

COURSE DESCRIPTION
GEOS 424/624: INTERNATIONAL VOLCANOLOGICAL FIELD SCHOOL
KATMAI TRIP
(3 CREDITS)

INSTRUCTORS

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Dates: June 10-24, 2025

Estimated costs: \$2,964 plus UAF tuition & fees plus roundtrip airfare to Anchorage*

Application deadline: February 28, 2025

The strenuous, two-week field trip to the Katmai National Park, Alaska (figure 1) provides a unique opportunity to explore the site of the largest volcanic eruption on Earth in the 20th century. Participants will learn about volcanic processes through direct examination of volcanic products while exploring the Valley of Ten Thousand Smokes and the neighboring volcanoes - Mount Katmai, New Trident, and Mageik (figure 2). The session will be led by Pavel Izbekov.

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 while carrying heavy backpacks, and willing to camp in remote, primitive, and potentially uncomfortable conditions. Basic conversational proficiency in English is required.

OBJECTIVES

- GEOS 424 is a stimulating exploration of physical science in a natural setting, ideal for undergraduate science majors with a passion for adventure and an interest in engaging with students from diverse cultural backgrounds.
- GEOS 624 is tailored for graduate students early in their academic careers, serving as an introduction to research opportunities in volcanism, tectonics, and related phenomena associated with subduction in the North Pacific region.

KEY CONCEPTS ADDRESSED

- Magma processes
- Subduction-related volcanism
- Products of volcanic activity
- Volcanic features and landforms
- Petrology of the Katmai group of volcanoes
- Volcano monitoring and public safety

*Please refer to the section COST for details

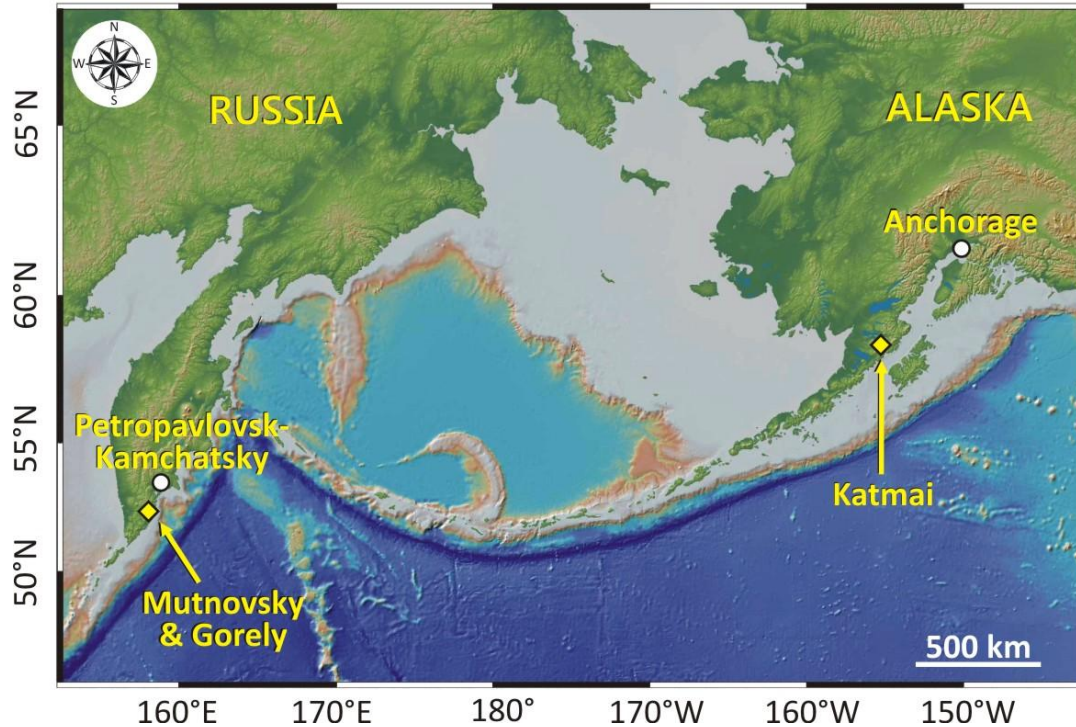


Figure 1: Map showing the Kamchatka Peninsula (left) and a portion of Alaska (right). Yellow diamonds denote locations of the Mutnovsky/Gorely (left) and Katmai (right) school sites.

STUDENT LEARNING OUTCOMES

GEOS 424:

- Students will learn to identify pyroclastic flow deposits, lava flows, and tephra fall deposits, as well as describe their characteristics and discuss the origins of these volcanic deposits.
- Students will gain the ability to make informed decisions while conducting scientific fieldwork in remote environments, adhering to safety requirements and communication protocols.
- Students will develop and improve their skills in effective communication with peers from diverse cultural backgrounds.

GEOS 624:

- All of the above.
- Students will develop and refine their skills in presenting scientific concepts to peers.
- Students will be able to make informed decisions about research opportunities in the North Pacific subduction region and engage in discussions on current topics and controversies in volcanology.
- Students will build collegial relationships with peers from other countries, fostering future collaborative research opportunities.

COURSE STRUCTURE

The course consists of daylong hikes interspersed with lectures. During the hikes, students will examine 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. Field discussions and subsequent lectures will delve into the processes and mechanisms behind these volcanic phenomena.



Figure 2: (A) One of our camping sites next to the Novarupta Dome during the 2022 field trip. The Baked Mountain huts, our previous base camp, were destroyed by a series of storms during 2017-2020. All participants will sleep in mountaineering tents, camping at wind-protected sites and moving the basecamp 1-3 times depending on weather conditions. (B) Access to the region is by floatplane. Notable landmarks visited during the course include the Novarupta Dome (C) and the Katmai Caldera (D).

SCHEDULE AND ROUTE

The course will begin and end in Anchorage, Alaska. Students are responsible for arranging their own transportation to and from Anchorage, ensuring arrival by the late evening of Day 1 and departure in the late evening of Day 15. Please refer to the official course web page for the exact dates of the field trip:

<https://www.uaf.edu/geosciences/academics/international-volcanology/index.php>

Day 1: Arrival to Anchorage

Upon arrival in Anchorage, please take a taxi to our rental house, where we have *pre-paid* reservations for Day 1 and Day 2. The exact address and check-in instructions will be sent to participants a few days before Day 1. If you choose to arrive to Anchorage before Day 1 or leave it after Day 14, please make hotel arrangements in advance, as finding affordable accommodation in Alaska during the summer can be challenging. On Day 1, we will share a dinner together and discuss our plans.

Day 2: Preparation for the field trip in Anchorage

The morning is spent for orientation and purchasing food supplies at local department stores. In the afternoon, we will visit the Alaska Volcano Observatory, where you will receive a briefing on the current state of volcanic activity at Katmai, current snow conditions, and weather forecast. We will distribute cooking

sets, tents, field guides, and have a dinner together. We will discuss safety requirements and communication protocols. We will also practice using MSR cooking stoves and setting up our tents.

Day 3: Flying to Brooks Lodge via King Salmon

We will depart Anchorage for King Salmon on the Alaska Peninsula, flying over the Cook Inlet volcanoes. Weather permitting, we will see Redoubt, Iliamna, and St. Augustine volcanoes. In King Salmon, we will split into two or three small floatplanes and fly to Brooks Lodge located at Naknek Lake. Upon arrival, the National Park Service will brief us on bear safety, and we will be assigned to cabins. Each cabin accommodates four people and includes a shower. We will have dinner at the lodge (all meals at the Brooks Lodge are included in the course fees) and prepare our backpacks for the long hike the following day.

Day 4: Getting to the Valley of Ten Thousand Smokes

After breakfast, we will board a 4WD bus for a slow ride to the trailhead at the Valley of Ten Thousand Smokes, where we will begin our hike around noon. This first hiking day will be the most challenging, as we will be carrying full packs (about 50-80 pounds; 23-36 kg). If we choose to camp at the Baked Mountain site, then it is 10 miles (15 km) and about 2000 ft. (600 m) elevation gain, most of which occurs at the end. There are two river crossings. The routine for crossing is to take off long pants, put on water shoes or other lightweight shoes (or no shoes if you have extremely tough feet), and wade through. The river crossings and the steep climb on loose ash at the end of the hike are the main challenges of the day. One section of the trail is a steep side-hill, which may be unsettling for those who are uncomfortable with heights, but it is not dangerous (a fall would not be injurious). The first half of the trail is also used by bears – which again can be disconcerting to those not accustomed to this hazard. However, no bear is going to risk an encounter with a large group of loud humans. We will reach the Baked Mountain Huts site located in the middle of the Valley of Ten Thousand Smokes at about 8-11 pm. We will collect water from nearby snowfields. The site offers an unobstructed view of the Griggs Volcano and no vegetation, just pumice and ash. The elevation at the site is about 2600 ft. (~800 m). Since the Baked Mountain Huts no longer provide shelter and relative comfort, we may choose to establish our camp at one of several wind-protected sites, depending on weather conditions, the abundance of snow in the upper part of the Valley, and other factors.

Days 5-13: Exploring the Valley of Ten Thousand Smokes and its surroundings

We will conduct day hikes as weather permits and will study staying in our tents during inclement weather conditions. Our typical day-hike destinations include

- Novarupta Dome (effusive vs. explosive volcanism; eruption history)
- Katmai Caldera (caldera formation; magma chamber; internal structure of arc volcanoes)
- Trident Volcano lava flows and vent (cone building; normal arc volcanism; magma mixing)
- Upper Lethe Valley (ignimbrite emplacement; welding; glacier/tephra interaction; glacier/lava interaction; glacial retreat; magma intrusion)
- Upper Knife Creek Valley (more ignimbrite features; phreatic deposits; fumarolic systems)
- Baked Mountain (pyroclastic surges; sedimentary basement; valley overview)

The longest hike is 18 miles and 4000 ft. gain (29 km; 1200 m) to the rim of Katmai Caldera and back. This hike takes about 12 hours, including a rest at the top - and we usually rest the following day too! It is, however, arguably one of the most incredible sights on Earth. GPS tracks of our typical day hikes can be sent to interested students by email upon request prior to the field trip. Depending on weather conditions, we may choose to move our camp from the Baked Mountain site to Novarupta, Mageik Lakes, or Knife Creek sites for better wind protection and access to streams with clean drinking water.

Day 14: Return to the Brooks Lodge

After many wonderful experiences, we march out from the Valley to the waiting bus on Day 14. The hike will be easier, as it is downhill and our packs will be lighter. We will return to the lodge by about 5 pm, where we

will have dinner and spend the night in the cabins. That evening we will play “tourist” and watch the bears catch salmon at Brooks Falls – the location where most of the iconic brown bear pictures were likely taken.

Day 15: Flying back to Anchorage via King Salmon

We will have breakfast at the Lodge, following which you will take a test with 15-20 multiple-choice questions. We will also collect your field notebooks for grading. The notebooks will be returned to you before we depart from Brooks Lodge. You will be able to visit Brooks Falls again and/or explore other “tourist” activities at the Brooks Lodge, such as an excursion to the archeological site, kayaking, and fishing, amongst others.

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, they will be given an alternative writing assignment. Students are expected to record their field observations in their field notebooks, following guidelines and examples provided prior to the field trip. Students enrolled in the 400-level course are encouraged, but not required to give a presentation on their research or a relevant topic, which can be selected with instructor’s assistance prior to the trip. Students enrolled in the 600-level course 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 Katmai volcanism, with the topic to be discussed with the instructor before the field trip. Hearing presentations by other students is often one of the most valued experiences in the course. All presentations will be conducted using a whiteboard, along with any handouts the presenter wishes to distribute.

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. We are happy to work with you, along with Disability Services, Veterans' Services, Rural Student Services, and others, to find reasonable accommodations as needed. Students at this university are protected against sexual harassment and discrimination under Title IX, and minors have additional protections. If we observe or are informed of certain types of misconduct, we are required by law to report it to the appropriate authorities. For more information on your rights as a student and the resources available to help resolve any issues, please visit: www.uaf.edu/handbook/

COST (\$3,571-\$6,572 plus round trip airfare to Anchorage, Alaska)

The cost of the Katmai trip in 2025 includes \$2,964 course fee, which covers all transportation, lodging, and food for the duration of the class, which begins and ends in Anchorage. In addition, registered students will be responsible for three credits of UAF tuition, a few smaller UAF fees, and costs of transportation to/from Anchorage. Estimated total costs can be found in the table below.

	AK resident rate*		WUE**		Non-resident rate		Invited lecturer / Special guest
	GEOS424	GEOS624	GEOS424	GEOS624	GEOS424	GEOS624	
Course fee	\$2,964	\$2,964	\$2,964	\$2,964	\$2,964	\$2,964	\$2,964
Tuition, 3 credits	\$867	\$1,617	\$1,302	\$3,315	\$2,565	\$3,315	N/A
UA network fee	\$36	\$66	\$36	\$66	\$36	\$66	N/A
Consolidated fee	\$159	\$159	\$159	\$159	\$159	\$159	N/A
Department of Geosciences fee	\$50	\$50	\$50	\$50	\$50	\$50	N/A
Facilities fee	\$18	\$18	\$18	\$18	\$18	\$18	N/A
Administrative fee	N/A	N/A	N/A	N/A	N/A	N/A	\$607
Total:	\$4,094	\$4,874	\$4,529	\$6,572	\$5,792	\$6,572	\$3,571

* Students attending University of Alaska, military personnel on active duty, their spouses and dependent children etc. Please refer to the full list of eligible students at <https://www.alaska.edu/student-services/student-resources/residency/>

** Western Undergraduate Exchange: Arizona, California, Colorado, Hawai'i, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming

The tuition rate and other UAF fee estimates are preliminary. For official published fees, please refer to <https://www.uaf.edu/financial/costs/index.php>. A special rate of \$3,571 is available for invited lecturers and special guests who do not register through UAF for course credits. Any vacancies not filled by February 28, 2025 will be offered at this rate to eligible waitlisted students.

EQUIPMENT

Students will need to bring their own backpacking 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.

- 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 windblown 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 bag insert. Adds 5°C thermal value and keeps the sleeping bag clean.
- Sleeping pad
- 1L water bottle. For a hike to Katmai caldera we recommend to carry 2L of water. Please consider bringing a spare plastic 1L water bottle. You can substitute water bottles with a 2-3L water bladder, of-course.
- 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 or water shoes (for stream crossings - ice-cold rivers with rocky bottom and 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 might be useful inside huts
- Handheld GPS
- Personal first aid kit that fits your needs and a personal survival tool

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 return to the base camp. Synthetic fabrics dry faster than cotton and wool, so please chose them if possible.

We recommend packing your backpack in a military-style duffel bag for checking in on the plane. This helps prevent losing items attached to your backpack and reduces the risk of damage during transit. This is a common issue each year. We will provide MSR cooking sets, MSR multi-gas stoves, and fuel bottles. We will provide four-season mountaineering tents, which will be shared by 2-3 participants. Although there will be limited opportunities for hardcore mountaineering, we will provide ice axes for safety. We will have several 2-way radios, an inReach device, a satellite phone, and a basic first aid kit with us.

MEALS

In the morning of Day 2, we will assign participants to food teams, each consisting of 3 members. Each team will share similar dietary preferences (e.g. vegetarians, meat lovers, etc.) and will be provided with a cooking stove, two cooking pots, and three fuel bottles. Each team will have a leader who will make sure that equipment is complete and meals are planned. Our typical menu will include the following.

- Breakfast: We will boil water for hot cereal and coffee/tea.

Course Description for International Volcanological Field School, Katmai session, Summer 2025

- Lunch: Power bars, cheese, crackers, nuts, jerky, dried fruits with cold drinks (stream water with optional additives such as Gatorade powder).
- Dinner: We will prepare freeze-dried dinners with boiled water 6 times. Each participant will carry 6 pouches of the freeze-dried food. We will use them after strenuous day hikes. In addition, we will cook 3 dinners on the days of light physical activity. Each member of a food group will have to provide one (1) dinner for their group, which will include themselves and 2 peers. There is always some sort of friendly competition in culinary art between groups, so please think ahead, if you wish to impress your team members. Food groups will shop together to make sure that there are no surprises regarding dinner selections.

Participants will be individually responsible for selecting and carrying their food. Freeze-dried food will be pre-ordered from REI.com. All other camp food will be purchased at Fred Meyer during the first half of Day 2. These expenses, as well as all meals at Brooks Lodge are covered by course fees. Students are only responsible for their meals in Anchorage during Day 1-3.

During our field trip, we will use water collected from the 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 in the Valley of Ten Thousand Smokes. I will be carrying the inReach Explorer communication device as our primary means of connection to the outside world. The device accepts short, 160-character messages sent via e-mail to pavelizbekov@inreach.garmin.com. Additionally, I will carry an Iridium satellite phone. In case of an emergency, participants' parents can contact them during Days 3-14 by sending an email to pavelizbekov@inreach.garmin.com. Participants will be able to reply using the inReach, or if absolutely necessary, call back via satellite phone. Please note that there may be delays of several hours in replying, as I will frequently turn off the inReach to conserve power. The satellite phone will only be turned on when necessary.

We will have 6 two-way radios with spare AAA batteries for communication during our hikes. These radios and batteries will be distributed among participants at Brooks Lodge before our hike.

If you experience any flight delays or travel complications on Day 1 while traveling to Anchorage, please call or text me at +1-907-978-4061.

INSURANCE

UAF will provide complimentary student accident insurance for all students registered for three UAF credits. The Special guest rate does not include insurance.

LIABILITY FORM

UAF requires all participants in its field-based courses to sign the release of all claims form. I will bring the completed forms with me to Anchorage and collect your signatures before our departure to Katmai. The form will also be sent to all accepted students via email prior to the trip.

SELECTION PROCEDURE

The success of the program relies 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 (<https://www.uaf.edu/geosciences/academics/international-volcanology/index.php>). Prospective students are asked to fill out the application form. Preference will be given to students who demonstrate enthusiasm

for field science and a strong interest in fostering collaborative relationships with students and scientists from diverse cultural backgrounds.

The application deadline is February 28, 2025. Once students have been notified of their acceptance, they will be able to register and pay fees. Since travel arrangements require significant financial commitments from organizers, *a non-refundable deposit of \$250 is required to reserve a spot in the group.* The remaining portion of the payment should be received by UAF no later than two weeks before the trip. Available spots will be offered first to students registered through UAF, who are willing to pay the associated tuition and fees. On February 28, 2025 any remaining vacancies will be made available at the special guest rate to qualified participants. Please contact Pavel Izbekov to confirm eligibility for this option.

READING MATERIALS

* Required for all students

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

Coombs, M., J. Eichelberger, and M. Rutherford, 2000, Magma storage and mixing conditions for the 1953-1968 eruption of Southwest Trident Volcano, Katmai National Park, Alaska, *Contr. to Mineral. and Petrol.*, 140: 99-118.

Coombs, M.L., and J.E. Gardner, 2001, Shallow storage conditions for the rhyolite of the 1912 eruption at Novarupta, Alaska, *Geology*, 29: 775-778.

Coombs, M.L., J.C. Eichelberger, and M.J. Rutherford, 2002, Experimental and textural constraints on mafic enclave formation in volcanic rocks, *J. Volcanol. Geotherm. Res.*, 119: 125-144.

* Eichelberger, J.C., 2006, The Valley of Ten Thousand Smokes, Alaska, University of Alaska Fairbanks, 60p. (Copy provided to students registered for Katmai session)

Eichelberger, J.C., and P.E. Izbekov, 2000, Eruption of andesite triggered by dyke injection: Contrasting cases at Karymsky Volcano, Kamchatka and Mt. Katmai, Alaska, *Phil. Trans. Royal Soc. of London*, 358: 1-21.

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

Hammer, J.E., M.J. Rutherford, and Wes Hildreth, 2002, Magma storage prior to the 1912 eruption at Novarupta, Alaska, *Contr. to Mineral. and Petrol.*, 144: 144-162.

Hildreth, W. and J. Fierstein, 2000, The Katmai volcanic cluster and the great eruption of 1912, *Geol Soc Amer Bull*, 11: 1594-1620.

** Hildreth, W. and J. Fierstein, 2012, The Novarupta-Katmai eruption of 1912—largest eruption of the twentieth century; centennial perspectives: *U.S. Geological Survey Professional Paper 1791*, 259 p. (Available at <http://pubs.usgs.gov/pp/1791/>.)

FREQUENTLY ASKED QUESTIONS

Q: Is Internet, cell phone connection, and electricity available in the Valley of Ten Thousand Smokes?

A: None of these is available in the Valley of Ten Thousand Smokes. You can charge your devices at Brooks Lodge. Be sure to bring enough batteries or power banks for your electronics. Portable solar panels work well in Katmai, as we will have more than 19 hours of daylight.

Q: Is it possible to take a shower?

A: There are no civilized shower facilities in the Valley of Ten Thousand Smokes. Many participants bring wet wipes (baby wipes) or use a collapsible jar filled with snow-melted water as a rudimentary shower. Wet towels are also effective.

Q: May I bring my own tent?

A: We will provide Mountain Hardwear Trango 2, Mountain Hardwear Trango 3.1 and Hilleberg Tarra 2 tents. It is more practical to carry one larger tent and share it with one or two other participants. If you prefer to have your own tent, please consult with an instructor for approval. Small, lightweight tents are not recommended — you will need a four-season mountaineering tent with specifications that meet or exceed those of the provided tents.

Q: Would you expect me to carry anything in addition to my personal gear and food?

A: In addition to your personal gear and food you will need to carry (1) your share of the cooking group gear, i.e. either a cooking set or a fuel bottle (about 2 lb), (2) supplies for one dinner, which you will prepare for your cooking group in one of the evenings (weight depends on your cooking preferences, but typically less than 3 lb), (3) 1/3 or 1/2 of a tent, 4-9 lb, depending on whether your tent is 3-person or 2-person, and (4) a two-way radio with 4 spare AAA batteries, if provided (0.5 lb). You will also be provided an ice axe, unless you choose to bring your own.

Q: May I leave some of my travel gear in Anchorage and/or Brooks Lodge?

A: We will have a large SUV parked at the long-term parking lot at Anchorage Airport during the field trip. You may leave your travel gear (such as civilized clothes or luggage) in the vehicle and retrieve it upon our return. It's also a good idea to leave a small plastic bag with a clean set of clothes at Brooks Lodge. While Brooks Lodge doesn't have official storage facilities, they will store a couple of our duffle bags as a courtesy. Please do not leave excessive gear or valuables in the truck or at Brooks.

Q: I have no backpacking experience. Do you think I will survive the trip?

A: Students with no backpacking experience have successfully completed this trip, thanks to excellent physical fitness, good gear choices, careful trip preparation, and a strong enthusiasm for the experience. Please discuss any concerns or limitations with us before signing up. We will help you to make an informed decision.

Q: May I get some advice on field gear?

A: There are many online resources that discuss backpacking gear. For example, some useful information could be found at <http://www.adventurealan.com>. We are also happy to provide advice on your field gear as needed.