COURSE DESCRIPTION

GEOS 424/624: INTERNATIONAL VOLCANOLOGICAL FIELD SCHOOL

KAMCHATKA TRIP

(3 CREDITS)

INSTRUCTORS

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Dates: August 10-24, 2020
Costs: $2121 or $2883 plus roundtrip airfare to Petropavlovsk-Kamchatsky

The field trip to Mutnovsky and Gorely volcanoes in Kamchatka (figure 1) offers a chance to learn about full spectrum of volcanic processes using some of the best examples in the world. This includes ignimbrites of caldera-forming eruptions, lava flows, cinder cones, extrusive domes, and active fumaroles (figure 2). A side trip to the 50 MW Mutnovsky Geothermal Power plant is used as an excellent opportunity to discuss the utilization of geothermal energy. This field trip will be led by Pavel Izbekov and Olga Khubaeva, a field camp Director, acting on behalf of our hosting organization, the Institute of Volcanology and Seismology of Russian Academy of Sciences.

PREREQUISITES

- GEOS 424: Acceptance into the course is contingent upon: (1) A completed application, (2) a reference letter, and (3) permission of the Instructor.
- GEOS 624: All of the above plus a graduate standing.

RESTRICTIONS

Students must be in good health, capable of hiking for at least 20 km per day carrying heavy backpacks, and be willing to camp under primitive, remote, and possibly uncomfortable conditions. Basic conversational ability in either English or Russian is required.

OBJECTIVES

- GEOS 424 is a stimulating exploration of physical science in nature, suitable for undergraduate science majors with a zest for adventure and an interest in meeting students from other cultures.
- GEOS 624 should be taken by graduate students early in their graduate careers as an introduction to research possibilities in volcanism, tectonics, and related phenomena associated with subduction in the North Pacific.

KEY CONCEPTS ADDRESSED

- Magma processes
- Subduction-related volcanism
- Products of volcanic activity
- Volcanic features and landforms
- Petrology of the Mutnovsky & Gorely Volcanic center
- Volcano monitoring and public safety
- Geothermal energy utilization

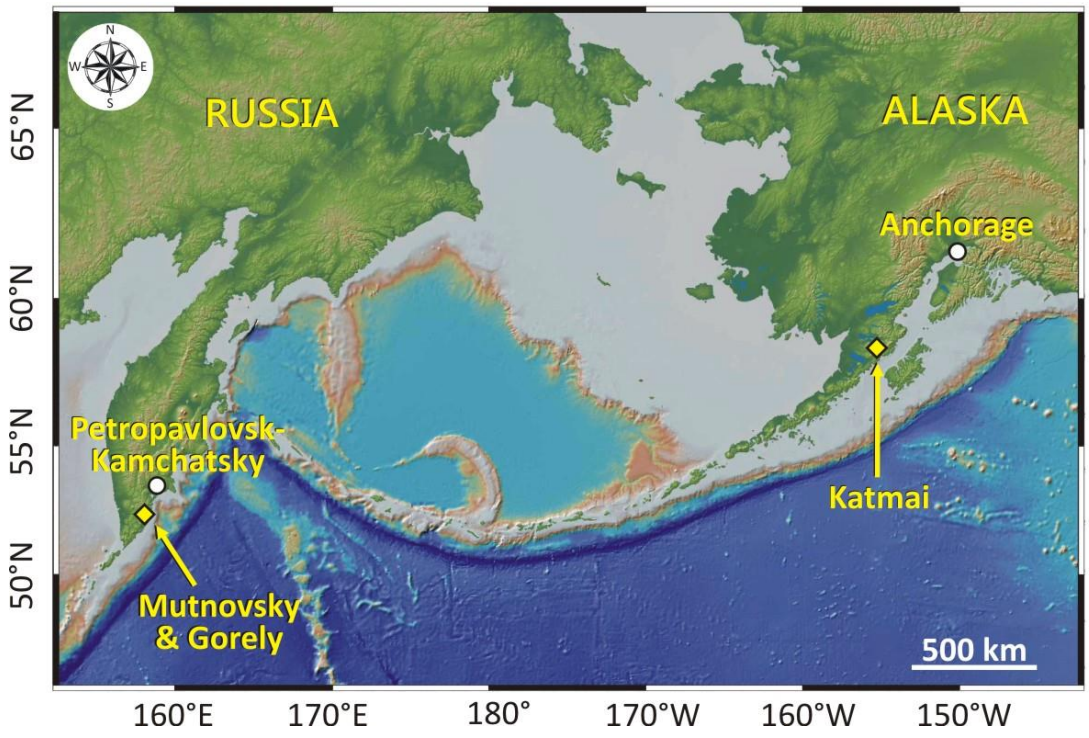

Figure 1: Map showing the Kamchatka Peninsula (left) and a portion of Alaska (right). Yellow diamonds denote locations of the Mutnovsky/Gorely (left) and Katmai (right) school sites.

STUDENT LEARNING OUTCOMES

GEOS 424:

- Students will learn to identify pyroclastic flow deposits, lava flows, and tephra fall deposits, as well as to describe characteristics and to discuss origin of aforementioned volcanic deposits
- Students will be able to make informed decisions conducting scientific field works in a remote environment while following safety requirements and communication protocols
- Students will develop / improve skills of effective communication with peers from different cultures

GEOS 624:

- All of the above.
- Students will develop / improve skills of presentation of scientific concepts to peers
- Students will be able to make informed decisions on research opportunities in the North Pacific subduction region and discuss current topics and controversies in volcanology
- Students will establish collegial relationships with students from other countries for future collaborative research

COURSE STRUCTURE

The course consists of day-long hikes interspersed with lectures. Lectures occur on days of bad weather and rest days. During hikes, students will examine ignimbrites, lava flows, pyroclastic flows, air fall tephra, craters, fissures, faults, vents, crater lakes, and fumaroles spanning the common range of volcanic rock types from basalt to rhyolite. Discussions in the field and following lectures will explore why and how these phenomena occur.

Figure 2: The Vakin Hut, our basecamp at Mutnovsky & Gorely volcanoes in Kamchatka (A). The hut provides a place for eating, lectures, drying clothes, and study for all. The hut provides a safe haven during extreme weather conditions for up to 40 people. Access to the region is by trucks (B). Gorely's summit craters (C) and Mutnovsky craters (D) are amongst primary landmarks visited by course participants.

SCHEDULE AND ROUTE

The course will begin and end in Petropavlovsk-Kamchatsky, Russia. Students are expected to arrange their own transportation to/from Petropavlovsk-Kamchatsky with arrival by early afternoon of Day 1 and departure on Day 14. Please refer to the official course web page for actual dates of the field trip: https://www.uaf.edu/geosciences/academics/international-volcanology/index.php.

Day 1: Arrival to Petropavlovsk-Kamchatsky

Olga and I will meet your at Elizovo airport and take to the guesthouse of the Institute of Volcanology and Seismology, where you will be able to rest after long flights and prepare for a ride and possible hike to our basecamp at Mutnovsky Volcano next morning. We will have a dinner together and discuss safety requirements, communication protocols, as well as the current state of volcanic activity at Mutnovsky and Gorely Volcanoes.

Day 2: Getting to the Vakin Hut, our base camp at Mutnovsky & Gorely volcanoes

At about 11:00 am we will start a 2-3 hour drive to Mutnovsky & Gorely. Depending on the snow conditions inside of the Gorely Caldera, we may need to employ a smaller cross-terrain vehicle, which will make several trips to our basecamp transporting our field gear, kitchen, and food supplies. Meanwhile, we will continue our journey to the basecamp by foot, carrying our personal backpacks for approximately 8 miles with less

than 500 feet of elevation gain. We will reach the Vakin hut by 17:00-18:00, set up our tents, and have a dinner.

Days 3-12: Exploring Mutnovsky and Gorely volcanoes and their surroundings

We will conduct day hikes as weather permits and run lectures during inclement weather conditions. Our typical day-hike destinations include

- Opasny creek (cross section of a cinder cone, basaltic scoria, bombs, lava flows)
- Mutnovsky crater (hydrothermal activity, inner making of a stratovolcano, lahar deposits)
- Mutnovsky crater rim (summit crater/caldera deposits)
- Gorely craters (lava and tephra fall deposits)
- Gorely caldera (ignimbrites)
- Mt. Dvugorbaya (magma mixing)
- Skalistaya Mt (rhyolite extrusion, lava flows of high-Mg basalts)

The longest hike is about 15 miles and 3,500 ft. gain (24 km and 1,100 meters) to the summit craters of Gorely Volcano and back, which will take a full day (ca. 12 hours). GPS tracks of our typical day hikes can be sent to interested students by e-mail upon request prior to the field trip.

Days 13: Return to Petropavlovsk-Kamchatsky

It is very likely that by the end of our stay at Mutnovsky, the snow conditions will improve considerably and in the morning of Day 13 we will load our trucks and will retreat to the guesthouse of the Institute of Volcanology and Seismology, where we will enjoy a farewell dinner and a hot tub, after which you will take a test with 15-20 multiple-option questions. We will collect your field notebooks for grading. The notebooks will be returned back to you prior to our departure from Kamchatka next day.

Days 14: Flying back home

Some students will leave to the airport in the morning for early flights to Moscow, Sheremetyevo, others will have an opportunity to visit the Institute of Volcanology and Seismology, its museum, then stroll along the downtown of Petropavlovsk-Kamchatsky with many historical sites and a couple of museums. If weather permits, we will hike to Mishennaya hill for a panoramic, 360 degrees view of the Petropavlovsk-Kamchatsky, Avacha bay, Avachinsky and Koryaksky volcanoes. Students will depart to Elizovo airport for a late flight to Anchorage at about 18:00.

POLICIES

Students are expected to participate in all class activities including day hikes, discussions, and lectures. If physical conditions prevent a student from full participation in a day hike, he/she will be given a writing assignment. Students are expected to record their field observations in their field notebooks following guidelines and examples given prior to the field trip. Students taking this course at the 400 level are encouraged, but not required to give a presentation on their research or a relevant topic, which can be chosen with instructor's assistance prior to the trip. Students taking this course at the 600 level are required to give a presentation on their thesis research. As an alternative, they may choose to give a presentation on one of the aspects of volcanism, in which case the topic of presentation must be discussed with an instructor prior to the field trip. Hearing presentations by other students from other countries is an experience that many students value most. All presentations will be via PowerPoint projector, whiteboard, and whatever handouts the presenter wishes to distribute. There will be at least one laptop, so there is no need to bring your own unless you really want to. You are welcome to bring your presentation on a USB memory stick.

The course is graded based on the following accomplishments:

- 60% on quality and completeness of field notes. Field notes may be interspersed with lecture notes in chronological order. Lecture notes will not be evaluated. Field notes will be evaluated based on the completeness of observations and quality of descriptions at each visited landmark and/or observation site using scores outlined below.

3 (Proficient)	2 (Competent)	1 (Novice)
Complete detailed description with annotated drawings; thoughtful discussion raising questions.	Good, intelligible description with some drawings; basic interpretation lacking in-depth discussion.	Unintelligible notes; primary observed features are not described; interpretation is either missing or incorrect.

- 40% and 20% on final test for 400 and 600 levels, correspondingly.
- 20% on presentation for 600 level. Presentation will be evaluated based on (1) organization and content, (2) subject knowledge, (3) effective use of whiteboard and handouts, and (4) presentation skills. Students taking this course at the 400 level can use this opportunity to earn 20% as an extra credit.

This percentage score is transformed into a plus-minus letter grade using these cutoffs:

F	D	D+	C	C+	B	B+	A-	A
<60%	≥60%	≥67%	≥70%	≥77%	≥80%	≥87%	≥90%	≥93%

The grades “B-”, “C-”, “D-”, “F+”, and “F-” will not be given. “A+” is reserved for truly extraordinary work.

Students are subject to the UAF Student Code of Conduct. University of Alaska is an AA/EO employer and educational institution and prohibits illegal discrimination against any individual: www.alaska.edu/nondiscrimination.

STUDENT PROTECTIONS AND SERVICES STATEMENT

Every qualified student is welcome in our classroom. As needed, we are happy to work with you, disability services, veterans' services, rural student services, etc. to find reasonable accommodations. Students at this university are protected against sexual harassment and discrimination (Title IX), and minors have additional protections. As required, if we notice or are informed of certain types of misconduct, then we are required to report it to the appropriate authorities. For more information on your rights as a student and the resources available to you to resolve problems, please go the following site: www.uaf.edu/handbook/

COST

The estimated cost of the Kamchatka trip is $2121 and $2883, for 424 and 624 levels correspondingly. The cost includes tuition at the *in-state rate* plus the course fee and smaller UAF fees. Except for a few meals, incidental expenses, and visa costs (about $200), the course fee covers all transportation, lodging, food, and insurance for the duration of the class, which begins and ends in Petropavlovsk-Kamchatsky, Russia. Students will be responsible for their own travel arrangements to/from Petropavlovsk-Kamchatsky.

RUSSIAN VISA

Unless you have a valid Russian visa or a passport that grants you a visa-free entry to Russia, you will need to obtain a Russian visa to enter the country. The procedure is not as complicated as it may appear from the first glance. Please make sure that *you have a passport with expiration date after March 1, 2021*. There are two steps in applying for visa:

STEP 1: Obtaining Invitation letter

Our host institution, the Institute of Volcanology and Seismology, will apply to local authorities for an invitation letter on your behalf. In order to apply the IVS will need from you a JPEG copy of first two identity pages of your passport (300 dpi, color, actual size) and the following information:

1. Full name (last, first, middle)

2. Date of birth (date, month, and year)
3. Place of birth (town, city, country)
4. Gender (female/male)
5. Citizenship
6. Home address
7. Passport number, date of issue/expiration
8. Institution (full title) and address
9. Position
10. Telephone number, e-mail, fax
11. Copies of previous Russian visas if any
12. Nearest Russian consulate or embassy, where you intend to apply for Russian visa. The list of Russian consulates in the United States can be found at https://washington.mid.ru/en/consular-services/consulate/russian-consulates-in-the-us/. Please check with us, if in doubt.

Please send this information and passport copy to me by **April 16.**

In approximately 30 days after we provide this information to our hosts, the invitation letter will be sent directly to the Russian Consulate near you (item #12 in the questionnaire above). A copy of the invitation letter will be sent to you by e-mail. Optionally, the original invitation can be mailed to you, if required by your nearest Russian Consulate (uncommon). In such instance, please make sure that we have your current mailing address, where your invitation will be sent by a courier mail.

STEP 2: Obtaining Russian Visa

You will use your invitation letter to apply for Russian visa in the nearest Russian consulate following our instructions, which *will be e-mailed to you as a separate PDF file*.

EQUIPMENT

Students will need to bring their own camping equipment appropriate for high mountains. The following list is based on our prior experience and may guide you through your preparation for the field trip. Essential items are underlined.

- ☐ Tent (4-5 pole four-season mountaineering tent is highly recommended)
- ☐ Backpack (internal frame type recommended)
- ☐ Good rain suit (jacket and pants; not poncho; this is most important; light-weight gear will tear in the wind; heavy-duty Gore-Tex-Pro gear seems to be the most adequate)
- ☐ Long underwear
- ☐ Long sleeve fleece sweater or pullover
- ☐ Packable down/synthetic sweater or jacket
- ☐ Cold-weather hat (fleece or wool)
- ☐ Cap or hat for rain
- ☐ Clothing: socks, underwear, shirts, pants (quick drying material recommended)
- ☐ Trekking poles - highly recommended, yet not required
- ☐ Goggles (for ash; glacier goggles or cheap plastic safety goggles will do)
- ☐ Sunglasses
- ☐ Sun block
- ☐ Gloves or mittens
- ☐ Gaiters (mostly to keep snow and loose pumice out of your boots)
- ☐ Sleeping bag good to at least 0°C, maybe a bit colder to be safe
- ☐ Sleeping pad
- ☐ 1L water bottle.

- Personal eating gear (bowl, cup, spoon)
- Waterproof hiking boots (we will hike on wet snow over long distances, so it is important to make sure that your boots are waterproof, broken in, suitable for all-day hikes)
- Light athletic shoes for wearing at our basecamp
- Camera (brings plastic bag or good case to protect from rain and ash)
- Day pack sufficient to carry lunch, water bottle, rain gear, extra sweater *or use your main backpack as a day pack*
- Field notebook and pencils
- Hand lens
- Flashlight with spare batteries
- Handheld GPS
- Personal first aid kit that fits your needs and a personal survival tool
- Snow traction device (e.g. microspikes) could be extremely helpful on snow and ice, which will be abundant

Note that the idea with clothing is to have a spare of everything (except boots and rain suit) so that you can get soaking wet and be able to change into something dry when we get back to the huts. Synthetic gear dries faster than cotton and wool, please chose it if you have an option.

We suggest putting your backpack in a military-style duffel bag for checking it on the plane. Otherwise, you will risk losing items attached to your backpack and/or getting your backpack damaged in transit. This happens every year. We encourage you to *put the maximum number of your essential items in your carry on*, so that even if your luggage is lost or delayed, you could still participate in the course. We will have 2-way radios, one satellite phone, and a basic first aid kit with us.

MEALS

We will have a kitchen and a full-time cook. Typical menu will include kasha (Russian hot cereal) in the morning, sandwiches and chocolate bars during day hikes, and hot dinners (soups, pastas) in the evening. Vegetarians should find it easy to avoid meat if desired. There will also be lots of tea. If you have some personal craving, like coffee or power bars, it might be wise to bring your own supply. We will use water collected from the nearby streams and snowfields, which is safe to drink untreated. You are welcome to bring your own water purification/treatment means if you choose to do so.

COMMUNICATION

There will be no cell phone reception at the Vakin hut. I will carry Iridium satellite phone, which will be used for daily weather updates, checking in with my colleagues at the IVS, and checking my office voicemail (+1-907-474-5269). The phone accepts text messages, which can be sent via https://messaging.iridium.com/ at no charge, but with some delays. You parents will be able to contact you in case of emergency during Days 2-12 by (1) sending a text message to the satellite phone AND (2) leaving a message on my voicemail. Unfortunately, there will be hours of delay before you will call them back as we will be turning on the satellite phone once a day to conserve its battery power. The number of the satellite phone will be sent to accepted students prior to the trip. We will have a dozen of two-way radios with spare AAA batteries for communication during hikes. Please send me an e-mail, if you experience any delays or any other complications during your transit to Kamchatka.

INSURANCE

UAF will provide you with a complimentary student accident insurance. We will distribute the insurance brochure and send you your policy number prior to the trip.

LIABILITY FORM

UAF requires all participants of its field-based courses to sign the release of all claims form. I will bring the completed forms with me to Petropavlovsk-Kamchatsky and collect your signatures before our departure to Mutnovsky & Gorely. The form will be sent to all accepted students by e-mail prior to the trip.

SELECTION PROCEDURE

The success of the school depends on everyone being able to travel on foot together. It will be very difficult if not impossible for students who find themselves unable to adapt to field conditions to leave before the session is completed. Therefore, an application procedure has been established (http://www.uaf.edu/geology/academics/international-volcanology/). Prospective students are asked to fill out the accompanying application form. Preference will be given to students who exhibit enthusiasm for field science and a strong interest in establishing collaborative relationships with students and scientists from other cultures. For the Kamchatka session, we will consider students who do not intend to pursue careers in science but who have a strong interest in Russian culture and language.

Applications will be accepted and reviewed on the continuous basis until all vacancies are filled. If interested, please apply as soon as possible to reserve your space in the group. Once students have been notified of their acceptance, they will be able to register and pay fees through the UAF Summer Sessions at www.uaf.edu/summer. Since travel arrangements require significant financial commitments from organizers, we request a non-refundable deposit of $250 to reserve a space. The remaining portion of the payment should be received by Summer Sessions no later than 2 weeks before the trip.

READING MATERIALS

* Required for all students

** Required for students taking this course at the 600 level

**Aiuppa, A. et al., 2012, First volatile inventory for Gorely volcano, Kamchatka, *Geophysical Research Letters*, 39(6): L06307.

Gavrilenko, M., Ozerov, A., Kyle, P.R., Carr, M.J., Nikulin, A., Vidito, C. and Danyushevsky, L., 2016, Abrupt transition from fractional crystallization to magma mixing at Gorely volcano (Kamchatka) after caldera collapse. *Bulletin of Volcanology*, 78(7), p.47.

**Eichelberger, JC, P Izbekov, and B Browne, 2006, Bulk chemical trends at arc volcanoes are not liquid lines of descent, *Lithos*, 87, 135-154.

Kuznetsov, P.Y., Koulakov, I., Jakovlev, A., Abkadyrov, I., Deev, E., Gordeev, E.I., Senyukov, S., El Khrepy, S. and Al Arifi, N., 2017, Structure of volatile conduits beneath gorely volcano (Kamchatka) revealed by local earthquake tomography. *Geosciences*, 7(4), p.111.

*Selyangin, O.B., 2006, Guide to Mutnovsky and Gorely Volcanoes (copy provided to students registered for Kamchatka session).

Simon, A., Yogodzinski, G.M., Robertson, K., Smith, E., Selyangin, O., Kiryukhin, A., Mulcahy, S.R. and Walker, J.D., 2014, Evolution and genesis of volcanic rocks from Mutnovsky Volcano, Kamchatka. *Journal of Volcanology and Geothermal Research*, 286, pp.116-137.

**Zelenski, M. and Taran, Y., 2011, Geochemistry of volcanic and hydrothermal gases of Mutnovsky volcano, Kamchatka: evidence for mantle, slab and atmosphere contributions to fluids of a typical arc volcano, *Bulletin of Volcanology*, 73(4): 373-394.

FREQUENTLY ASKED QUESTIONS

Q: Is Internet, cell phone connection, and electricity available at the basecamp?
A: We will have no Internet at the Vakin Hut. Cell phone reception might be available during our day hikes to Mutnovsky crater rim, where we will have a direct line of sight of the Mutnovsky Powerplant. We will have a 2,000 W gas generator with us and you will be able to charge your gadgets in the evenings. Please make sure that your power supply works on 220 V. If so, you will only need a European plug adapter.

Q: Is it possible to take a shower at our basecamp?
A: There is no civilized shower at the Vakin Hut. People bring wet wipes (baby wipes) or water from the nearby stream for washing themselves. We may have a large tent established for basing needs, if weather permits.

Q: I have no backpacking experience. Do you think I will survive the trip?
A: Students with no backpacking experience have survived this trip in the past thanks to their excellent physical shape, good choice of field gear, careful preparation to the trip, and high level of enthusiasm. Please discuss any possible limitations and concerns with us before signing up for the course. We will help you to make an informed decision.

Q: May I get some advice on field gear?
A: There are many on-line resources discussing camping and backpacking gear. For example, some useful information could be found at http://www.adventurealan.com/recommended-backpacking-gear/. We can certainly provide our advice on your field gear as well.

Q: How much cash should I bring with me?
A: The cost of food, lodging, and transportation in Kamchatka is included into the class fee. You may need some money for souvenirs, drinks, snacks, and for food while in transit to/from P-K, as well as for your meals in the city on the days of arrival and departure ($100 would be a very generous amount). The most convenient way to get rubles (Russian currency) is with a debit/credit card (VISA, MASTERCARD) at an ATM (daily transactions are limited to about $150). You may want to notify your bank about dates of your foreign travel and check on their foreign transaction fees.

Q: Should I bring a bear spray?
A: Please do not pack any bear spray, flares, and guns into your luggage unless you really want to get in trouble at airline security checkpoints and customs.

Q: The cost of my round trip ticket to Kamchatka exceeds $6,000. Is it reasonable?
A: No, it is not, unless you chose to fly in the first class exclusively. It does take some time and effort to find a “not so expensive” airfare to Kamchatka. For a round trip to Kamchatka from Fairbanks, I consider myself lucky if the airfare is under $1,200. I consider a $1,600-$1,900 ticket as a reasonably priced. Everything above $3,000 is too expensive. It is wise to buy the SVO-PKC ticket as early as possible if you fly via Moscow. This ticket on a direct flight by Aeroflot can be found in February for about $300. In August, you will have hard time finding any tickets from Moscow to Kamchatka for under $1,500. This is because Russian families are returning to Kamchatka from their summer vacations in time for a school year, which starts on September 1.