

# ALASKA GEOLOGY

## Newsletter of the *Alaska Geological Society*



### Evaluating Oil Quality and Microbial Activity Across Fault Blocks and Subunits of the Ugnu (N. Slope, Alaska) by Volatiles Analysis of Cuttings and Produced Crude - Implications for Completions and Production

**Seth Nolan<sup>1</sup>, Reid Edwards<sup>1</sup>, Christopher Smith<sup>2</sup>, Caleb Conrad<sup>3</sup>,  
Timothy Smith<sup>2</sup>, Patrick Gordon<sup>2</sup>, Michael Smith<sup>2</sup>**

<sup>1</sup>Advanced Hydrocarbon Stratigraphy, Tulsa, OK; <sup>2</sup>Baker Hughes, Houston, TX; <sup>3</sup>Hilcorp Alaska, LLC, Anchorage, AK  
[christopher@advancedhydrocarbon.com](mailto:christopher@advancedhydrocarbon.com)

Hilcorp's Milne Point S-203 was drilled in 2019 targeting the biodegraded heavy oil of the Ugnu, for exploration and development; one of the first Ugnu wells to be successfully drilled, completed, and conventionally produced. S-203 crossed three fault blocks and intersected multiple Ugnu subunits. A volatiles analysis, via rock volatiles stratigraphy (RVS), also known as Volatiles Analysis Service (VAS), of the cuttings from the main borehole and sidetracks enabled a spatial assessment of oil quantity, microbial activity, and the effect of faults in the different subunits. Produced oil was analyzed with RVS and both RVS datasets were combined with completions to assess production contribution across the borehole. These results provide important insights for development of the Ugnu as a heavy oil play on the Alaskan North Slope.

RVS is a cryo trap-mass spectrometry technique that gently (no added solvents or heat) extracts, identifies, and quantifies 40+ different volatiles, including C1-10 hydrocarbons (HCs), biodegradation compounds, CO<sub>2</sub>, sulfides, and water. Volatiles are extracted under sequential 20 and 2 mbar vacuums providing data on permeability and grain surface/fluids interactions. Sealed at well cuttings informed on HC composition and biological activity. Unsealed cuttings provided information on reservoir properties. Both were collected on S-203. A wellhead oil sample from early in the life of S-203 was also analyzed with RVS. A statistical model combined with the completions schema was used to model contributions necessary to result in the produce oil composition. (continued on page 2)

## **AGS Meeting**

Date & Time:	Thursday, October 27; Doors open 11:30 am, announcements 11:45 am, talk 12:00 – 1:00 pm
Program:	Evaluating Oil Quality and Microbial Activity Across Fault Blocks and Subunits of the Ugnu (N. Slope, Alaska) by Volatiles Analysis of Cuttings and Produced Crude - Implications for Completions and Production
Speaker:	Christopher Smith, Advanced Hydrocarbon Stratigraphy, Tulsa, OK
Place:	Hybrid online & <b>Live Presentation at BP Energy Center</b> ; 1014 Energy Court, Anchorage, AK
Reservations:	Reservations are not required
Login:	For instructions on how to log in see AGS website: <a href="http://www.alaskageology.org/events.html">http://www.alaskageology.org/events.html</a>
How to Join:	Join with Google Meet: <a href="https://meet.google.com/vdn-jzxf-txj">meet.google.com/vdn-jzxf-txj</a> or join by phone: (US) +1 470-705-4012 PIN: 562 655 451#

The spatial distributions of biological activity and oil quality were determined allowing for the determination of the optimal subunit and fault block in terms of oil quality. Oil quality was determined to be negatively correlated to biological activity using the hydrophobic biodegradation product, methyl ethyl ketone (MEK), to track microbial action. MEK also showed apparent negative correlations with its feedstock molecule (butane) indicating local activity. The middle fault block (subunit MD) was identified as likely having an API gravity of  $\leq 10$  due to biological activity. Utilizing completions schema, volatiles analyses of the oil, and sealed cuttings; it was determined that none of the production came from the subunit with the severe biological degradation of the resource.

The volatiles analysis of the cuttings provided important information on oil quality with respect to the separate fault blocks and subunits of the Ugnu. Similarly, the analysis provided information on the distribution of the microbial activity as MEK is locally generated. Understanding these distributions and which portions of the Ungu formation and fault blocks contribute to production provides important information which can further the development of the Ungu. This study also reveals the utility of measuring MEK, a non-HC oil soluble volatile, by RVS in rock samples to track biological activity in the subsurface. Assessing production contributions by comparing the volatiles analysis of produced oil vs sealed cuttings can have important applications in heterogeneous reservoirs.

### **About the Speakers:**

Seth Nolan is a development geologist at Hilcorp Energy Company. He has studied several fields across Alaska (Endicott, Northstar, Milne Point, NPRA, Cook Inlet and Terrebonne Bay in Southern Louisiana. He received his MS. In Geological Sciences from University of Alaska Anchorage, under the advisership of Professor Jennifer Aschoff. His primary study was of the identification and implications of Torok and Nanushuk shelf edge deltas in western NPRA. He earned his B.S. degree in Geological Sciences from University of Idaho.

Christopher Smith has been a Senior Chemist with Advanced Hydrocarbon Stratigraphy (AHS) since January 2019 and works in Houston on data analysis, instrumentation, client engagements, and business development. Most of his analysis work focuses on the North Slope in Alaska, the Delaware Basin, the Anadarko Basin in Oklahoma, and the Marcellus. Prior to working for AHS, he received his PhD in analytical chemistry from the University of Arizona in the Winter 2018 term with focuses on instrumentation, data analysis programming, 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.

### **From the President's Desk:**

Happy Fall AGS Friends!

It's hard to believe it's already October, the leaves have turned, and we have already had our first freeze. I am hoping the rain trend we have endured these past few months translates to a winter full of snow to brighten the upcoming darkness!

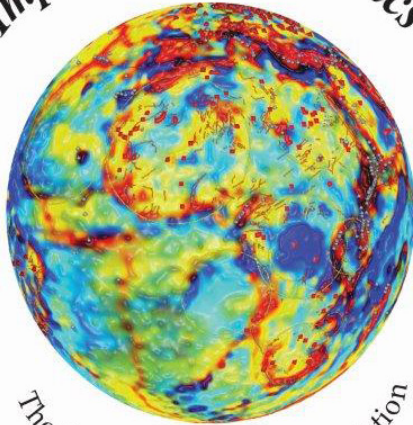
Thanks to all who logged into our first AGS meeting, and especially to those who were present in person! It was a relief to have a technical talk to get the community together to learn about rocks and their importance in our lives again. I look forward to many more as winter approaches, and community events become key to making it through the darkness!

I hope to see many of you at our next talk, and if not, out enjoying the trails in Anchorage!

Happy Halloween!

Sincerely yours,  
Sarah Frey

# Impact Crater Tectonics

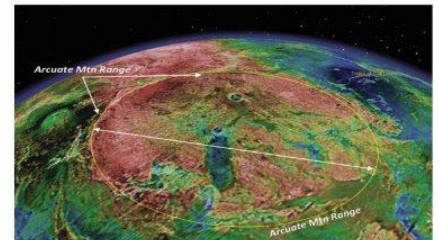


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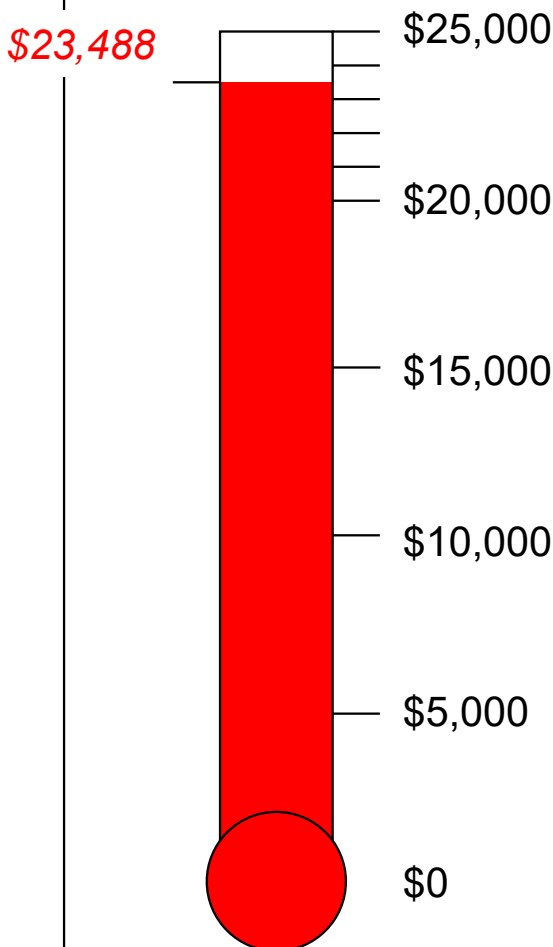
Full-color, 297-page, 8.5" x 11" perfect-bound book, with over 200 photos, graphs, and illustrations. Available on Amazon, or signed copy from author at [ImpactCraterStudies.org](http://ImpactCraterStudies.org).



## Gil Mull Scholarship

**PLEASE HELP!**

We're nearly there!



In memory of Gil Mull (1935-2021), family and friends are raising funds for the *Charles Gilbert Mull Field Camp Scholarship* for geology students at the University of Alaska Fairbanks. The scholarship will allow students to attend a geology field course of their choice.

**GOAL:** Build a minimum endowment of \$25,000, which will provide a UAF scholarship in perpetuity

**DONATIONS:**

You may contribute online here:

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Select designation "Other", and write in: *Charles Gilbert Mull Field Camp Scholarship* and complete the form.

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Please contact Prof. Michael Whalen with any questions ([mtwhalen@alaska.edu](mailto:mtwhalen@alaska.edu))



# Alaska Geological Society



## SEEKING DONATIONS FOR AGS SCHOLARSHIP FUNDS

This is a challenging year for students at all levels, and geoscience students in the universities need our support more than ever. When you pay your membership dues this year, please consider a contribution to an AGS scholarship fund. You can also contribute to AGS scholarships through Pick, Click, Give when you apply for your Alaska Permanent Fund Dividend. **AGS is a 501c3 nonprofit organization and all contributions are tax deductible.**

The Alaska Geological Society offers scholarship awards to graduate and undergraduate students who are conducting geoscience research projects in Alaska

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Scholarship information and applications are available online at  
**[www.alaskageology.org](http://www.alaskageology.org)**

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The Alaska Geological Society, Inc.  
P.O. Box 101288  
Anchorage AK 99510  
<http://www.alaskageology.org>

The Alaska Geological Society is an organization which seeks to promote interest in and understanding of Geology and the related Earth Sciences, and to provide a common organization for those individuals interested in geology and the related earth sciences.

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Kenneth P. Helmold (Editor)  
Alaska Geological Society, Inc.  
P. O. Box 101288  
Anchorage, AK 99510  
e-mail: [helmold@alaskan.com](mailto:helmold@alaskan.com)  
mobile: 907-297-8883

## MEMBERSHIP INFORMATION

AGS annual memberships expire November 1. The annual membership fee is \$25/year (\$5 for students). Lifetime membership is \$250. You may download a membership application from the AGS website and return it at a luncheon meeting, or mail it to the address above.

Contact membership coordinator Kirk Sherwood with changes or updates (e-mail: [membership@alaskageology.org](mailto:membership@alaskageology.org); phone: 907-240-2546)

All AGS publications are now available for on-line purchase on our website.

Complete catalogue at: <http://www.alaskageology.org/publications1.html>

## ADVERTISING RATES

Advertisements may be purchased at the following rate: \$200 for 9 monthly issues (September - May) of AGS newsletter (any size up to full page) and companion ad on AGS website for full year (beginning each September).

Contact Jennifer Crews at [jennifer.r.crews@conocophillips.com](mailto:jennifer.r.crews@conocophillips.com) to place ad.

# Pick.Click.Give.

## It's PFD Application Time!

Did you know that you can support the society through Pick.Click.Give? When you fill out your PFD application, just select Alaska Geological Society, Inc. in the list of non-profits and you can help AGS to promote the uniqueness of Alaskan Geology and provide for education, geologic research, and networking to all who are interested as well as provide scholarships to students across a wide range of geologic topics.

<https://www.pickclickgive.org/index.cfm/pfdorgs.info/Alaska-Geological-Society-Inc>

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# Alaska Geological Calendar of Events



Date	Time	Organization	Event	Location
May 25, 2022	11:45 am	AGS	Guy M. Oliver, Geolog Americas, "A digital-cuttings drill-down, with examples from the Geolog Americas Nanushuk-Torok Regional Cuttings Consortium"	Google Meet
Sept 29, 2022	11:45 am	AGS	Jon R. Rotzien, Basin Dynamics, "Mixed deepwater systems from the North Slope to offshore"	Hybrid: Google Meet & BP Energy Center
Oct. 27 2022	11:45 am	AGS	Chris Smith, Advanced Hydrocarbon Stratigraphy, "Evaluating Oil Quality and Microbial Activity Across Fault Blocks and Subunits of the Ugnu (N. Slope, Alaska) by Volatiles Analysis of Cuttings and Produced Crude - Implications for Completions and Production "	Hybrid: Google Meet & BP Energy Center

**AMA:** Alaska Miners Association; **AGS:** Alaska Geological Society; **GSA:** Geophysical Society of Alaska

**AAEP:** Alaska Association of Environmental Professionals; **SPE** Society of Petroleum Engineers;

**UAA** University of Alaska Anchorage.

## Membership Note

Membership renewal is November 1; annual dues are:

*Full member - \$25*

*Student member - \$5*

*Lifetime membership - \$250*



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