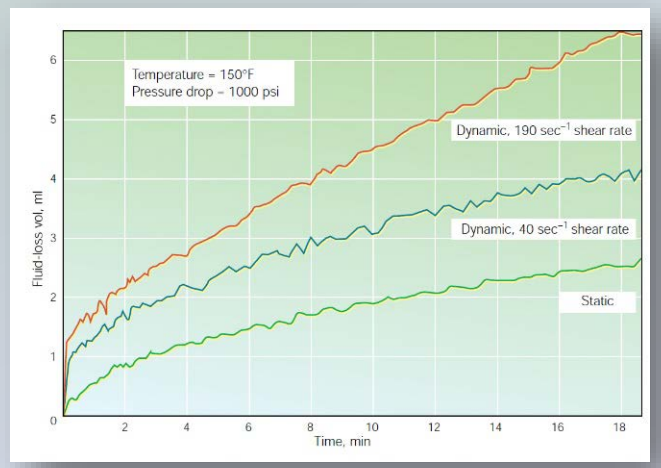
KŐMÉRŐ

PÉCSI TUDOMÁNYEGYETEM
UNIVERSITY OF PÉCS

Dinamic leak-off tests and gel reology







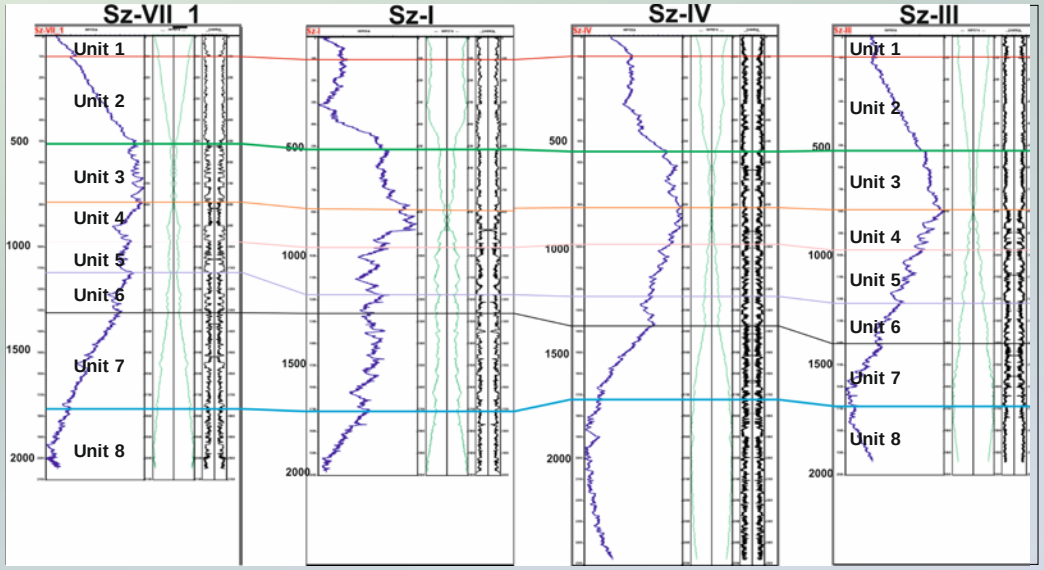




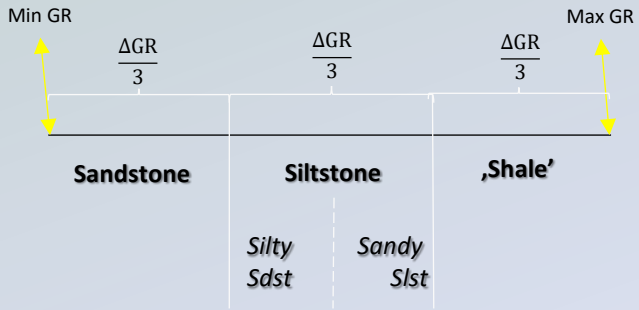


Stratigraphy and modelling

Section B



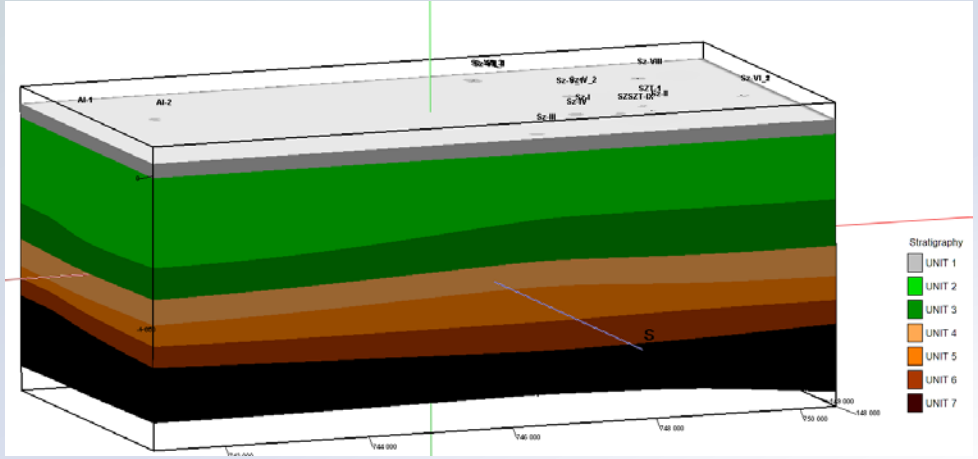
Rock-type definition



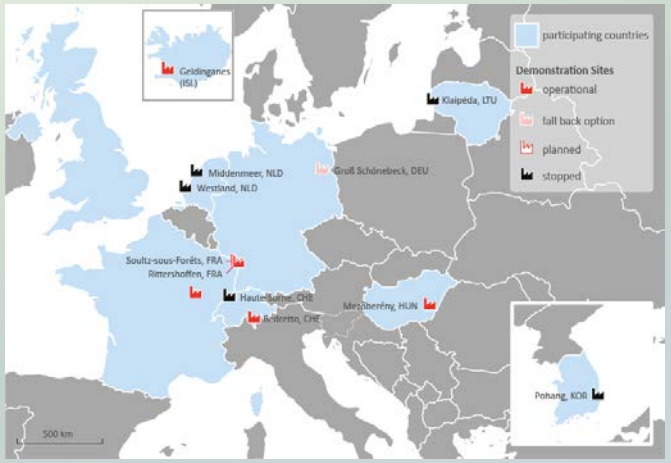
Average GR calculation

Calculation of mean GR for each depth

Depth	GR-AL-1	GR AL-2	GR SZ-I	GR SZ-II	GR SZ-III	GR SZ-IV	GR SZ-V_1	GR SZ-V_2	GR SZ-VI	GR SZ-VI_2	GR SZ-VII_1	GR SZ-VII_2	GR SZ-VII_3	GR SZ-VIII	GR SZ-IX	GR SZT-1	MEAN GR	
8.4	2.6	2.6	8.62	7.00	7.66	8.13	3.62	5.84	5.24	12.88	5.57	5.94	2.46	2.51	8.8492	9.6403	6.20	16-
8.5	2.65	1.3	8.62	6.88	8.19	8.28	3.62	5.48	5.23	12.47	5.60	5.95	2.45	2.48	9.3221	9.6798	6.14	16-
8.6	2.65	2.7	8.60	6.86	6.77	7.14	3.63	6.19	5.21	12.31	5.62	5.96	2.43	2.45	7.3366	9.0406	5.93	16-
8.7	2.53	1.4	8.49	6.86	7.08	6.89	3.62	5.78	5.18	15.13	5.63	5.97	2.38	2.45	7.6161	10.5688	6.10	16-
8.8	2.64	1.8	8.53	6.78	7.08	6.98	3.63	5.89	5.16	14.81	5.64	5.98	2.40	2.48	7.6399	10.011	6.09	16-
8.9	2.73	1.6	8.53	6.77	8.22	6.36	3.68	6.00	5.14	13.88	5.64	6.00	2.45	2.53	8.4647	10.0699	6.13	16-
9	2.79	2.2	8.44	6.67	8.72	6.61	3.73	5.81	5.13	15.22	5.65	6.03	2.52	2.58	7.8272	10.0501	6.25	16-
9.1	2.95	1.9	8.27	6.69	7.94	5.48	3.76	5.39	5.07	14.94	5.66	6.06	2.65	2.57	8.0864	10.2398	6.10	16-
9.2	2.97	1.7	7.99	6.65	7.02	5.36	3.78	4.42	5.04	12.59	5.67	6.09	2.71	2.56	8.3444	11.3091	5.80	16-
9.3	3	1.8	7.71	6.71	7.09	5.38	3.75	4.98	4.98	13.06	5.70	6.13	2.81	2.52	10.3001	10.5814	6.03	16-

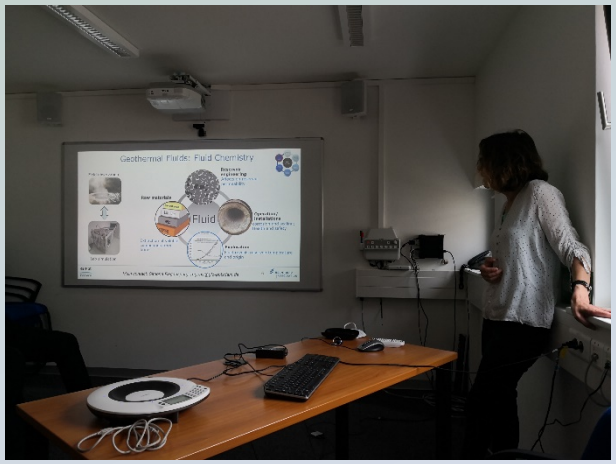


Experience exchange – field experiments

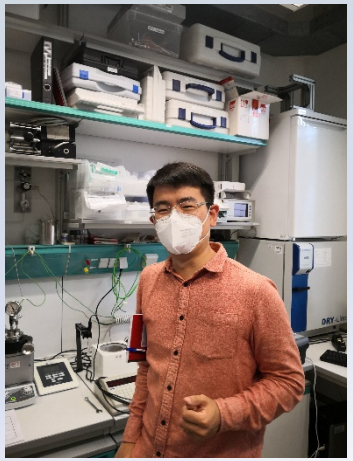


DESTRESS
Demonstration of soft stimulation treatments of geothermal reservoirs

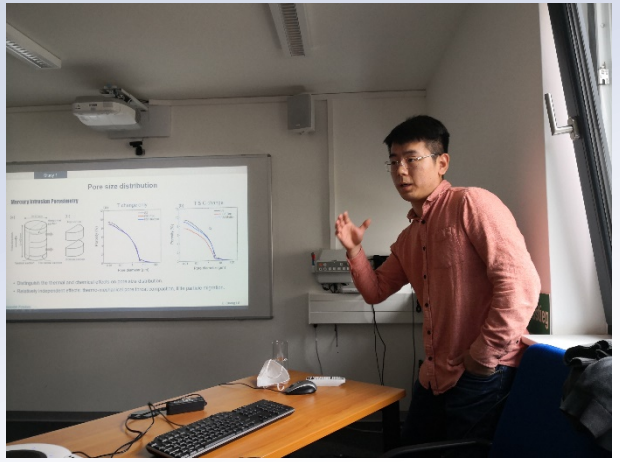
Visit in GFZ laboratories, project meeting
08-09.07.2021 Potsdam

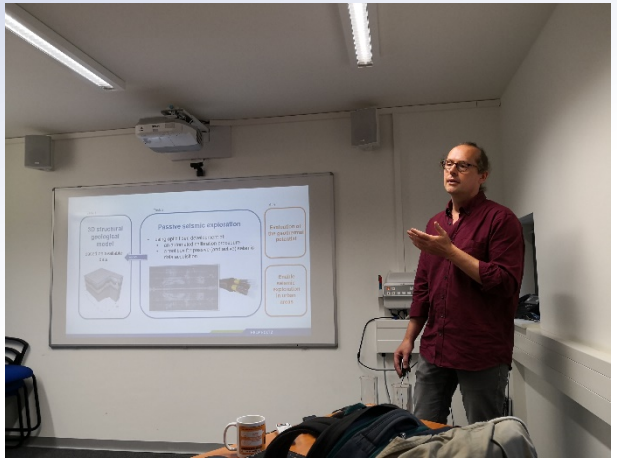












Non-exhaustive list of publishing activities

Presentations, posters

Koroncz, P., Kovács, J., Fedor F.: Is proppant embedment a real phenomenon in the case of Upper Pannonian unconsolidated and friable sands? poszterelőadás, Geofluid 2021 konferencia, online, 2021.07.07-09

Koroncz Péter, Fedor Ferenc, Magyar Gábor, Kovács János: Homokkőbe történő vízvisszasajtolást támogató laboratóriumi vizsgálatok, előadás, PTE előadóülés, 2022.03.17, Pécs

Fedor Ferenc, Koroncz Péter, Magyar Gábor, Kovács János: Homokkőbe történő vízvisszasajtolást támogató laboratóriumi vizsgálatok, előadás, Nosztalgeo, 2022.03.18, Algyő

Koroncz Péter, Fedor Ferenc, Magyar Gábor, Kovács János:Termálvíz visszasajtoló kutak létesítéséhez és üzemeltetéséhez kapcsolódó rétegkárosodási folyamatok laboratóriumi vizsgálata, előadás, GINOP 2.2.1, SzKK - nyitókonferencia, 2022.06.30, Pécs

Kuncz, M., Koroncz, P., Kovács, J., Magyar, G., Fedor, F.: Dynamic Leak-off experiments on Upper Pannonian sandstones and HPG gels, AAPG ERC 2022.05.03-04, Budapest

Non-exhaustive list of publishing activities

Abstracts in abstract books – Geofluid 2021, GeoMATES 2022

KORONCZ, P., FEDORNÉ SZÁSZ, A., FEDOR, F., KOVÁCS, J.: Is proppant embedment a real phenomenon in the case of Upper Pannonian unconsolidated and friable sands?, In: Mádl-Szőnyi, J., Erhardt, I.: Abstract book of Geofluid 2021 Conference, 07-09.07.2021, p.94, ISBN: 978-615-81297-2-5

CASTRO, C., GEIGER, J., FEDOR, F.: Relationship between textural and petrophysical characters of Sandstones and Siltstones: A case study from Szentes area, Hungary, In: Hatvani, I.G., Erdélyi, D., Fedor, F.: Abstract book of the GeoMATES'22, p.86, 19-21.05.2022, Pécs, ISBN: 978-963-7068-14-0

PUSZTAI, P., KORONCZ, J.P., KUNCZ, M., JOBBIK, A., FEDOR, F.: A New Method for Determining Propped Fracture Permeability, In: Hatvani, I.G., Erdélyi, D., Fedor, F.: Abstract book of the GeoMATES'22, p.88, 19-21.05.2022, Pécs, ISBN: 978-963-7068-14-0

Non-exhaustive list of publishing activities

Abstracts in abstract books – AAPG 2022, EGEC 2022

Koroncz, P., Fedor, F., Kovács, J., Magyar, G.: Dynamic Leak-off experiments on Upper Pannonian sandstones and HPG gels, AAPG ERC 2022 abstract book, p.130

Péter Koroncz, Ferenc Fedor, Zsane Vizhányó, Máté Kuncz, Péter Ács, Anita Fedor Szász, Márton Pál Farkas, Eszter Sendula, Tímea Pernyeszi, Gábor Magyar, János Szanyi, László Kovács, József Csicsák, Hannes Hofmann, János Kovács: Laboratory R&D related to the development of technology for water re-injec on in poorly consolidated Upper Miocene rocks, European Geothermal Congress 2022, Berlin, Germany, 17-21 October 2022

Non-exhaustive list of publishing activities

Diplome works and PhD

Márton Farkas: Hydraulic fracturing in hard rock, 2022.05.02, GFZ Potsdam

Péter Koroncz: Laboratory investigation of layer degradation processes associated with the construction and operation of thermal water recovery wells – in progress

Patrik Pusztai – topic: Proppant investigation (Miskolc Univ.)

Máté Kuncz: Petrographic and petrophysical analysis of UP sandstone samples from target layers of fracturing and thermal water reinjection, MSc thesis – Univ. Szeged, 2021

Catarina Castro MSc thesis – in progress

Non-exhaustive list of publishing activities

Articles before publication

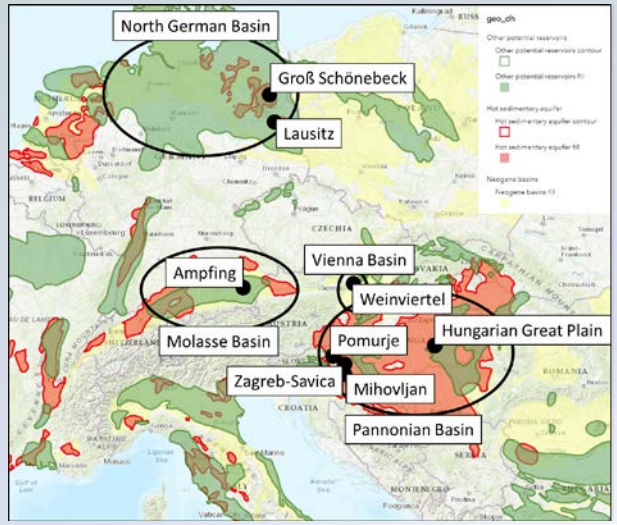
Patrik PUSZTAI, Péter János KORONCZ, Máté KUNCZ, Anita JOBBIK, and Ferenc FEDOR: Fracture permeability correlation of mixed proppants with different size distribution, ***CEG***

Péter Koroncz, Zsanett Vizhányó, Márton Pál Farkas, Máté Kuncz, Péter Ács, Gábor Kocsis, Péter Mucsi, Anita Szász Fedorné, Ferenc Fedor, and János Kovács: Experimental Rock Characterisation of Upper Pannonian sand-stones from Szentes geothermal field, Hungary, ***energies***

Future challenges, outlook

TRANSGEO – Transforming abandoned wells for geothermal energy production

Funding priority 2: Cooperating for a greener central Europe
Spec. Obj. 2.1: Supporting the energy transition to a climate-neutral central Europe
Planned project duration: 1 January 2023 – 31 December 2025 (3 years)
Planned project budget: ~2.9 Mio €
Lead partner: GFZ Potsdam
Decision: December 2022



Vision: Enable a structural change from hydrocarbon industry to a green geothermal industry by:

- demonstrating repurposing opportunities for hydrocarbon infrastructure in agreement with a circular economy,
- maintaining the know-how from the hydrocarbon workforce and applying it to geothermal in agreement with a just transition to renewable energies, and
- removing non-technical barriers by policy recommendations, especially with regards to legislation

Project partners:
GFZ, ONEO, LBGR, GBA, GreenWell, BVH, CROST, PTE, MENEA, LEAP, UNIZG-RGNF

Acknowledgements

Logframe Ltd. – project management

Miklós Hlatki – project development, expert activity in first two years

Árpád-Agrár Ltd. – pilot project sites

János Szanyi – expert activity beyond the scope of his tasks

Panterra Geoconsultant from The Netherland and GEOCHEM – Cyclolog software licens for diplome work

Subcontractors, colleagues and other participants who supported the project

Thank you for the support of the Hungarian State and the European Union!

THANK YOU FOR YOUR ATTENTION!

GINOP-2.2.1-15-2017-00102 "Development of a well completion technology for sustainable and cost-effective reinjection of thermal water"

Pécs, 27 October 2022