ALASKA GEOLOGY
Newsletter of the
Alaska Geological Society

Pliocene to Recent Alkalic Volcanic Centers in Southeast Alaska: Western Component of the Northern Cordilleran Volcanic Province

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More than 32 volcanic centers, including 13 newly identified lava flows, ranging in age from 6 Ma to 110 years old and scattered throughout southeast Alaska, constitute a previously unrecognized western component of the Northern Cordilleran Volcanic Province (NCVP). The volcanic rocks are dominantly mafic, locally bimodal, high-Na alkalic rocks that have "within plate" element ratios and primitive $^{87}Sr_i/^{86}Sr_i$ ratios (~ 0.703). Mafic rocks are Light Rare Earth Element (LREE) enriched with HREE 10 x chondrite, have average MgO/SiO_2 ratios of 0.13, TiO_2/MnO ratios of 13.86, Nb/Zr ratios of 0.13, and La/Nb ratios of 0.93 (n=43). In contrast, Mount Edgecumbe, which is tholeiitic, has flat chondrite-normalized REE's, and has dominant "enriched mid-ocean ridge basalt" incompatible element (Nb,Ta/Th/Hf) ratios. Mount Edgecumbe is geochemically unique in southeast Alaska; it is located on a strand of the Fairweather-Queen-Charlotte transform fault, and has been attributed to "leaky transform fault" volcanism with a small component of oblique subduction. The alkalic volcanoes are all located many km east of the Fairweather-Queen Charlotte fault system, and west of the Tintina Fault. The alkalic volcanic rocks have similar compositions, ages, isotopic signatures, and chemistry to rocks of the NCVP and are underlain by the same Northern Cordilleran (Pacific-Juan de Fuca) slab window that is interpreted to influence the sources of the NCVP. Some volcanic fields in southeast Alaska and the NCVP have associated warm springs. The volcanoes and warm springs are located along structures, commonly N-S and NW-SE striking faults, in a conjugate orientation that suggests their locations are controlled by broad regional extension along the Pacific-North America transform margin. Widely distributed thermal springs in southeast Alaska reflect an elevated geothermal gradient under southeast Alaska related to the slab window. *(continued)*

AGS Luncheon

Date & Time: **Sept. 19th, 11:30 am – 1:00 pm**

Program: **Pliocene to Recent alkali volcanic centers in southeast Alaska: western component of the Northern Cordilleran Volcanic Province**

Speaker(s): **Sue Karl, USGS**

Place: **BP Energy Center**

Reservations: **Make your reservation before noon Tuesday, Sept 17th, 2013**

Cost:

Seminar only, no meal:	**Free**
Reserve a box lunch:	**$15**
Reserve a hot lunch:	**$20**
Lunch with no reservation:	
On an "as-available" basis only	

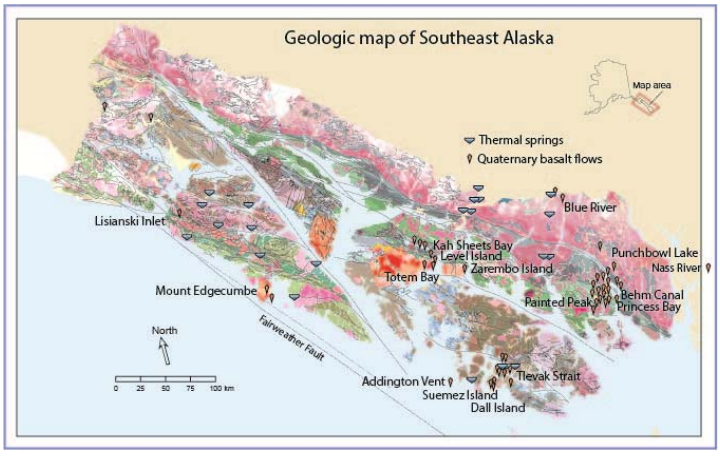
E-mail reservations: **vp@alaskageology.org or phone (907) 564-4028**

For more information: visit: www.alaskageology.org

Discrete marine terraces in southern southeast Alaska are dated by C^{14} shell and wood ages at about 9.6, 5.0, and 2.0 ka, indicating Holocene postglacial isostatic adjustments have been augmented by episodes of tectonic uplift, an additional component of the regional tectonic environment that hosts the volcanic rocks.

Lava flows and tephra overlie and underlie glacial and marine deposits, preserving evidence for climate cooling and warming cycles, sea level change, and isostatic adjustment. In various places, flows have subaerial, subaqueous, and ice contact features. Pollen, foraminifer, tree ring, C^{14}, and $^{40}Ar/^{39}Ar$ ages bracket the timing of volcanic flows, glacial advances and retreats, and subsidence and uplift of marine terraces. Ages of flows in the NCVP range as old as 11 Ma. Basalts in Behm Canal yielded questionable K-Ar ages of 6.1±0.18 Ma and 5.0±2 Ma that are likely too old, because the volcanic edifaces are located in fiords and are post-glacial. On Suemez Island, 2 rhyolite domes that yielded $^{40}Ar/^{39}Ar$ ages of 842±11 ka and 851±17 ka lie between glacial deposits and have ice contact features. A basalt flow that yielded a $^{40}Ar/^{39}Ar$ age of 367.7± 8.7 ka fills a deeply incised pre-existing fiord in Rudyerd Bay and has been carved by subsequent glacial advances. In the Duncan Canal area, basalt flows that have ice marginal features yielded $^{40}Ar/^{39}Ar$ ages of 200.8±4.5 ka and 90.1±3.6 ka, and another basalt flow overlies glaciomarine deposits that contain left-coiling cold-water planktonic foraminifers of Pleistocene age. Fault-controlled basalt flows east of Ketchikan yielded $^{40}Ar/^{39}Ar$ ages of 101.5±2.7 ka, 106±3.5 ka, and 65.7±2 ka. Shells and wood in a glaciomarine deposit that overlies glacially striated gneiss and lies beneath a basalt flow have C^{14} ages of 42-44 ka; the flow is overlain by marine deposits that contain palagonite and shells that have C^{14} ages of 13 ka. Nearby, a steep-sided 430 m-thick deposit of hyaloclastite is bounded laterally by till, contains sparse glacial dropstones, and is inferred to have erupted subglacially. A postglacial flow in Behm Canal is 8.1±1.8 ka. Basalt that overlies till east of Suemez Island is 21.5±3.8 ka, and an unglaciated pahoehoe flow south of Suemez Island at modern sea level is 6.7±3.3 ka. Historic flows on the Blue River are dated by tree rings and charcoal at 370 and 110 years. Volcanic eruptions, possibly with associated toxic gases, along the Nass River, in British Columbia south of Ketchikan, caused the deaths of all inhabitants of a First Nations village on the Nass River in 1775. All of the volcanoes in southeast Alaska and the NCVP are considered inactive, but the frequency of historic eruptions indicates a significant, but low-level, volcanic hazard for the area.

Columnar jointed trachyte at Cape Felix, Suemez Island, southeast Alaska



Geologic map of southeast Alaska showing locations of Quaternary basalt flows and thermal springs

About the Speaker:

Sue earned a BA degree from Middlebury College in 1973, and first came to Alaska in 1973 as a teacher in the VISTA (Volunteers in Service to America) program. In 1974-1976 she attended UAF and worked summers in mineral exploration for RioTinto, WGM, and Urangeschellschaft. In 1977 she transferred to Stanford University and completed a PhD at Stanford in 1983. She has worked in the Alaska Geology Section of the USGS Minerals Program since 1977. Sue has worked all over the state as a mapper and stratigrapher, with emphasis on sedimentary petrology, igneous geochemistry, and the tectonic settings of mineral deposits. She is currently working on sedimentary petrology and stratigraphy for the Western Alaska Range project, the tectonic setting and distribution of Quaternary volcanoes and related thermal springs in southeast Alaska, PGE resources and the tectonic settings of ultramafic rocks in southeast Alaska, and REE resources and the tectonic settings of peralkaline granites in southeast Alaska, the western Alaska Range, and the Ray Mountains. Sue is a career member and fellow of numerous professional organizations, and has been an executive, board member, and/or committee chair in the Alaska Geological Society since 1990. She especially likes participating on the scholarship committee and giving a boost to young geologists. Sue's family includes 2 young adults, 23 dogs, and a cat: she enjoys hiking, camping, sea-kayaking, river rafting, skiing, dogsledding, and life in Alaska.

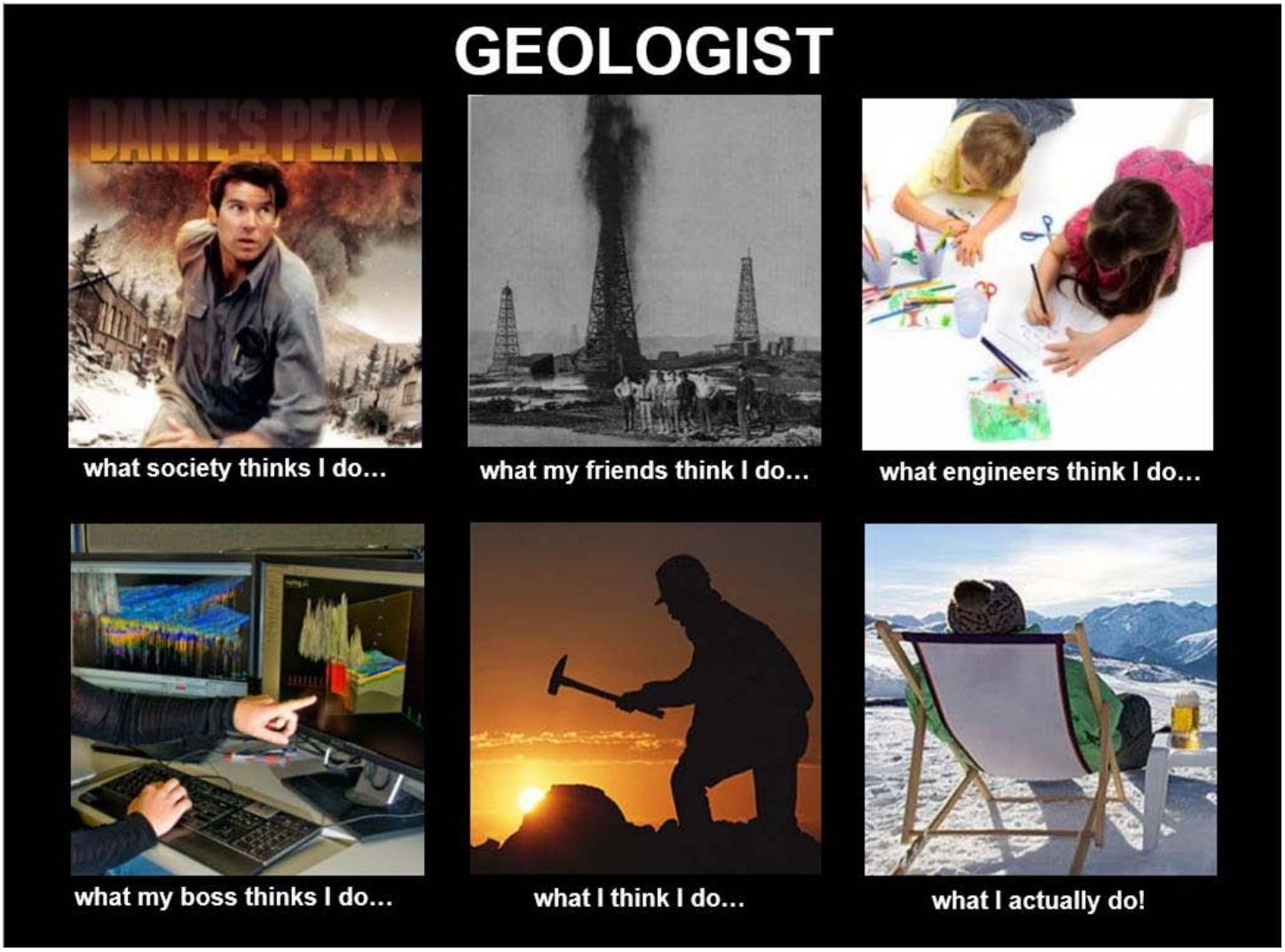
From the President's Desk:

Welcome back everyone. As someone who ascended to this lofty post in seemingly rapid fashion I feel like I should start off by making a brief introduction. Alaska has been my home base since 1997 when I came here as an exploration geologist with Union Oil of California poking around the Cook Inlet for gas. It wasn't long before I moved over to the oil production arena looking after the offshore assets. I've transferred out twice to international postings but seem to always be coming back, first with Chevron and now with Hilcorp. The draw has been both personal and professional. You can't beat the variety of outdoor activities and the geology is always interesting and a challenge.

It's a shame how a warm and sunny summer in Alaska can pass by so quickly but we can now look forward to another season of AGS newsletters and presentations. Many an evening was spent admiring the mountain views with the realization that there is a lot of spectacular geology just out the door. This past summer's AGS sponsored field trip to Denali was a great, sold out success illuminating the vast and complex geology right in the heart of Alaska. A field trip to cover the Turnagain Arm to Hatcher Pass area is in the works for this autumn. Also in the planning stages is an Eklutna to Portage field trip to coincide with a Spring Technical Conference. All this along with a slate of interesting and topical talks for the 2013-14 luncheons makes for an exciting year to come.

Of course none of this happens without a fair amount of effort from quite a number of people. From the board members to the directors, committee members, delegates and those who do any heavy lifting it's an all-volunteer effort. Volunteering is how I ended up becoming President of the AGS. Although I've been a member for the 16 years that Alaska has been home base my involvement had been very minimal in the AGS directly and in the geologic community in general. Nevertheless, I somehow managed to be known to and considered by the right people. It was an honor to be called upon to serve. I felt a duty to help out and with some trepidation I accepted but I haven't regretted it. My fellow board members are enthusiastic and more than willing to be supportive. So, consider the activities mentioned above and think about where you might be able to help or at least be willing to contribute if called upon.

~ Matt



The Alaska Geologic Material Center gets its upgrade

Bob Swenson
State Geologist and
Director, Alaska Division of Geological and Geophysical Surveys

Those of us that have made the trek out to the Alaska Geologic Materials Center (GMC) in Eagle River over the last 30 years will have a great appreciation (and fond memories) of what the original visionaries were able to put together with a shoestring budget, a telephone, a pickup truck, a lot of work, and a lot of luck. After the facility was officially opened on December 12th, 1984, its varied history has literally been written in stone. John Reeder ran the GMC for more than 20 years, and his commitment / tenacity towards sample preservation (and tendency to hoard things in connexes or under blue tarps) is legendary among long-time Alaskan geologists. John did not accomplish all this on his own of course, and there are many staff members, college interns, volunteers, individual geologists, agencies, and companies that have given their blood, sweat, time, and money to the cause. What this group was able to accomplish is one of the shining stars in our Alaskan geologic tool kit, and arguably the most important and comprehensive set of geological samples available in Alaska today. For all those who contributed to this effort; you should be very proud.

The sample collection at the GMC outgrew the available space many years ago and continues to expand from the original humble beginnings. The archive has grown to more than 80,000 cubic feet of sample boxes requiring more than 30,000 square feet of storage on a variety of shelving in a myriad of buildings. The original method John used to manage the collection has now been replaced and the antiquated process of locating a samples, which was literally a phone call to John (if he was there) and then a reliance on his memory, spreadsheets, stacks of paper, and luck to locate which connex or building it was in, is no longer a hindrance.

John Reeder, GMC curator from 1987 to 2009

Curator Ken Papp (far right) and GMC staff

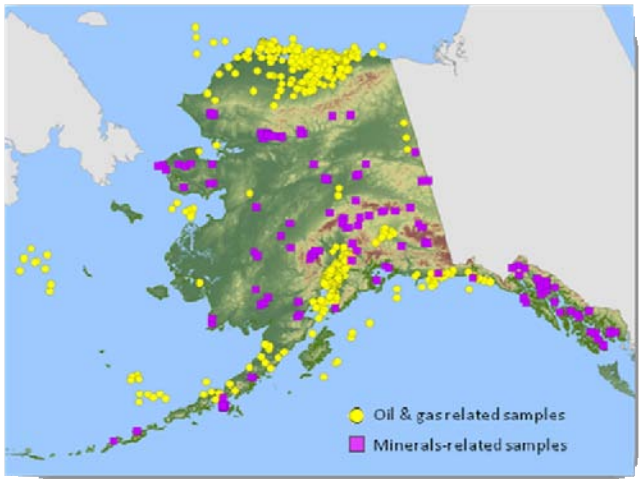
Although the current GMC "facility" is still bursting at the seams with over 60 shipping containers housing more than 60% of the collection, our new GMC team (Curator Ken Papp and his staff of wizards; Jean Reardon, Kurt Johnson, and a hoard of hard working volunteers & interns) have transformed the archive into a modern collection we can all be proud of, complete with an interactive database available anywhere you have a computer and internet connection. They have been exceedingly busy organizing, bar-coding, populating a new database, re-boxing, cleaning, and protecting the collection so our users can easily access and employ the samples in their research. If you have not visited the GMC recently, I urge you to make the trip and/or visit the website to see firsthand what we are so excited about. (www.dggs.alaska.gov/gmc)

2013 → **2014**

New Facility

The fact that the GMC collection is in need of a new home has been recognized for many years, yet finding a suitable building, and/or raising the funds to build a new 'stand-alone' facility has been elusive. Arguably, the 13 million feet of O&G wellbore represented by core and cuttings from 1600+ wells; the 250,000 feet of hard rock core from 1800 boreholes; the 275,000 processed samples; and the 400 analytical reports represents a ***priceless and irreplaceable collection***. The condition of the Eagle River facility clearly did not represent the value or importance of this collection to the State, but the budget process in 2012 changed all of that. After years of planning, research, and discussion, the Governor included in his budget, and Legislature approved in appropriation, the funds to begin the process of making a new GMC facility a reality.

Rendering of what the new GMC facility will look like at 3651 Penland Parkway



Distribution of samples from across the State

On July 2, 2013, the State purchased a 100,550 sq. ft. building at 3651 Penland Parkway in Anchorage (currently the Debarr Sam's Club) to establish a new Geologic Materials Center. Besides providing a proper facility to protect, access, and perform research on this invaluable collection, the new facility will allow for up to 380% expansion of the collection in the coming years. Wal-Mart Stores Inc. contributed $2.5 million to the purchase in support of the educational opportunities for students and universities as part of the agreement. Current plans for the layout of the facility include private and secure viewing rooms available for rent to perform confidential analyses and research, open viewing areas, sample processing areas, and warehouse space for companies to store private confidential collections. We envision core workshops on samples of emerging resource plays, as well as opportunities to host college courses and support student/faculty research. What the new facility will end up providing to the geologic community in Alaska is limited primarily by our imaginations.

Ken Papp and the GMC crew are busy making preparations to start the process of moving the collection during the summer of 2014, which will be a non-trivial process. The current plan is to perform retrofit construction and slab upgrade during the late fall and winter of 2013-14, and start the collection transfer during the spring of 2014. We are all very excited about this new opportunity, and hope that you will start making plans now to increase your subsurface geologic knowledge at the Alaska Geologic Materials Center.

AAPG Delegate Report:

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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.

This newsletter is the monthly (September-May) publication of the Alaska Geological Society, Inc. Number of newsletters/month: ~300

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Contact membership coordinator Ken Helmold with changes or updates (e-mail: ken.helmold at alaska.gov; phone: 907-269-8673)

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