Old Tax-Credit Subsurface Data and New Analytics: Implications for Improved Subsurface Interpretation and Skilled Workforce Development

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The North Slope and Cook Inlet basins of Alaska have been producing hydrocarbon for many decades. Although hydrocarbon production from the state has been declining over the years, the recent discoveries in the Nanushuk and other formations on the North Slope are expected to reinvigorate it and reverse the trend. Over the years, many geophysical surveys have been acquired in Alaska and made available to the public. In recent years, a trove of previously collected 2D/3D seismic and well data have been released from the State of Alaska, Department of Natural Resources through the tax-credit program. In this talk, I will show the application of new geophysical techniques and predictive data analytics on some of these old datasets to glean the subsurface information to the extent as much as possible. The talk will primarily focus on the shallow and deep hydrocarbon reservoirs on the North Slope. The preliminary results show the complexity of the subsurface, in terms of structure, stratigraphy, and rock properties. Advanced machine learning and deep learning techniques can be used on these datasets to predict the approximate location and extent of the prospective features. These datasets have been of immense value in meaningful and applied geosciences education.

Joint AGS/GSA/SPE Luncheon

Date & Time: Tuesday, April 23; doors open at 11:30 am, talk from 12:00 – 1:00 pm
Program: Old tax-credit subsurface data and new analytics: Implications for improved subsurface interpretation and skilled workforce development
Speaker: Shuvajit Bhattacharya, University of Alaska Anchorage, Anchorage, AK
Place: BP Energy Center, 1014 Energy Court, Anchorage, AK
Reservations: Reservations are not required
Cost: Seminar is free (catered lunches are no longer available)
Feel free to bring your own brown-bag lunch

For more information call (907) 854-2363 or visit the AGS website: http://www.alaskageology.org
About the Speaker:
Dr. Shuvajit (Jit) Bhattacharya is currently an assistant professor in the Department of Geological Sciences at the University of Alaska Anchorage. He teaches courses in integrated subsurface mapping, applied geophysics, and petrophysics. His broad research themes are energy geosciences, quantitative rock property analysis, and big data analytics. Prior to joining UAA, he worked with EOG Resources, Talisman Energy (now Repsol), and Battelle. He completed multiple projects for unconventional energy resources exploration, enhanced oil recovery, and carbon storage in North America, Australia, and South Africa. He received awards from AAPG and SPWLA for best presentations. Currently, he is engaged in multiple research projects focused on the improved subsurface analysis of multiple hydrocarbon source and reservoir rocks in northern and south-central Alaska.

From the President’s Desk:
On some level Alaska and Indiana share some geological features. Both landscapes have been dramatically altered by glaciation. Avak and Kentland are known and well-studied astroblemes. Both Indiana and Alaska have two distinct petroliferous basins. And you can drive across a continental divides if you choose. Also, water quality varies across both states. Of course, there are additional subtle features that lie underfoot; not that I would fail to mention the glaring differences; particularly those such as mountain ranges, far-traveled terranes, glaciers and all kinds of igneous rocks. But the geology is everywhere for the curious.

Unfortunately, some geology will have to wait. I failed to get things up and running and the AGS Technical Conference will not convene in Fairbanks this year. My apologies for that. Hopefully I will be able to get things together for a Technical Conference next April in Fairbanks. We still have a couple more presentations on schedule for April and May. In addition, the AAPG 3P Conference (Polar Petroleum Potential) should be held in 2020. This is an international conference. Although it is predominantly petroleum-oriented, many papers on Arctic Geology range in scope from basin evolution, to plate tectonic reconstructions, sedimentation and timing of these inter-related events. A conference like this brings in researchers, their data, their interpretations and new ideas for us to consider. I will pass along more specifics when they come my way. I hope AGS can contribute some of our expertise towards making this conference a success if Alaska is chosen as a host.

Art Banet, AGS President 2018-19

A volunteer is needed to fill the position of:
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Linking Current Volcanic Activity to the Explosive 1929 Eruption of Mount Gareloi, Alaska through Petrology and Volatile Geochemistry

Nathan Graham, University of Alaska Fairbanks

Our ability to monitor active volcanic systems is of paramount importance in determining periods of volcanic unrest of a system and mitigating the hazards that an impending eruption may pose on local communities, infrastructure, aviation and maritime traffic. It is essential to understand key petrologic and geochemical aspects of past eruptive products of a volcanic system as a proxy to current monitoring techniques for direct correlation to potentially serious signs of volcanic unrest. This study has attempted to address these key petrologic and geochemical questions pertaining to the historic eruptions of Mount Gareloi volcano in the Western Aleutians, Alaska and has linked the petrology and geochemistry of these eruptive products to try and understand the eruptive driving forces and pre-eruptive storage conditions of an evolving magmatic system underneath Gareloi’s active edifice. Gareloi’s active South Peak edifice has produced pre-historic and historic eruptive products ranging in bulk composition from basaltic-andesite to trachyte with ample evidence of hybridization of these two compositionally distinct end members. Funding graciously provided by the 2017 Don Richter memorial scholarship and the 2018 AGS research scholarship has allowed focused electron microprobe (EPMA) analyses of mineral and glass phases that comprise the historic eruptive products of Mount Gareloi using an electron microprobe housed at the Advanced Instrumentation Laboratory (AIL) at the University of Alaska Fairbanks. Information gleaned from these analyses suggest a complex source and cooling history for magmas of the historically active volcano with evidence that a rising basaltic-andesite magma may have mobilized and partially mixed with a more evolved trachyte magma body shallowly stored beneath Gareloi’s South Peak edifice and catalyzed the explosive eruption of Gareloi volcano in 1929. Mineral chemistry and phase relationships suggests these two compositionally distinct magmas interacted prior to the 1929 eruption and produced the trachyte and hybridized latite lava erupted during the 1929 explosive eruption of Mount Gareloi with a subsequent basaltic-andesite lava extruded from the South Peak vent between 1950-1980. Current seismic activity and active gas fumaroles suggest shallowly stored magma beneath Gareloi volcano’s South Peak vent, so this model provides information on events that drove a historically explosive eruption at Mount Gareloi and may help put potential future volcanic activity at this system into a historic and petrologic context.
2019 AGS Scholarship Awards

2019 Scholarship committee members:
Sue Karl, Chair
Eric Cannon
Ken Helmold
Peter Johnson
Cheryl Searcy
Marion Richter
Pam Richter

Don Richter Memorial Scholarship:
Curtis Bernard: MS candidate, University of Alaska Fairbanks
Project: Geologic mapping in remote Alaska to guide hyperspectral imaging applications to mineralization

Alaska Geological Society Scholarships:
Jordan Jenckes: MS candidate, University of Alaska Anchorage
Project: Hydrochemistry of fresh water fluxing to the Gulf of Alaska: A focus on silicate weathering of glacial and non-glacial meltwater streams
Brandon Keough: MS candidate, Purdue University
Project: A sedimentary record of the growth of continents by collisional processes, Cantwell basin, central Alaska Range, Alaska
Zena Robert: MS candidate, University of Alaska Fairbanks
Project: Climate change and the Denali Park infrastructure: Landslide hazard assessment of the Denali Park road
Kelsy Tucker: BS candidate, University of Alaska Anchorage
Project: Integrated geochemical and petrophysical analysis of the Hue Shale, North Slope of Alaska

Pacific Section AAPG Scholarships:
Scott Pantaleone: MS candidate, University of Alaska Anchorage
Project: Potential for fluid storage, utilization, and risks of induced seismicity in the Cook Inlet basin, Alaska
Ben Suranovic: MS candidate, University of Alaska Anchorage
Project: Comparison of highstand and lowstand deltaic deposits in the Brookian sequence, National Petroleum Reserve of Alaska: Implications for reservoir quality
Triffon Tatarin: MS candidate, University of Alaska Anchorage
Project: Tectonic history, fault evolution, and structural inheritance along the Beaufort margin, northern Alaska
The Paleozoic through Mesozoic fossils of Shellabarger Pass in Denali National Park and Preserve have an integral and unique story to tell of the history of life and the geology of North America. This remote region in southcentral Alaska has not been well-explored or documented. As part of our national and historical heritage it is pertinent to record and analyze the paleontological and geological history of Shellabarger Pass. This is the first year of a two-year project to characterize the Paleozoic and Mesozoic fossils of Shellabarger Pass in order to explain the geological evolution of the region. Shellabarger Pass is a remote area of the preserve, far from the road system and accessible only by helicopter and backcountry fieldwork. By targeting sites also of interest to the archaeological researchers, coordination allows the maximum use of available backcountry equipment and creates a diverse field experience covering the Ordovician to the time of North America's early human populations. The paleontological project has two approaches. The first is a review and accumulation of all prior research on the paleontology of Shellabarger Pass and the location status and updated documentation of any collected specimens. The second approach is visiting known and new potential sites to survey, compile geological data, take field observations, and document paleontological samples. Fossils recovered to date from Shellabarger Pass are primarily of Ordovician, Silurian, Devonian, and Lower Jurassic age. The Devonian fauna are highly diverse and include a number of non-Laurentian (non-North American) genera. Their abundant presence suggests that the Farewell terrane rocks of Shellabarger Pass are of Eurasian origin, most likely representing a rifted portion of the Siberian paleocontinent, or a tectonic entity nearby. Our planned future efforts include making better known the distinctive Devonian and Early Jurassic fauna of this region. Upper Silurian cyanobacterial reefs are well developed in Shellabarger Pass, and contain an unusual Uralian megafauna, including aphrosalpingid calcareous sponges and brachiopods. The Early Jurassic (Sinemurian) fauna will be emphasized in our future study and includes ammonites, bivalves (including the distinctive genus Weyla), brachiopods, and possibly the earliest record of belemnites in North America. The results of this project will be used to develop models of the sections, integrate research with previous literature, and prepare reports and publications that are pertinent to our understanding of North America's tectonic history through fossil heritage. Furthermore the project promotes a better understanding for the public in the importance of protecting Denali National Park and Preserve's fossil resources.

Acknowledgments

We extend our heartfelt thanks to the following individuals who have provided significant support for this project: Denny Capps (US National Park Service, Denali National Park & Preserve, Denali, AK), Vincent L. Santucci (US National Park Service, Washington, D.C.), and Juanita Ruiz (Sacramento State University, Sacramento, CA).
References to Paleontology of the Shellabarger Pass Region


Blodgett, R.B., and Boucot, A.J., 1999, Late Devonian (late Emsian) eospiriferinid brachiopods from Shellabarger Pass, Talkeetna C-6 quadrangle, south-central Alaska and their biogeographic importance; further evidence for a Siberian origin of the Farewell and allied Alaskan accreted terranes: Senckenbergiana lethaea, 72, no. 1, p. 209-221.


View from inside field tent in the mountainous terrane of Shellabarger Pass, Denali National Park & Preserve.

Measuring section and collecting fossils from a late Emsian (late Late Early Devonian) limestone section in the Talkeetna C-6 1:63,360 quadrangle, Shellabarger Pass area, west-central Alaska.

The North Slope and Cook Inlet basins of Alaska have been producing hydrocarbon for more than four decades. Both North Slope and Cook Inlet basins contain petroleum systems with multiple source rocks, reservoirs, trap configurations, and seals. The North Slope has several producing formations, including the Lisburne, Ivišak, Sag River, Kuparuk, Alpine, and Brookian. On the other hand, the Cook Inlet basin of south-central Alaska contains multiple oil and gas producing formations, such as the Hemlock, Tyonek, Beluga, and Sterling. Apart from these two well-known basins, there are other areas, such as the Arctic National Wildlife Refuge 1002 area, Interior Alaska, Chukchi Sea, which are also considered prospective. A large portion of Alaska still remains understudied and underexplored. Although hydrocarbon production from the state has been declining over the years, recent discoveries in the Nanushuk and other formations on the North Slope are expected to reinvigorate it and reverse the trend.

With all the new discoveries and 50th anniversary of the Prudhoe Bay discovery, time calls for a special section of the Interpretation journal to look at Alaska’s long history of production, current exploration activities, challenges, and future potential. This special section of Interpretation invites papers on exploration, development, and monitoring of different hydrocarbon reservoirs in Alaska for publication in the May 2020 special section to supplement the journal’s regular technical papers on various subject areas.

We seek submissions including but not limited to:

- Case studies in Alaska, including new discoveries on the North Slope
- New seismic acquisition and imaging techniques, including compressive seismic imaging
- Controls of permafrost on subsurface imaging
- Seismic interpretation, including seismic attributes, AVO, and impedance inversion
- Petrophysical analysis
- Reservoir characterization, monitoring, and surveillance
- Enhanced oil recovery
- Facies analysis and sequence stratigraphy
- Fault and fracture analysis
- Potential of unconventional reservoirs

Interested authors should submit their manuscripts for review no later than 1 July 2019. Authors should submit via the normal online submission system for Interpretation and select Alaska: challenges and opportunities in the last frontier in the dropdown menu. The submitted papers will be subject to the regular peer-review process, and the contributing authors also are expected to participate in the review process as reviewers.
### Alaska Geological Calendar of Events

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Organization</th>
<th>Event</th>
<th>Location</th>
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<tbody>
<tr>
<td>May 23, 2018</td>
<td>5:00 pm - 8:30 pm</td>
<td>GSA/AGS</td>
<td>GSA Annual Picnic</td>
<td>Airman's Banquet Hall, Anchorage</td>
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<tr>
<td>Sept 13, 2018</td>
<td>11:30 am</td>
<td>USGS/AGS</td>
<td>Neil Fernandes, Queen’s Univ. “The Proterozoic Vazante – Paracatu carbonate-hosted zinc district, Minas Gerais, Brazil: Siliciclastic rocks and their relationship with carbonate-hosted Zn-silicate and Zn-sulphide mineralizations”</td>
<td>USGS Conference Room, Glenn Olds Hall</td>
</tr>
<tr>
<td>Sept 18, 2018</td>
<td>11:45 am</td>
<td>AGS</td>
<td>Hannah Dietterich, USGS “Eruption response and preliminary observations of the 2018 eruption of Kilauea volcano, Hawaii”</td>
<td>BP Energy Center, Anchorage</td>
</tr>
<tr>
<td>Oct 23, 2018</td>
<td>11:45 am</td>
<td>AGS</td>
<td>Chad Hults, National Parks “Service 3D modeling and detailed digital elevation mapping in Alaska National Parks”</td>
<td>BP Energy Center, Anchorage</td>
</tr>
<tr>
<td>Nov 4 – 8, 2018</td>
<td></td>
<td>AMA</td>
<td>Alaska Miners Association. Annual convention, exhibition and short courses</td>
<td>Dena’ina Center, Anchorage</td>
</tr>
<tr>
<td>Nov 20, 2018</td>
<td>11:45 am</td>
<td>AGS</td>
<td>John Lyons, USGS, “Can you hear me now? Monitoring and studying active volcanoes with low frequency sound in Alaska, Hawaii, and beyond”</td>
<td>BP Energy Center, Anchorage</td>
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<tr>
<td>Jan 10, 2019</td>
<td>11:45 am</td>
<td>GSA/AGS</td>
<td>John Thornley, Golder Associates, “Update on the November 30, 2018 Anchorage earthquake – A geotechnical perspective”</td>
<td>ConocoPhillips, Anchorage, ATO-1</td>
</tr>
<tr>
<td>Feb 21, 2019</td>
<td>11:45 am</td>
<td>AGS/AMA</td>
<td>Rick Van Nieuwenhuyse (President and CEO of Trilogy Metals Inc), “Copper in the Ambler Mining District and the Green Energy and Transportation Revolution - Part of the Problem or Part of the Solution?”</td>
<td>BP Energy Center, Anchorage</td>
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<tr>
<td>March 14, 2019</td>
<td>11:45 am</td>
<td>AGS/GSA</td>
<td>Rob Witter, USGS, “Ground failures induced by seismic shaking during the 2018 Anchorage, Alaska M7 earthquake”</td>
<td>BP Energy Center, Anchorage</td>
</tr>
<tr>
<td>April 23, 2019</td>
<td>11:45 am</td>
<td>AGS/GSA/SPE</td>
<td>Joint AGS/GSA/SPE presentation, Shuvajit Bhattacharya (UAA), Old Tax-Credit Subsurface Data and New Analytics: Implications for Improved Subsurface Interpretation and Skilled Workforce Development</td>
<td>BP Energy Center, Anchorage</td>
</tr>
<tr>
<td>May 22, 2019</td>
<td></td>
<td>GSA</td>
<td>GSA 2019 Spring Scholarship Picnic</td>
<td>Alaska Airman’s Hall, Lake Hood</td>
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<tr>
<td>May 29, 2019</td>
<td>11:45 am</td>
<td>AGS</td>
<td>Laura Gregersen, Alaska DOG, “The history and aerial distribution of exploration drilling targets categorized by play type, North Slope and offshore arctic Alaska”</td>
<td>BP Energy Center, Anchorage</td>
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<tr>
<td>Sept 17, 2019</td>
<td>11:45 am</td>
<td>AGS</td>
<td>Greg Wilson, ConocoPhillips, title TBD</td>
<td>BP Energy Center, Anchorage</td>
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<td>Oct 22, 2019</td>
<td>11:45 am</td>
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<td>BP Energy Center, Anchorage</td>
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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.

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