Q4 2022

SPWLA Houston Chapter Newsletter

SPWLA Board for 2022 – 2024

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Meet our Sponsors

President's Corner

Dear fellow members of the Houston Chapter,

The new 2022-24 SPWLA-Houston Chapter board can report on a very successful and busy second half of 2022. I would like to take the opportunity to thank each and every board member for their contribution. Our work's cumulative effect has impacted the Houston Petrophysical community and is confirmed in well attended meetings and networking events.

CCUS has indeed materialized as the key topic and discussion point – as we predicted. It has an organic/natural marriage to machine learning which also has become a key discussion topic beyond the greater petrophysical community. It's like we are living through a third wave of petrophysics, and it looks like we have a great and shiny road ahead of us with many scientific challenges to solve along the way.

The biggest event in Q4 2022 was the annual SPWLA Technology Show at the Hyatt on I-10/Eldridge. Ten companies were showing their latest tools and inventions, and 75 attendees did have some great holiday food while learning new tips and tricks as well as tools from 4 presentations and a keynote lunch presentation by Adam Haecker on CCUS Petrophysics. (Yes, he did receive 1.106 byr old chunk of *Llanite* as present). After the soccer match penalty shooting, a group of us gathered at the Black Gold Bar for further "scientific discussions". Thank you, all exhibitors and sponsors! This would not be possible without you.

The board also re-booted the Networking events. These events welcome each member to join and mingle with fellow petrophysicist. No need to RSVP. Often food items and drinks are sponsored. To make it easy to remember, we will have the event each last Thursday monthly from 5:07 – 8:08 pm at the same location. This also gives companies the chance to plan for a given month as a sponsor allowing for some marketing. Please reach out to a board member if you already have a month you would like to become a sponsor.

This year's biggest event is the SPWLA International June 11th – 14th in Conroe. Registration is open, and discounted hotel rooms are ready to reserve. Visit www.spwlaworld.org for more details.

We will continue our work to serve you – our petrophysical local community. Thank you for attending our events and activities. If you think you have something to share with the greater petrophysical audience and would like to present – please reach out to a board member. Also, if you like to be more involved in our activity, please reach out as there for sure is enough work to be done – maybe you can even see yourself as part of the team (the next elections will be in spring 2024)?

Bests and let's have a great 2023!

Bernd Ruehlicke

Bernd Ruehlicke

Houston Chapter President
president@spwla-houston.org

Useful links

Sign up for the Houston Chapter Mailing List [Link]

Houston Chapter

SPWLA International

Join SPWLA – become a member

Houston Chapter LinkedIn page

Upcoming Seminars

Seminar Downtown Houston:
CCUS IN MATURE FIELDS: HOW CORE-TO-LOG DATA DRIVEN ANALYTICS ENHANCES MECHANISTIC MODELS FOR THE PURPOSE OF RESERVOIR AND CAPROCK MINERALOGICAL CHARACTERIZATION

Seminar Date: Mar 01 2023

Time: 12:00 PM - 01:00 PM (US CDT)

Admission/Registration Link: https://attendee.gotowebinar.com/register/968727347656853590

Contact: Artur Posenato Garcia (VP Downtown, SPWLA Houston Chapter)

Corresponding: vpdowntown@spwla-houston.org

Fees: FREE

ABSTRACT:
This paper discusses how an integrated data-driven analytics (DDA), mechanistic petrophysical and mineralogical modeling can enhance the characterization of reservoirs selected for Carbon Capture, Utilization and Storage (CCUS) projects. The approach makes use of exhaustive core datasets to generate synthetic mineralogical curves at wells, hence expanding the available log information. This allows a robust and complete quantitative analysis of storage and sealing intervals through a DDA-informed physics-based methodology. The growth of interest around CCUS pushes towards in-depth analyses of reservoir layers, as well as of the sealing ones. In brown fields the available open-hole (OH) logs might not be enough for a detailed lithological and petrophysical characterization, which is mandatory to establish the storage capacity of the assets. Hence, the proposed methodology starts from X-Ray Powder Diffraction (XRD) core data representative of the field under investigation for both reservoir and non-reservoir sections. Next, DDA is used to generate synthetic volumetric fractions of given minerals after an ensemble learning relating core mineralogy and selected logs. The DDA-based log mineralogy and the other available OH logs are then input for conventional mechanistic models to obtain final petrophysical and mineralogical properties. The added value is demonstrated through a real case study, where a CCUS project is ongoing for a mature field. From the mineralogical standpoint, experimental studies performed for several cored wells show a wide composition variety with different coexisting phases including carbonates, silicates, feldspars, micas and clays. The main criticality is represented by the OH log datasets that are often incomplete and ineffective to provide a straightforward formation evaluation consistent with the complexity highlighted by core analyses. Therefore, after the calibration of the ensemble learner with hundreds of XRD data, high-frequency dielectric and reprocessed nuclear logs, the DDA steps have been successfully applied to about a hundred wells for obtaining synthetic mineralogical curves. These augment the information of the available

measured logs and allow the definition of a physics-based interpretation model able to properly characterize both the reservoir and caprock layers. In addition, the most reactive facies to carbon dioxide are recognized and represent another significant step forward to evaluate the sealing efficiency and integrity over time at field scale. The presented workflow is deemed able to provide a strong mineralogical and petrophysical characterization template in case of incomplete/not exhaustive wellbore dataset. The outcomes are fundamental for several aspects in CCUS projects, including reservoir modeling, geomechanics, geochemistry, monitoring phases and risk management.

BIOGRAPHY:

Marco Pirrone is Production Petrophysics Team Leader at Eni HQ and he has been with the company since 2009. He specializes in dielectric dispersion log analysis, rock physics modeling, nuclear magnetic resonance in porous media, cased-hole formation evaluation, wellbore integrity, production logging and data-driven analytics for reservoir characterization. He is now a focal point for the definition of downhole monitoring activities in CCUS and UHS projects, as well as for the development of new approaches in energy transitions. Marco has authored or co-authored more than 40 technical papers and joined the 2016-2017, 2019-2020 and 2022-2023 SPWLA Distinguished Speaker programs. He holds a MSc degree in Physics and a PhD in Theoretical Physics from the University of Milano-Bicocca, Italy.

FULL WAVEFORM INVERSION OF FIBER OPTIC VSP DATA FROM DEVIATED WELLS

Speaker: Olga Podgornova
Seminar Date: Mar 14 2023

Registration Opens: Jan 27 2023 - Mar 14 2023

Time: 11:30 AM - 01:00 PM (US CDT)

Contact: Artur Posenato Garcia (VP Downtown, SPWLA Houston Chapter)

Corresponding: vpdowntown@spwla-houston.org

Fees: $30

Location: Chevron building
1500 Louisiana St
Houston – TX - 77002
40th floor – Room 40024

Parking: Hyatt Regency Garage
611 Clay St.
Houston, TX 77002

ABSTRACT:
Distributed acoustic sensing (DAS) technology permits measuring the strain or strain rate along a fiber deployed in a well due to seismic wave propagation. In vertical seismic profiling (VSP) acquisitions where seismic waves are excited at the surface and measured by subsurface receivers in the well, the DAS serves as a fast alternative to a conventional geophone array. Like conventional multicomponent VSP velocity measurements, DAS VSP data contain information about the subsurface properties that are encoded in seismic events and attributes such as compressional and shear direct arrivals, reflections, converted modes, multiples, and amplitude and phase variations. These seismic data can be used to obtain elastic properties of the formation and characterize the reservoir. Full-waveform inversion (FWI) extracts the elastic properties of the formation from the seismic wavefield by minimizing the misfit between real measurements and synthetically modeled wavefields. The synthetically generated wavefields are obtained by solving partial differential equations that accurately model the physical phenomena of the real waveforms. For conventional geophone sensors, FWI is formulated for the particle velocity field. In this paper, we present a formulation of the modeling and inversion specifically for DAS measurements as an averaged strain along the fiber. The algorithm does not require converting the data to velocities. The gradient of the misfit function, by adjoint formulation, is a cross correlation in time of the forward propagated wavefield and backward-propagated residuals injected from the receivers. For conventional sensors, the residuals are injected as force terms but for DAS data, the residuals are averaged in space first and then injected as moment tensor sources with the radiation patterns determined by the well deviation. For multi-offset in-plane and outof-plane VSP acquisitions, a 2D algorithm has been developed which inverts for a 2D distribution of elastic medium properties and includes 3D well deviation effects. This paper will present the results of applying the inversion to real multioffset, highly out-of-plane VSP fiber data acquired in a deviated well. Simulations confirm that the well trajectory has considerable impact on the data amplitude and must be included in the modeling and inversion to reproduce amplitude variations. The inverted compressional and shear velocities agree well with the reference model based on sonic data. Another real data example is a multi-offset walk-above acquisition where a targeted domain is located below a deviated portion of the well. The inversion matches reflections and produces an image in the target area.

BIOGRAPHY:

Olga Podgornova is a research scientist at the Schlumberger-Doll Research Center in Cambridge, Massachusetts, USA. She graduated from Novosibirsk State University in Russia and received her PhD in Keldysh Institute of Applied Mathematics in Moscow. She joined Schlumberger Research in Moscow in 2009 and moved to the Schlumberger-Doll Research Center in 2014. She works on numerical modeling and inversion for wave propagation problem in seismic and borehole acoustic.

Recent Events

SPWLA Houston Chapter Jun Lunch Seminar

On Jan 25. Houston Chapter westside hosted a lunch seminar titled “GEOPRESSURE AND POROSITY – EXAMPLES FROM THE CHUKCHI SEA AND THE NATIONAL PETROLEUM RESERVE, ALASKA,” presented by Mark Herkommer (Qube Tech).

On Feb 8th. Houston Chapter northside hosted a lunch seminar titled “ Using Petrophysical rock types for variable electrical Properties (m & n exponents) in archie water saturation modeling,” presented by Mitch Pavlovic (OXY). Thank Baker Hughes Baker Hughes, for sponsoring the event.

One recent event was the the Annual Technology Show on December 9th, 2022, This is a popular event among SPWLA members in Houston. This year, the Technology Show went beyond the software, not only software but also recent innovation and technological advancement in different areas, including formation evaluation and data interpretation, and had chances to be exhibited in the show. It was a one-day event with several great talks distributed during the day, with plenty of opportunities for networking and seeing the latest technological advances. SPWLA Houston Chapter appreciate **AspenTech, Bker Hughes, Eriksfiord, Gaia, GeoSoftware, Geoactive, Geolog, Ikon Science, INT, SLB** for their supporting for the technology show.

NETWORKING EVENT

On Jan 26,2023 and Feb 23rd, the SPWLA Houston chapter hosted an in-person social networking event. The whole SPWLA community was invited. That was a party attended by Petrophysicists, Geologists, Geophysicists, Engineers, Managers, etc. We have current and past SPWLA international board members joining our event. That was a success and a great event.

We plan to have such networking event last Thursday **monthly** from 5:07 pm – 8:08 pm at the same location to make it easier to remember.

We hope to see y'all there next time!

More details available in the Houston Chapter's website

https://www.spwla-houston.org/

and the Houston Chapter LinkedIn profile

https://www.linkedin.com/company/houston-chapter-of-spwla/

Stay always tuned!

Photos

Photos

Thank AspenTech, Bker Hughes, Eriksfiord, Gaia, GeoSoftware, Geoactive, Geolog, Ikon Science, INT, SLB for their supporting for the technology show.

Recent innovation and technological advancement in different areas were exhibited in the show. Technical talks also had chances to present on the show.

The President of the Houston Chapter of SPWLA, Bernd Ruehlicke, greet the guests to make presentations at the technology show.

GEOLOG advanced offshore surface logging unit was exhibited on the show.

Golf networking event after the technology show. Thank **Gaia** for supporting the event.

The SPWLA Houston Chapter Vice-President west side Neil Cameron was shaking hands with speaker Mark Herkommer at Jan 25 lunch seminar event.

The President of the Houston Chapter of SPWLA, Bernd Ruehlicke, introduce the upcoming SPWLA event at the Feb 8th lunch seminar.

Mitch Pavlovic made a presentation about Petrophysical rock types.

The SPWLA Houston Chapter Vice-President Northside Houston Amer Hanif was the host.

Houston chapter Networking time with guests. Happy to have current and past SPWLA international board members joing our event.

Houston chapter Networking time at Feb 23rd. Welcome SPWLA international board member Harry Xie (VP InfoTech), Javier Miranda (North America Director) and Zach Liu (SPWLA past president) join the group. The event was hosted by Houston chapter team. Bernd Ruehlicke (Houston Chapter president) and Neal Cameron (Houston Chapter VP west side) was there welcome all members.

SPWLA international VP IT Harry Xie and other members gather at the networking event.

See you all next time at our events!