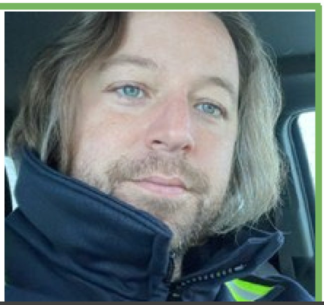
PBS-SEPM MARCH LUNCHEON

Tuesday, March 18, 2025 – 11:30AM



Bush Convention Center - 105 N Main St, Midland, TX 79701

$25 Early Bird Rate | $35 Walk-In/Late RSVP | $10 Student | $5 Virtual

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Characterizing the Effects of Drainage and Field Activities Using Geochemistry: Changes and Signatures in Subsurface Volatile Fluids Entrained in Legacy and Fresh Cuttings

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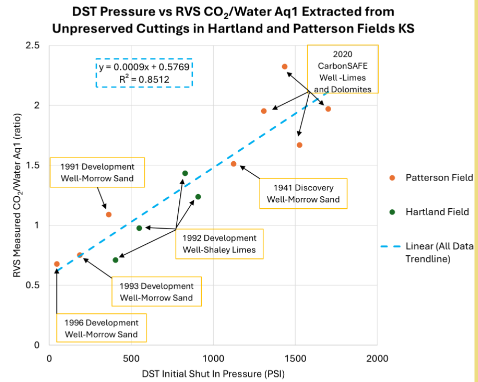
ABSTRACT

In both conventional and unconventional settings in West Texas, throughout North America, and even overseas there is growing interest in exploiting existing brownfields, both from the perspective of developing the remaining “white space” in the field and potentially developing previously bypassed targets either because they were unsuitable with the technology of the time or they were not previously identified. In conventional plays changes occur like oil water contacts rising, reservoir pressure decreasing, and increasing/changing biological activity as the field is produced. In unconventional plays be they self-sourced shales or simply tight carbonates/sands the physical relatively near borehole fractionation and drainage/loss of resource can also occur. This is the challenge faced by infill drilling programs, frequently referred to today as parent-child interactions where care needs to be taken that the existing borehole (parent) will not have drained the resource the new neighboring borehole (child) is meant to capture. Ultimately in both conventional and unconventional plays these changes to the subsurface distribution of water, HC resource, HC composition, and pressure leave telltale geochemical signatures in the volatile subsurface fluids entrained in rock samples, typically cuttings and core. These signatures can be then used to characterize the nature of the change, its physical distribution, and even quantify the loss of resource that has occurred along the borehole due to offset drainage by a parent well.

Pressure vs CO_2 Concentration in Water AHS

Across all measurements (n=12 in 6 wells across 2 fields, multiple rock types [sands, limes, and dolomites, a range of 79 years in age cuttings, and 2 orders of magnitude of pressure) there is a strong correlation between the ratio of the extracted CO_2 and water from the cuttings at 20 mbar by RVS and downhole pressure measurements made at time of drilling

CO_2 can be used as a proxy for pressure that is meaningfully affected by field activity – changes where apparent entrained volatiles in unpreserved cuttings samples in as little as 2 years of time – significant applications in the Permian predicting problematic wells, use in petroleum system analysis, and understanding parent – child interactions



Advanced Hydrocarbon Stratigraphy (AHS) has developed a novel technology and technique based on a gentle vacuum extraction cryo-trap mass spectrometry system where volatile subsurface fluids entrained in rock samples are gently extracted by vacuum (no heat or solvent used) and collected on a liquid nitrogen cooled cryo-trap. After the extraction and collection of the volatiles is completed the cryo-trap is slowly warmed and the released volatiles are then passed to a mass spectrometer as they release sequentially by sublimation point. This process enables the separation, identification, and quantification of the subsurface fluids extracted from the rock samples and is known as Rock Volatiles Stratigraphy (RVS). Direct measurements of 40+ different compounds including the C1-10 HCs, water, CO2, biological by-products, noble gases, stimulation chemicals, sulfides, and several others are made using this technique while the process is repeated on the same rock sample under increasingly strong vacuum conditions providing information on ease of release that can be related back to rock properties. RVS has been used in several brown field environments and experiences and lessons learned from the analysis of volatiles from cuttings both from parent and child wells will be shared. Specific case studies from conventional and unconventional plays in Texas on the Eastern Shelf, Oklahoma in the SCOOP and Merge, Kansas in the Patterson/Hartland fields in Kearny Co., and the Ionian Carbonates in onshore Delvina field Albania on the coast of the Adriatic Sea will be shown and discussed as well as general experiences in shale gas and oil plays.

BIOGRAPHY:

Christopher Smith has been a Senior Chemist with Advanced Hydrocarbon Stratigraphy (AHS) since January 2019 and moved to Midland in 2022 working on data analysis, instrumentation, client engagements, and business development. Most of his analysis work focuses on the Permian, the Anadarko and Arkoma basins in Oklahoma, the North Slope in Alaska, and the Marcellus.

Since 2020 a significant portion of Christopher’s work has been geared toward expanding the uses of AHS’s unique patented technologies into non-traditional fields for AHS beyond oil and gas – these include successful engagements and projects with academia, government, and operators on subsurface studies in carbon capture and sequestration, helium exploration, and geothermal power. Additionally, he has pushed AHS to be involved in scientific studies on permafrost in the Artic and the paleo environment before, during, and after the Chicxulub impact. Prior to working for AHS, he received his PhD in analytical chemistry from the University of Arizona with focuses on instrumentation, data analysis programing, spectroscopy, electrophysiology, surfactants, and surface modification chemistries. He also completed a MA in history at the University of Tulsa as a Henneke Research Fellow in 2012. He completed his undergraduate work cum laude in 2011 with degrees in chemistry, history, and biochemistry also from the University of Tulsa.