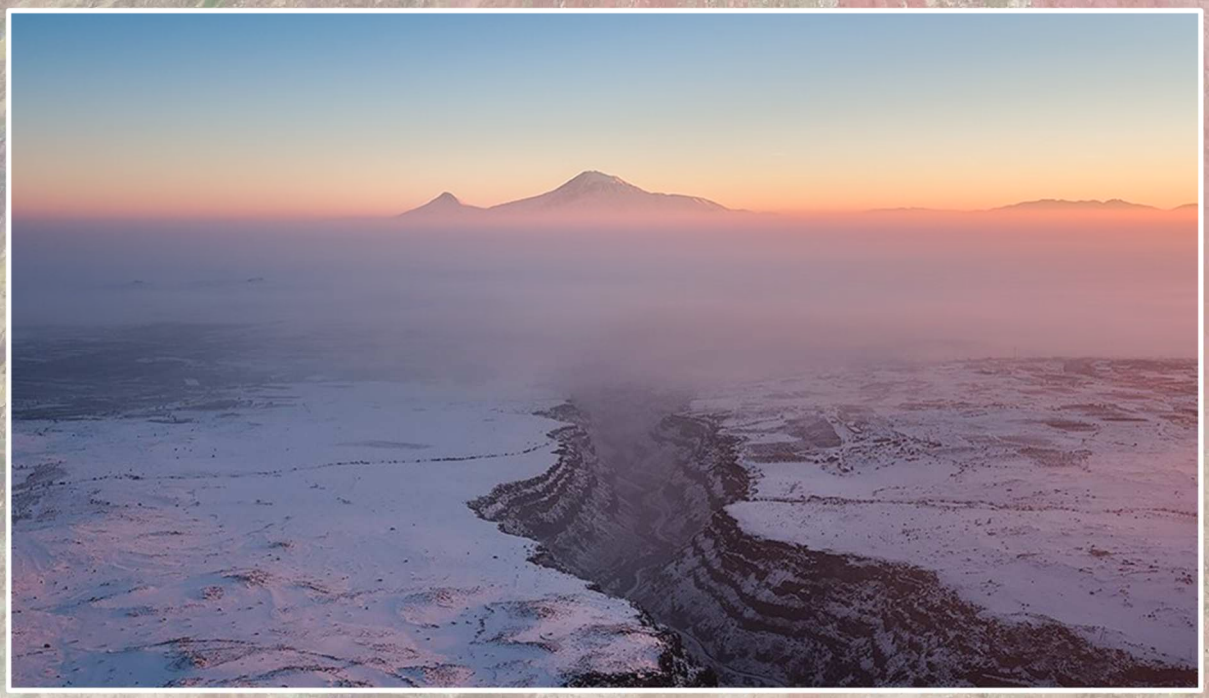
First Circular

CONFERENCE ANNOUNCEMENT AND CALL FOR ABSTRACTS:

"CONTINENTAL COLLISION ZONE VOLCANISM AND ASSOCIATED HAZARDS"

International Conference

Yerevan, Armenia, September 03-08, 2023



Aerial view of the canyon of Kasakh river filled by lava flows and ignimbrites related to Aragats volcanic province. Ararat volcano is in the background (photo by A. Keshishyan)

Background picture: Aerial image of Azhdahak volcano, 3597.3 m a.s.l., Gegham volcanic ridge (photo by E. Grigoryan)

DEAR COLLEAGUES,

The Organizing Committee and the Institute of Geological Sciences (IGS) of the Armenian National Academy of Sciences announce the international conference on "Continental collision zone volcanism and associated hazards" to be held in Yerevan on September 03-08, 2023. The conference will cover various aspects of volcanology, volcanic hazards, petrology, geochemistry, volcano-seismology, environmental impacts of volcanism, geothermal energy and other related disciplines.

The forthcoming Conference aims to bring together members of the scientific community active in volcanology, petrology, tectonics, geochemistry, hazard assessment and volcano-seismological and geothermal research. Leading scientists as well as young scholars will present talks and posters and will be offered plenty of opportunities to exchange their experiences, as well as to discuss recent innovations and further challenges in this field of science.

The conference to be held on September 03-08 2023 will include 2 day-long conference field trips (September 07-08) and for interested participants there is possibility of extended post-conference field trips 3 days long organized additionally (on September 09-11) to visit volcanoes and the historical sightseeing locations across Armenia.

The accepted abstracts will be published.

BACKGROUND ON VOLCANISM IN ARMENIA

Evidence of the Quaternary and Holocene volcanism in Armenia include plateau-basalt lavas, several large stratovolcanoes (e.g. Aragats) and associated ignimbrites. In Armenia, there are more than 500 Quaternary-Holocene monogenetic volcanoes located in several volcanic fields/highlands and forming one of the densest volcano clusters on the Earth. Compositionally, Armenian Quaternary magmas range from picrites and basanites to rhyolites and reveal unique geochemical fingerprints of collision zone volcanism that differ from those at island arcs, continental intraplate/ oceanic islands settings and mid-ocean ridges. Volcanism that has been active in the Holocene and over the historical period, as well as seismic swarms of volcano-tectonic origin provide evidence for potential volcanic hazards in the entire region of the Anatolian-Armenian-Iranian orogenic plateau.

CONFIRMED KEYNOTE LECTURES:

Prof. Julian Pearce, Geochemistry of Collision Zone Magmatism

Prof. Donald Dingwell, Experimental access to volcanic eruptions

Prof. Charles Connor, Distributed volcanism and distributed volcanic hazards: worldwide examples

**** The Expression of Interest form is attached to this 1st Circular.***
Please, fill in the form and return it to volcanology2023@geology.am
Before 15th February 2023

LOCAL ORGANIZING COMMITTEE

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CONFERENCE TOPICS

Geochemical fingerprinting of volcanism
Convergent margin volcanism
Volcanism and geodynamics
Numerical modeling of various volcanic phenomena
Statistics in volcanology
Volcano-tectonic interactions
Volcano-seismology, geophysics
Volcanic hazard assessment
Ignimbrites and Plinian eruptions
Experimental studies of volcanic systems
Volcanism and geothermal energy resources

Official Language of the Conference is English

Abstract submission procedure and details on presentations will be provided in the 2nd Circular that will be distributed in April 2023.

CONFERENCE SCHEDULE

- *September 03, 2023-Arrival to Yerevan and Icebreaker reception meeting*
- *September 04, 2023-Opening and General Session, keynote lectures*
- *September 05 and 07 2023 - Conference section sessions by topics*
- *September 06 and 08, 2023 - Mid-conference field trips*
- *September 09, 10,11, 2023 - Post-conference field trips*
- *September 12, 2023 - Departure*

IMPORTANT DATES

- *February 15, 2023-Deadline for submission of the Expression of Interest form*
- *April 30, 2023 - Deadline for abstract submission*
- *June 30, 2023-Notification of abstract acceptance and registration open*
- *July 31, 2023-Closure of early-bird registration*

REGISTRATION FEES

Regular fee- USD 400

Student fee- USD 150

Accompanying person fee-USD 250

Post-conference field trips- USD 350

Field trips for students- USD 150

The conference fee includes:

- *Attendance at the scientific sessions*
- *Coffee breaks and lunches during the meeting and the mid-conference field trip (September 03-08)*
- *Transportation and lunch during conference field trips (September 06 and 08)*
- *Conference banquet (September 07)*
- *Conference materials and an obsidian souvenir*
- *Welcome "Icebreaker" event*
- *Special sightseeing travel program will be offered to the registered accompanying persons*

The registration fees do not include the costs of international travel and accommodation in Yerevan.

VISA INFORMATION

- *Citizens of all European Union countries, Switzerland, the USA, China, Iran, and the states of formerly USSR republics do not need visas to enter Armenia.*
- *Citizens of many countries can easily get visa on arrival at the Yerevan Zvartnots international airport (visa fee is ~ USD 6).*
- *Citizens of some countries are required to apply for visa beforehand*

For more information about the visa policy of Armenia, please check the regularly updated websites:
http://mfa.am/en/visa/
https://en.wikipedia.org/wiki/Visa_policy_of_Armenia

For further inquiries, feel free to contact the Organizing Committee at:

E-mail: volcanology2023@geology.am

Phone: +374 10524426

Detailed information about mid-conference field trips is provided below. Detailed information about the post-conference field trips will be provided in the second circular.

We look forward to seeing you in Yerevan!

“CONTINENTAL COLLISION ZONE VOLCANISM AND ASSOCIATED HAZARDS” CONFERENCE

Excursions program

MID-CONFERENCE EXCURSION DAY 1, SEPTEMBER 06

1. Matenadaran - Scientific Research Institute of Ancient Manuscripts
2. Garni Hellenistic Temple and Fortress
3. Azat River Canyon and thick columnar joint lava flows
4. Geghard Monastery and thick volcanoclastic suite
5. Return to Yerevan

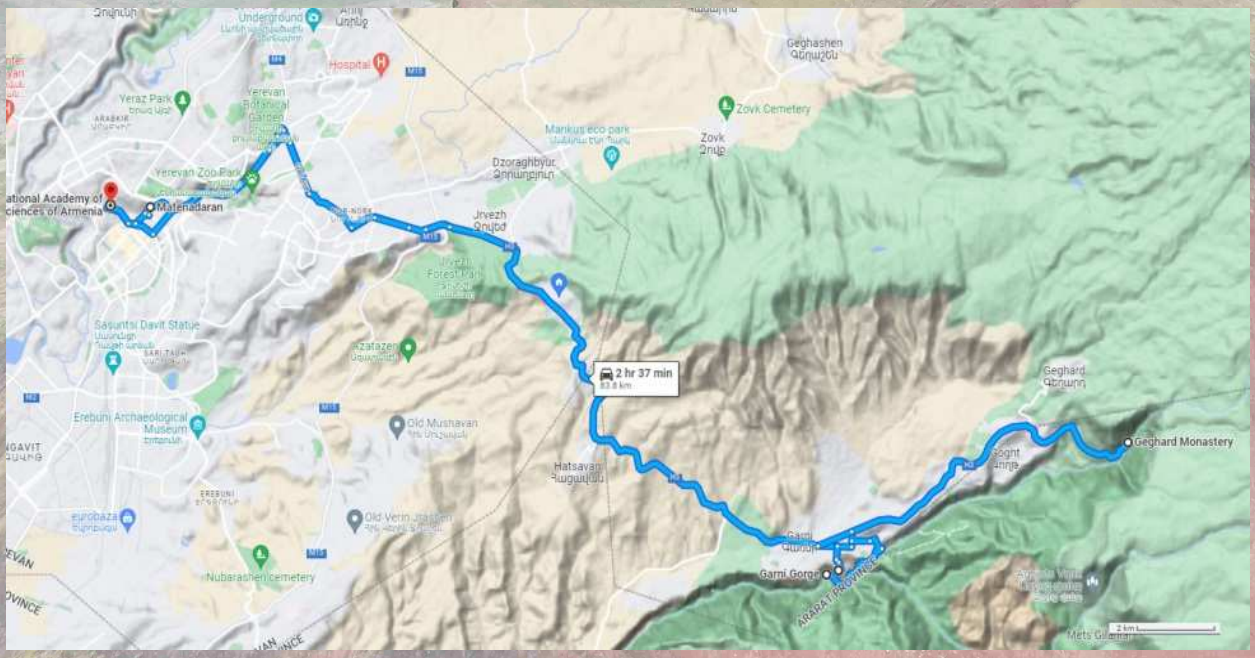


Figure 1. *Route of first day mid-conference trip*

First, we will visit Mesrop Mashtots Matenadaran, a repository of ancient manuscripts, a research institute and a museum in Yerevan. It holds one of the world's richest depositories of medieval manuscripts and books which span a broad range of subjects, including history, philosophy, medicine, literature, art history and cosmography in Armenian and many other languages (Figure 2).

Afterwards we will visit Garni Fortress and the 1st century AD Classical Hellenistic Temple of Garni. It is located 28 km away from Yerevan. The fortification at Garni was a summer residence of the kings and the place where their troops were stationed. The structures of Garni combine elements of Hellenistic and national culture, which is evidence of antique influences and the distinctive building traditions of the Armenian people (Figure 3).

Then the buses will take a route to the Azat River’s spectacular gorge, located a short distance from the temple, and see spectacular columnar joints lava flow (dated 127 Ka years), and Garni active fault. The source of the lava flow is within Gegham volcanic upland. Hexagonal prisms formed in the canyon are related to the slow cooling and cracking of lava flow in Armenia. It got the name “Symphony of stone” and is recognized as a geological monument. (Figure 4).

After lunch, we will visit the 4th-13th Century AD Geghard Monastery and view of Vokhchaberd volcanoclastic suite of the Upper-Miocene-Pliocene Age. The monastery complex was founded in the

4th century by Gregory the Illuminator at the site of a sacred spring inside a cave. Garni and Geghard are located at the foothills of the Gegham volcanic ridge's foothills in central Armenia(Figures 4, 5 and 6).

Figure 2. *Matenadaran Scientific Research Institute of Ancient Manuscripts after Mesrop Mashtots.*

Figure 3. *Garni Hellenistic temple, 1st century AD.*

Figure 4. *Columnar joint trachybasaltic andesite lava flow in the canyon of Azat River near Garni.*

Figure 5. *General view of Vokhchaberd Late Miocene-Early Pliocene volcanoclastic suite cut by canyon of Azat river and Geghard Monastery.*

Figure 6. *Geghard Monastery, 4-13 century AD.*

MID-CONFERENCE EXCURSION DAY 2, SEPTEMBER 08

1. Aragats volcano and the Armenian ignimbrites (650 Ka)
2. Amberd historical fortress
3. Irind volcano and unique Plinian eruption section
4. Arteni rhyolite volcano (1.5 Ma)
5. Barozh mid-late Paleolithic open air site and obsidian workshop
6. Return to Yerevan

Figure 7. *Route of second day mid-conference trip*

Aragats volcano and Armenian Ignimbrites

A short stop at the foothills of Quaternary Aragats volcano. Aragats (4090m, Figures 8, 9) is one the largest volcanoes in the entire region and produced central vent (inc. Plinian VEI ≥ 5) and monogenetic type flank eruptions and periphery plateaus within a total area greater than 5000 km^2, known as Aragats volcanic province (AVP). The Aragats volcanic province (AVP) comprises the composite cone of Aragats volcano, the peak of which is built on a summit plateau, ~45 km in diameter shield structure with dozens of flank vents, scattered monogenetic cinder cones on the adjacent volcanic plateaus as well as the neighboring stratovolcano Arailer.

The vast fields of lava flows, ranging in composition from basalts to dacites and ignimbrite forming Plinian eruptions in Armenia are related to Aragats volcano (Figure 10). New K-Ar and $^{40}Ar/^{39}Ar$ age determinations of groundmass and separated plagioclase samples indicate that volcanism at AVP began ~2.5 Ma, while the most recent volcanic activity is 0.49 Ma for Plinian eruption of trachydacites from Irind flank vent and basaltic trachyandesite lava flows from Tirinkatar (0.48-0.61Ma), Kakavasar, (0.52-0.54Ma) and Ashtarak (0.58 Ma) monogenetic flank centers, as well as trachyandesites of Jrbazhan volcano on the summit plateau of Aragats (0.52 Ma). The activity of Aragats stratovolcano itself is estimated to be around 1 Ma, between 1.54 Ma to ~0.5Ma.

***Figure 8**. Aragats stratovolcano, 4090 m. a.s.l. last central vent and flank activity ~500 Ka.*

***Figure 9.** The highest northern summit of Aragats stratovolcano (4090 m. a.s.l.)*

Figure 10. *Ignimbrites of Byurakan type with columnar joints covered by Tirinkatar trachybasaltic andesite lava flow.*

Amberd historical fortress

Amberd, a medieval fortress in Armenia (Figure 11), is located on the southern slopes of Mount Aragats, on a triangular cape where the rivers Arkashen and Amberd join. Amberd means “a fortress in the clouds," a fitting name considering its elevation at 2 300 m above sea level. The mansion and some sections of the walls were constructed in the 7th century by the noble house of Kamsarakan. The site incorporates a rich variety of buildings including a church, a chapel, baths, walls and several gates.

Figure 11. *Amberd historical fortress and Ararat stratovolcano in the background*

Irind volcano Plinian eruption section

Irind vent is located on the slopes of Aragats stratovolcano. Following the pyroclastic Plinian style VEI=4 eruption, produced ~13 m thick Plinian pumice fall deposit (Figures 12 and 13) with overlaying ignimbrite, a voluminous (2.9-3.6 km^3) effusive eruption of Irind created up to 120 m thick trachydacite lava flows that extended 18 km from the vent demonstrates relatively low viscosity of Irind magma, since such long and thick lava flows are not typical for viscous felsic lavas. The Irind eruption products are characterized by a plagioclase-two pyroxene mineral association that is atypical for Aragats. Our results support the view that often small eruptive vents (Irind) on the slopes of large coeval stratovolcanoes (Aragats) are not necessarily tapping the voluminous magma mushes underneath and are capable to deliver independent Plinian eruptions. The compositional differences between the volcanic products of the Irind cone compared to the main volcanic edifice of Aragats suggests that these are triggered by intrusions of hot, volatile-rich and alkaline felsic magmas that did not mix well with the otherwise dominant and older magmatic system under Aragats.

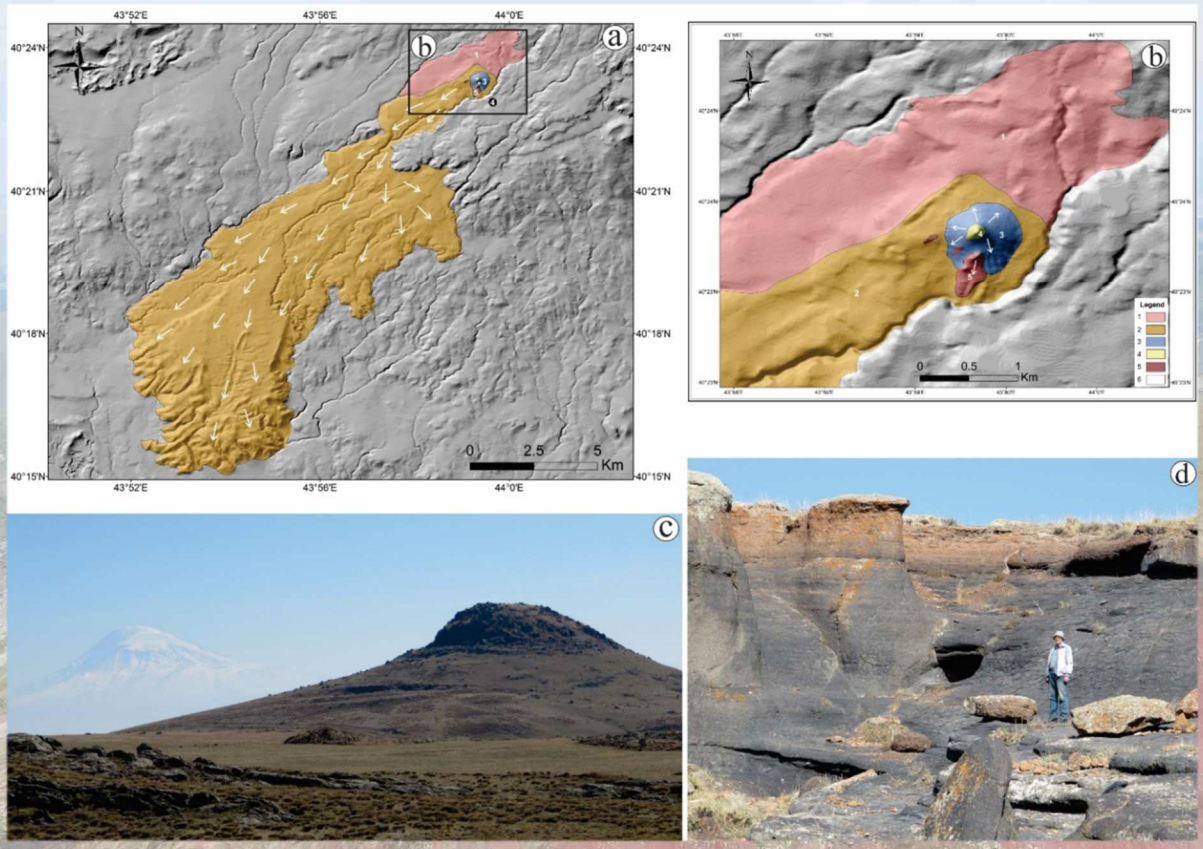


Figure 12. Overview (a) and close-up (b) sketch maps of the Irind volcano and its products. Legend: 1. Explosive Sub Plinian phase, 2. Effusive phase, 3. The contour of Irind volcano, 4. Trachydacite dome (plug) of Irind volcano, 5. Lavas from a system of cracks. White arrows show directions of lava flows (c) Photograph of the vent/plug of Irind volcano with Ararat stratovolcano in the background (in white). (d) Black-reddish column-collapse vitrophyre outcropping on the western flank of Irind volcano.

Figure 13. Plinian pumice fall and ignimbrite cover (left); Plinian fall deposit section (right)

Arteni rhyolite (obsidian) volcano

Arteni volcanic complex (Figures 14, 15) is located within Aragats volcanic province; the age of Arteni rhyolites considered to be early Pleistocene, K-Ar ages yielded: for Mets Arteni 1.45-1.5 Ma (Chernishev et al., 2002), fission tracks (1.27 Ma; Oddone et al., 1999) and 1,26 Ma for Pokr Arteni (Lebedev et al., 2011). Thus, rhyolitic eruptions and the formation of domes of Arteni volcano correspond to the Early Pleistocene. Eruption products of Arteni volcano are covered by more recent middle Pleistocene andesitic lava flows of neighboring Kabakhler cinder cone and ignimbrites of Aragats stratovolcano.

Arteni is the most compound rhyolitic volcanic complex in Armenia and consists of two independent rhyolitic volcanoes: Mets (Big) and Pokr (Little) Arteni (2047 and 1754 m asl, respectively). Volcanic activity began with an eruption of perlite-pumice pyroclastics, followed by eruptions of detrital perlite and zonal obsidian that flowed westward and southward; shorter flows also went northward (Fig. 15). Arteni obsidian is of high quality; "smoky quartz" of the translucent, reddish-brown, black, and other varieties is known, see (Karapetyan (1972) for details.

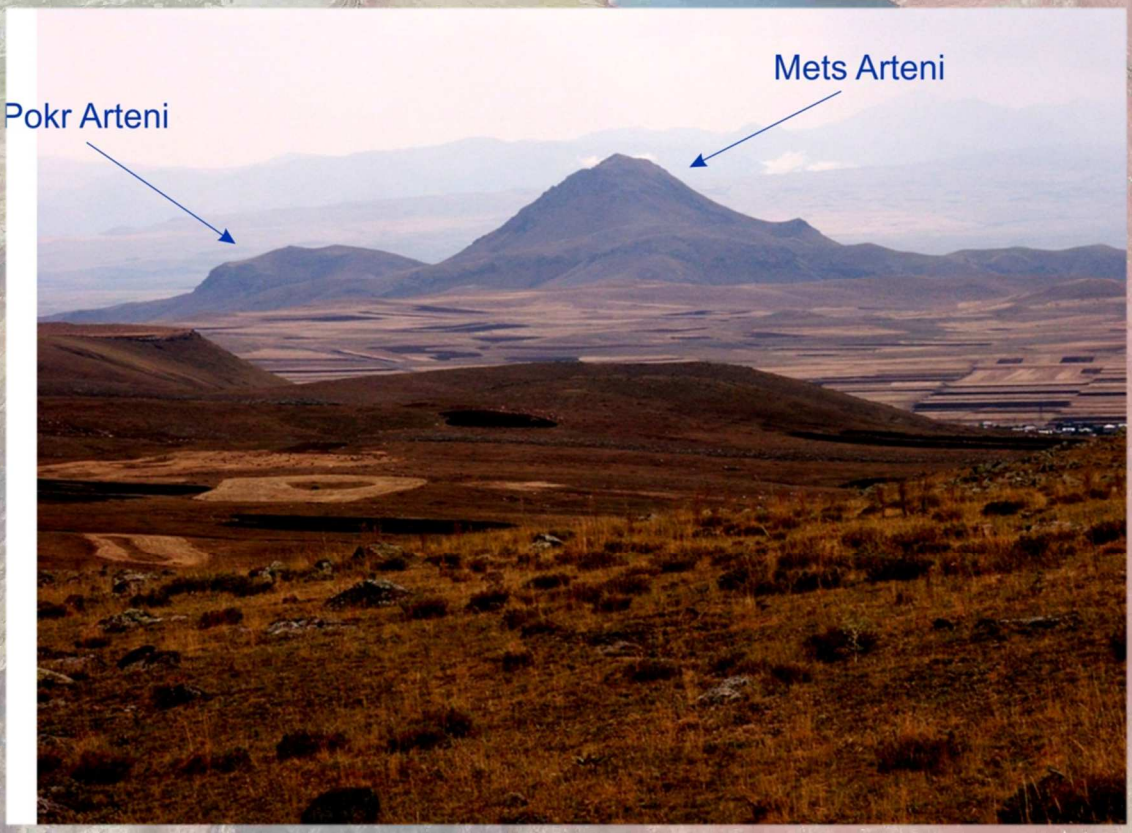


Figure 14. *Arteni volcanic complex in Armenia, Aragats volcanic province.*

Figure 15. *Products of explosive eruptions of rhyolite pumice and perlite pyroclastics (left). Obsidian cliff in small modern quarry across a lava flow erupted from Pokr Arteni volcano (right).*

Barozh Middle Paleolithic open air site and obsidian workshop

The newly discovered site of Barozh 12 open air Middle Paleolithic site was studied recently by the international archaeological team, summarized in Glauberman et al., (2013). It is located in western Armenia, near Arteni volcano (figure 16). The site yielded significant data on Late Middle Paleolithic technology, land use, and lithic economy in a region that has heretofore been little explored. The lithic assemblage appears similar to those from other later Middle Palaeolithic sites in the region and could date to the time range when archaic and anatomically modern species populations overlapped temporally and/or geographically. Barozh 12 is a large, high-density Middle Paleolithic site. The surface of a 1m×1m unit, and a 0.50m × 0.50m × 0.95m deep test trench yielded 1174 artifacts. Based on preliminary analysis of samples from the surface (n = 102) and excavated artifact assemblages (n = 340), both display typo-technological characteristics of the Middle Palaeolithic in the region. Both discoidal and triangular Levallois core reduction is observed on discarded cores and flakes, as are numerous retouched pieces, predominantly classified as points, blades, and a variety of unifacial scrapers. Surface and excavated artifacts are of all size classes and technological categories, including tool re-sharpening flakes and core trimming elements. Artifacts class frequencies and cortex analysis also suggest that all stages of core reduction and tool use, maintenance and discard occurred on site. Preliminary results of portable X-Ray fluorescence (pXRF) on a small sample of obsidian artifacts (mainly retouched pieces) indicate that most were manufactured from local (1-2km) Pokr and Mets Arteni material, while a smaller number of artifacts were manufactured on material that originates from 80km –>100km away. Varying frequencies of local and 'imported' raw materials observed in small samples from stratified archaeological levels suggest dynamic raw material transport patterns over time.

Figure 16. View of Barozh open-air Paleolithic site and test trench. Arteni volcano is in the background.

The extent of a 'raw material exploitation territory' is suggested by obsidian sourcing though only to the east of the site. Further pXRF study of obsidian raw materials in conjunction with further analysis of artifact manufacture and discard patterns, will elucidate regional-scale technological and land use behavior. These first results of survey, lithic assemblage analysis, and test excavation indicate that Barozh 12 was frequently reoccupied over time for a variety of uses, and may be considered a 'central place' in the regional settlement and mobility system.

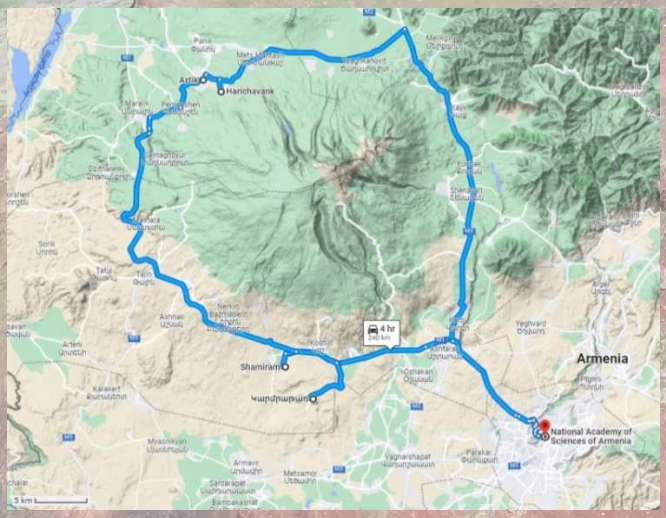
***Figure 17**. Artifacts from the test trench at Barozh12 (after Glauberman et al., 2013).*

POST-CONFERENCE EXCURSIONS SEPTEMBER 09-11

Detailed information about the post-conference field trips will be provided in the second circular.

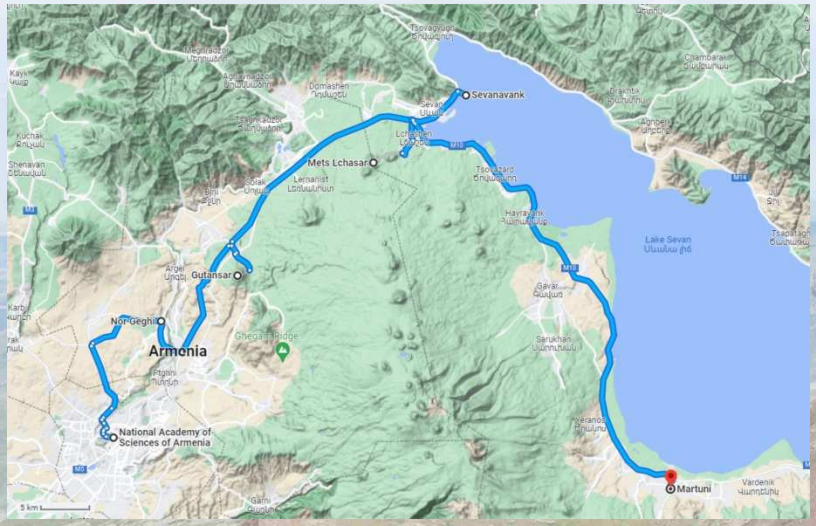
POST-CONFERENCE EXCURSION DAY 1, SEPTEMBER 09

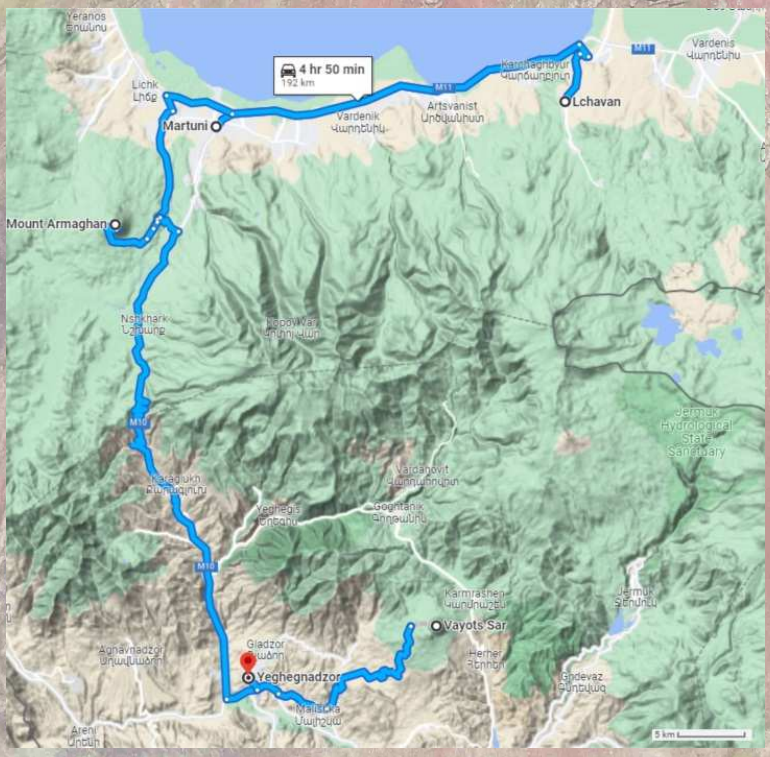
1. Shamiram volcanic plateau
2. Shamiram and Karmratar volcanoes
3. Yerevan ignimbrites and Artik “lava-like” ignimbrites
4. Harichavank monastery
5. Return to Yerevan



Post-conference excursion day 2, September 10

1. Nor Geghi Mid-Paleolithic site (400-200 Ka).
2. Gutansar volcano
3. Lchashen scoria sand-pit
4. Sevan peninsula, Sevanavank monastery
5. Stay in Martuni



POST-CONFERENCE EXCURSION DAY 3, SEPTEMBER 11

1. Khonarasar volcano split by an active fault
2. Armaghan volcano
3. Vayotsar volcano
4. Return to Yerevan